Impacts of sedimentation on coral settlement, Pelekane Bay, Hawai‘i

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Coral Reef Assessment and Monitoring Program (CRAMP)

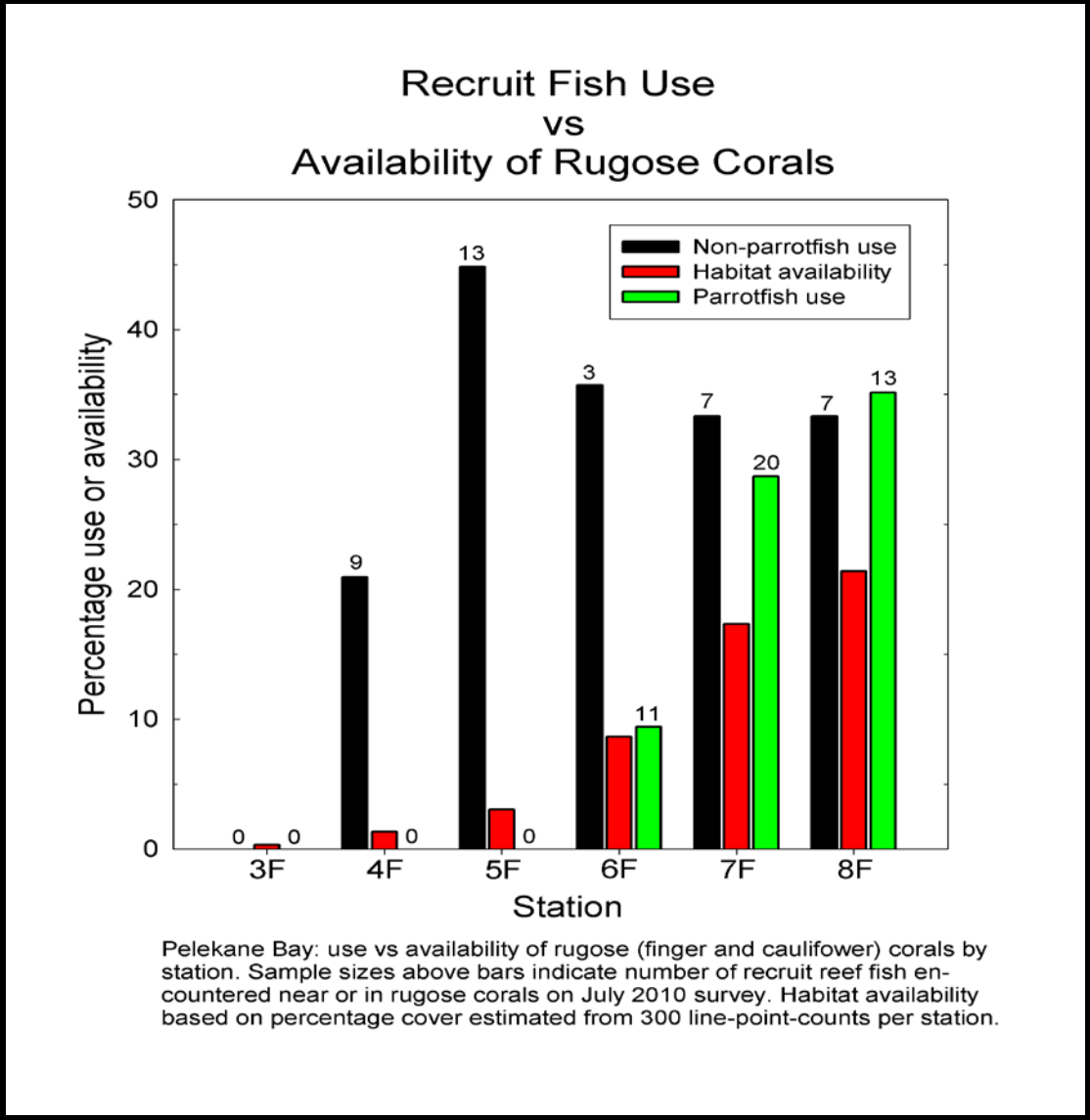
Project objective 2014

- To understand the potential of reef recovery
- To evaluate habitat quality in relation to reef recovery
- Understand the potential threat that existing mud deposits pose to adjacent, relatively pristine coral reef ecosystems

Reef study projects, Pelekane and Kawaihae

- 1969-70 Kanayama and Kawamoto (1970)
- 1976 Chaney et al. (1977)
- 1994-95 Jokiel et al. (1999)
- 1996 Tissot (1998)
- 2000-12 HIMB-CRAMP (Kawaihae)
- 2002 HIMB-CRAMP (Pelekane)
- 2004 USGS (2007), habitat mapping
- 2005 Beets et al. (2010), fish
- 2006 Hoover and Gold (2006)
- 2010-2011 Collaborative USGS, NOAA, HIMB-CRAMP, TNC
- 2011 HIMB-CRAMP, coral settlement and water quality
- 2012 Stender et al. (2014) long-term comparison
- 2014 HIMB-CRAMP, coral settlement in progress

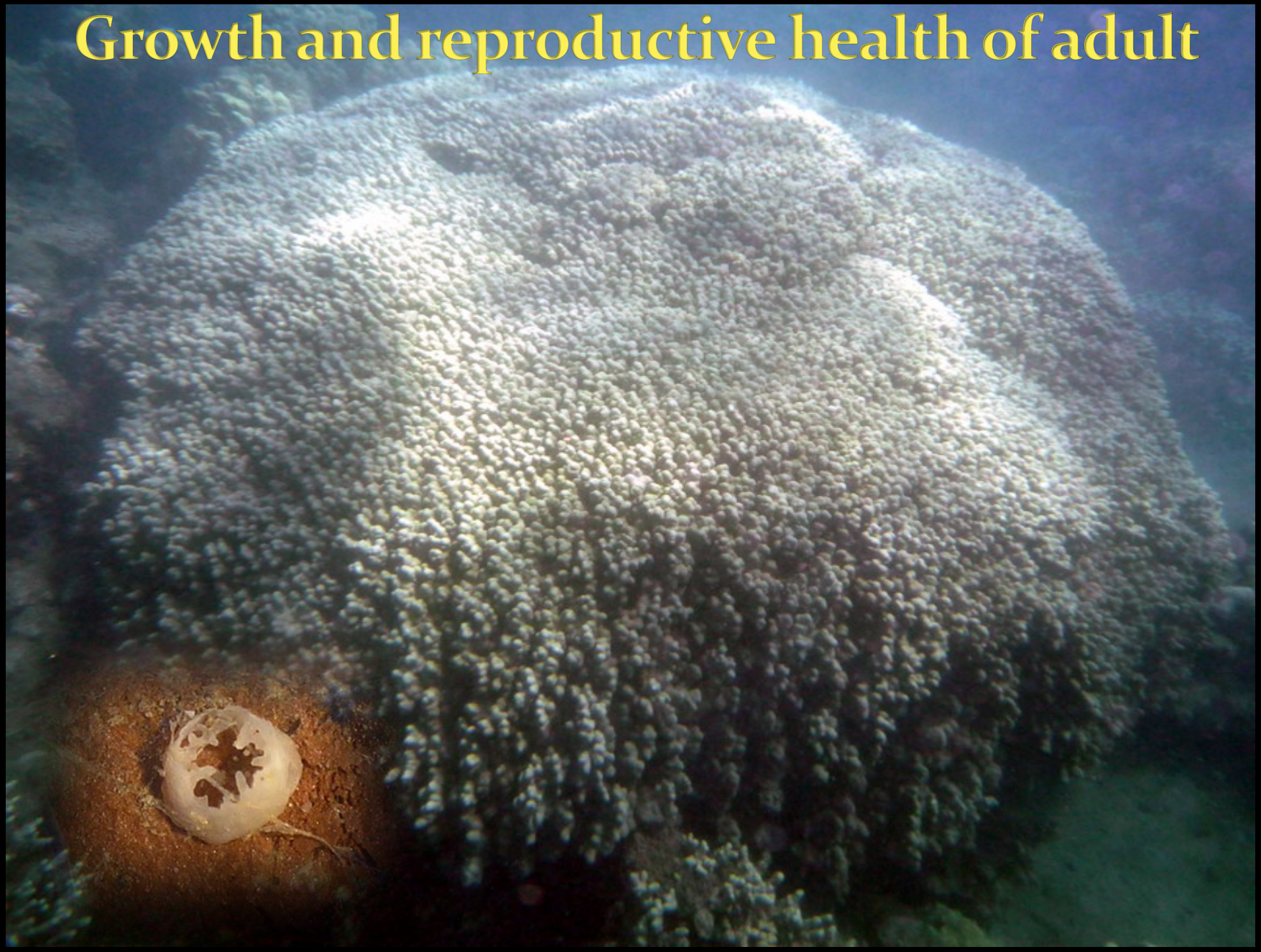
Corals, habitat quality, and fisheries

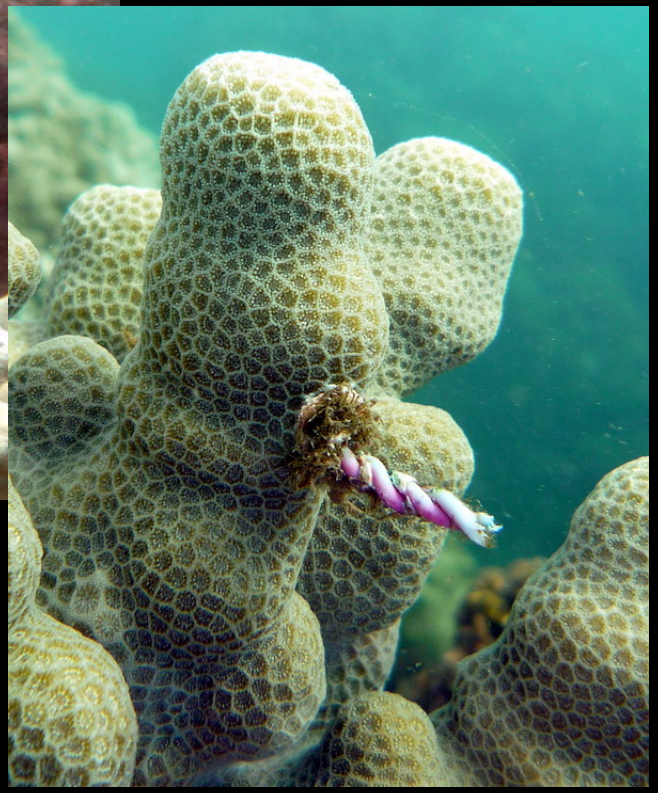


Pelekane Bay: use vs availability of rugose (finger and caulifower) corals by station. Sample sizes above bars indicate number of recruit reef fish encountered near or in rugose corals on July 2010 survey. Habitat availability based on percentage cover estimated from 300 line-point-counts per station.

DeMartini et al. (2013) Journal of Coastal Conservation

Growth and reproductive health of adult

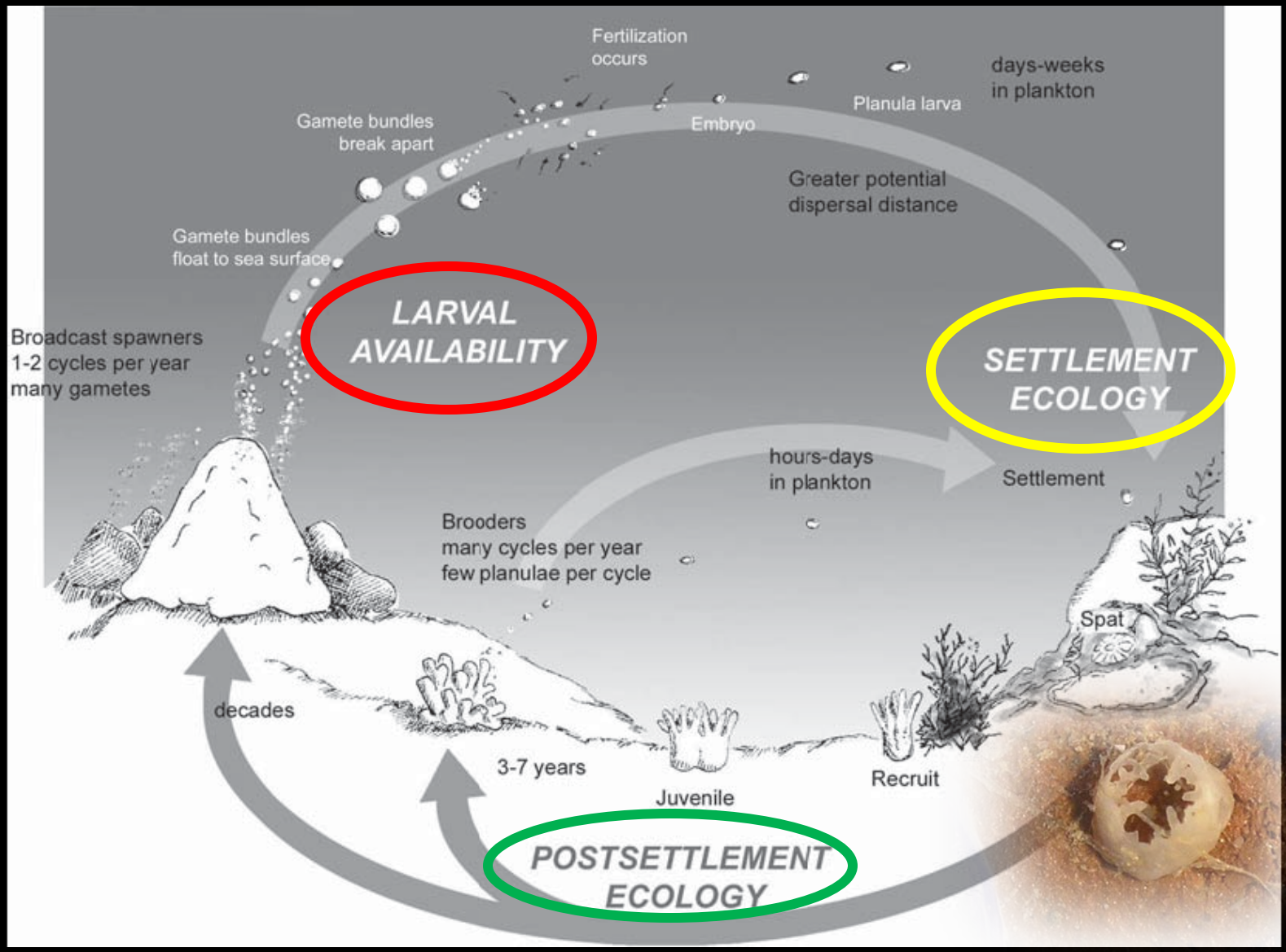




Coral Growth Studies
Finger Coral *Porites compressa*

June 2010-Nov 2010

Larval settlement and recruitment



Ritson-Williams et al. (2009), drawn by Vermeij, M.

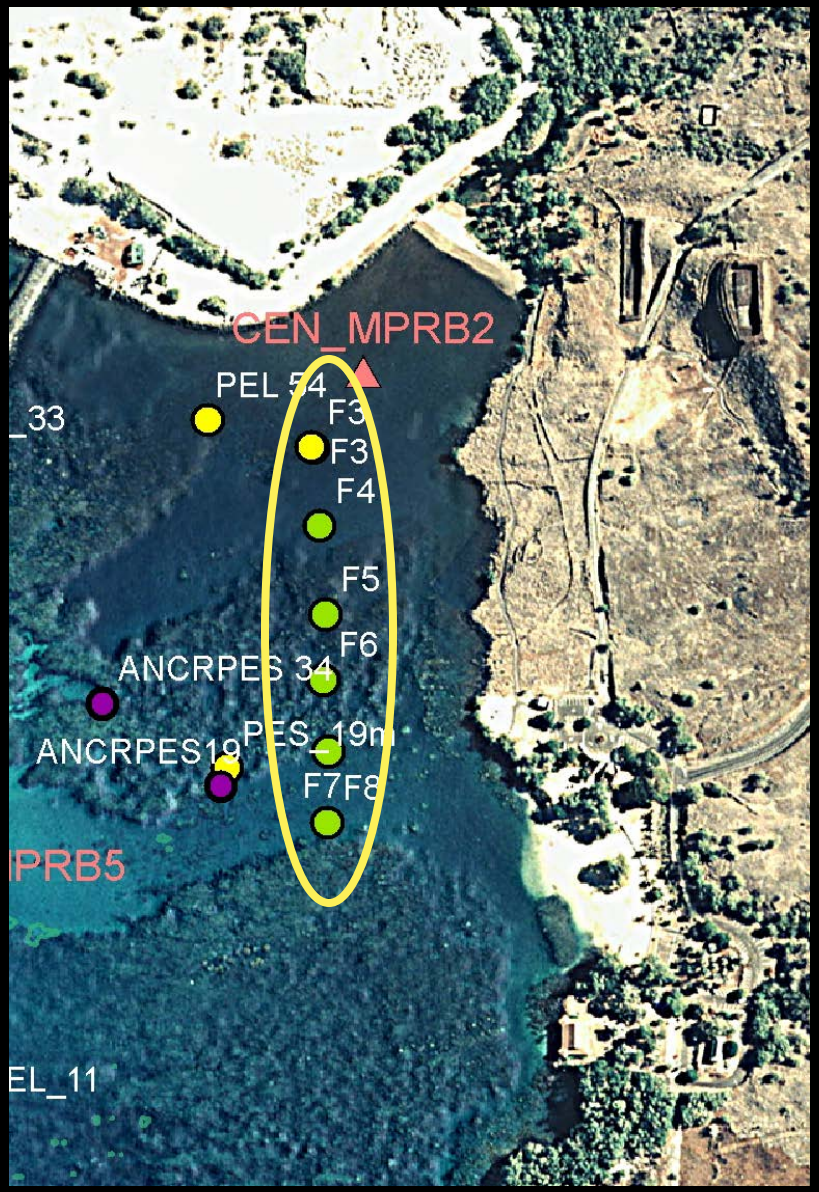
2010 coral settlement

Montipora

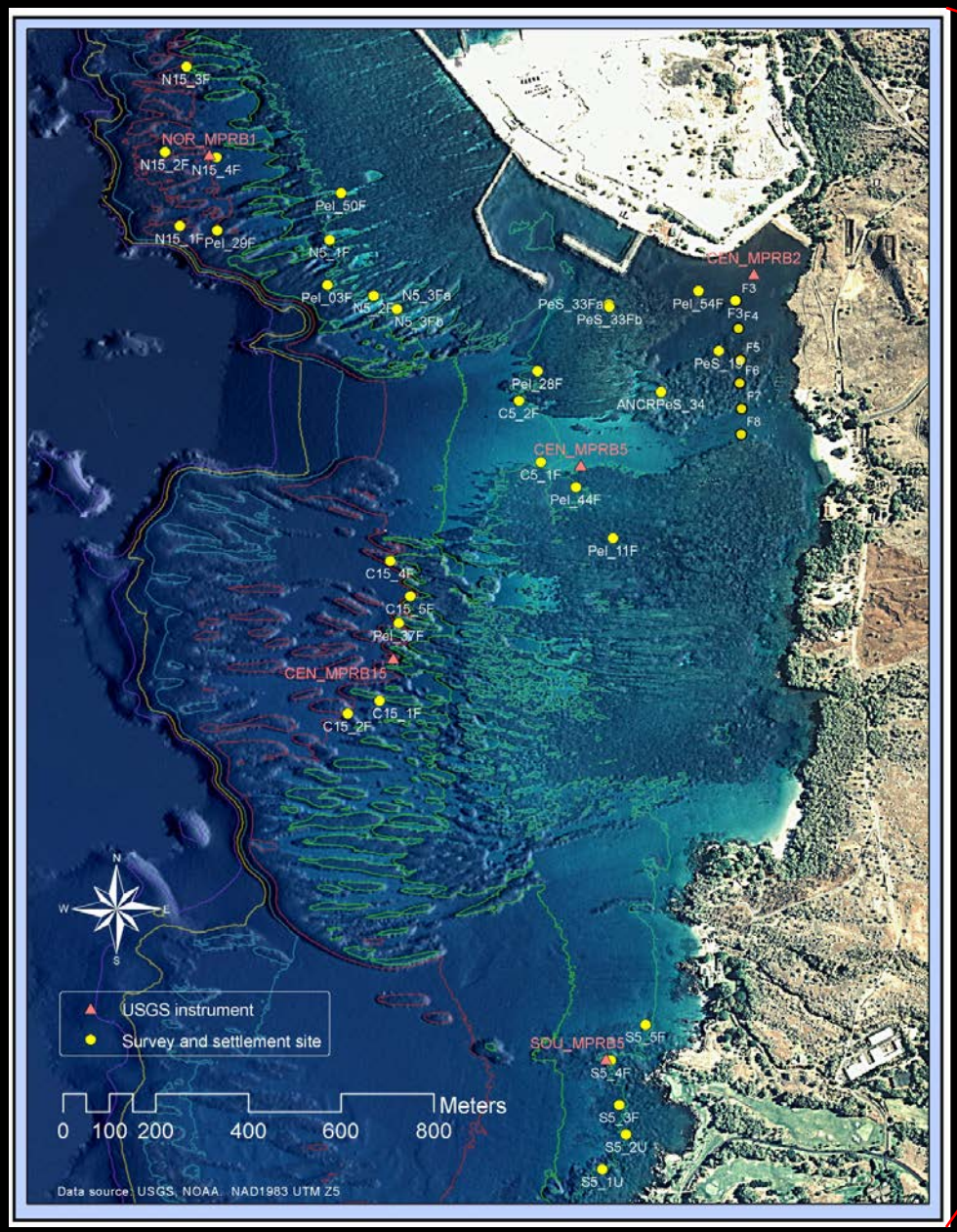
= 4

= 1

Porites



2011 coral settlement

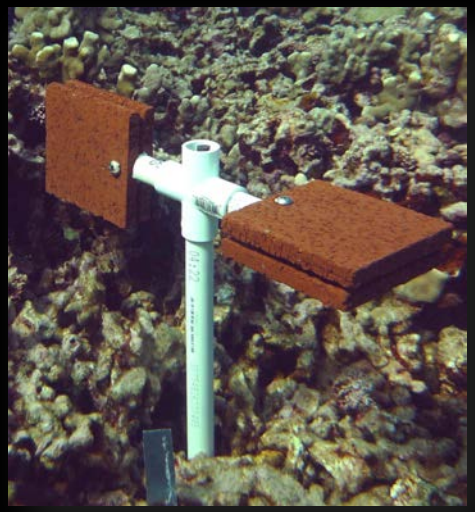


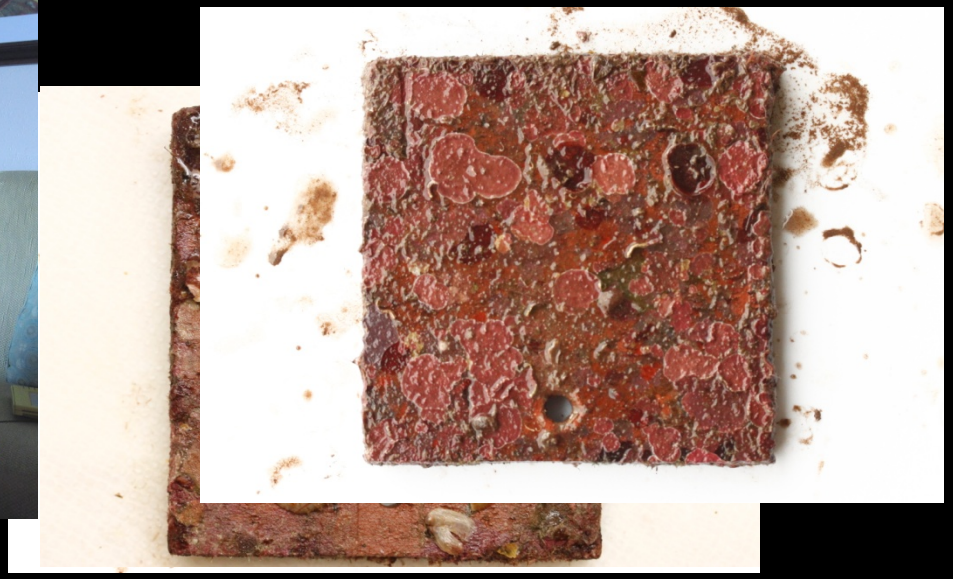
Expanded spatial scale

40 sites
Depth 1.5 – 15 m

Methodological approach

- Unglazed clay tiles
- Light, temperature, salinity, pH, turbidity, rugosity, depth
- Number of recruits, genus, size, surface



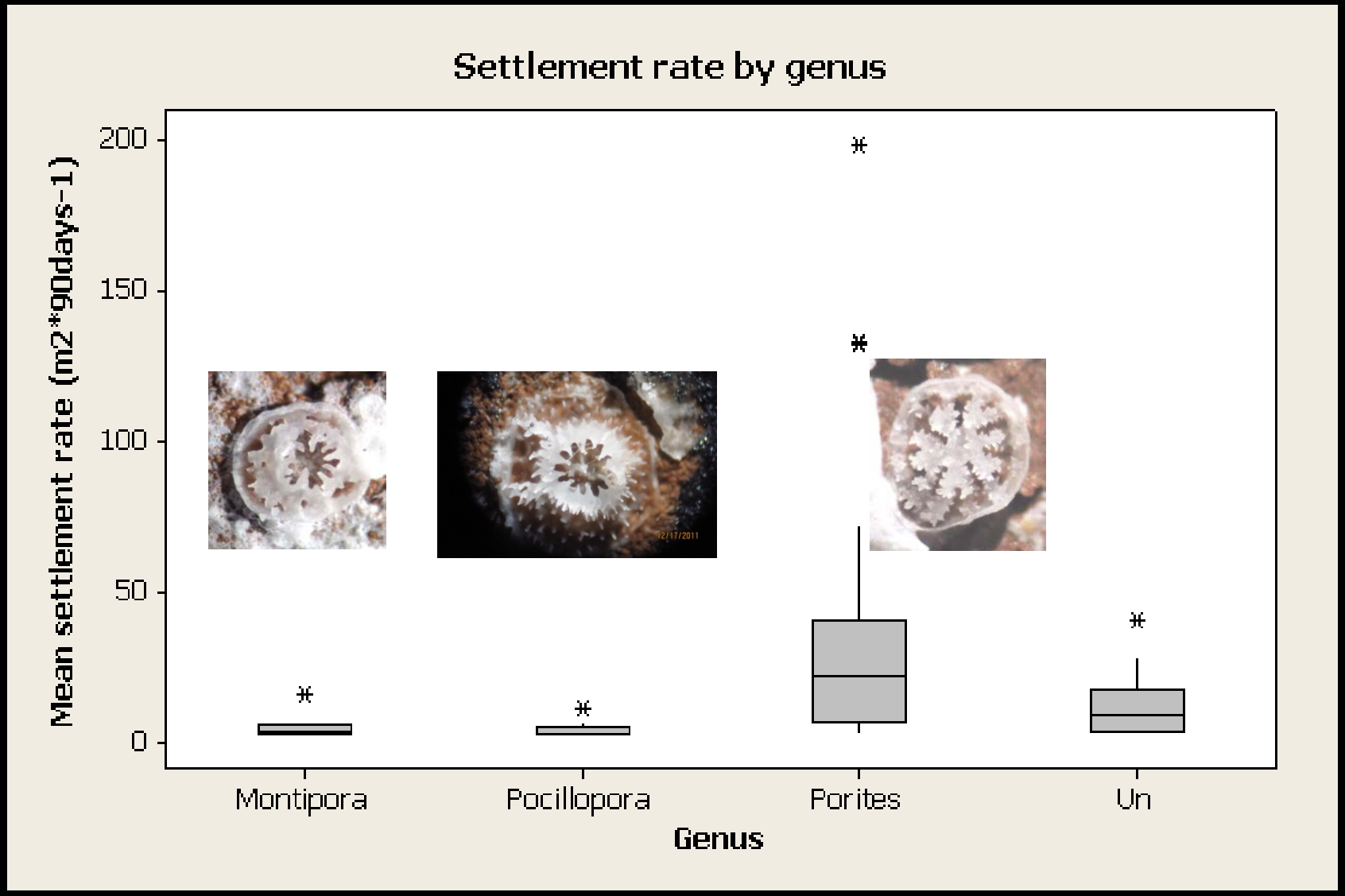


2010-2011 findings: are there different environmental regimes?

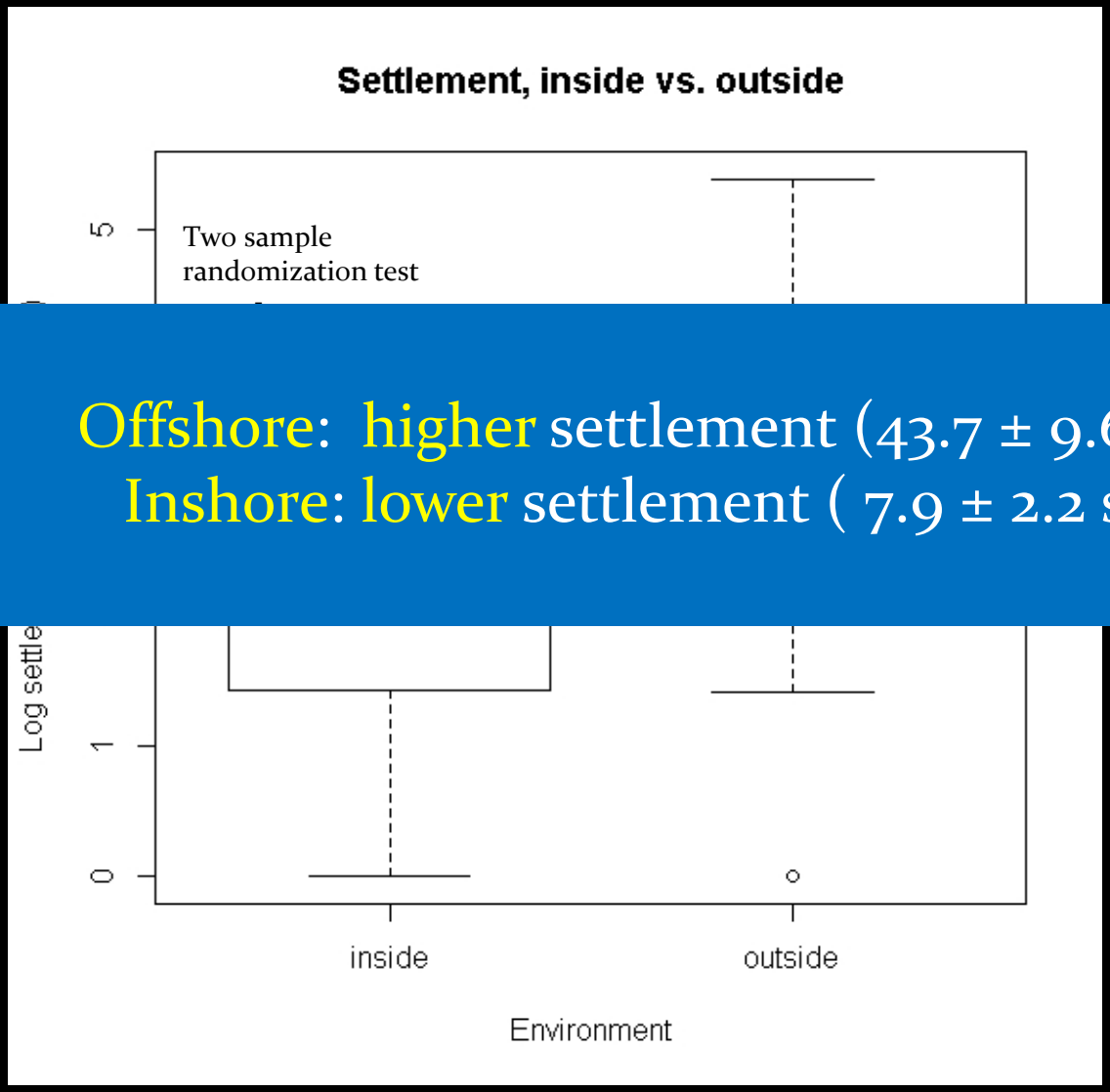
There are two major environmental regimes: characterized by available light, temperature, salinity, and depth.

Inshore: shallow, less light, warmer temperature, lower salinity
Offshore: deep, more light, cooler temperature, higher salinity

2011 overall settlement



2. Do settlement patterns differ between the environmental regimes?



Bootstrap percentile
95% CI

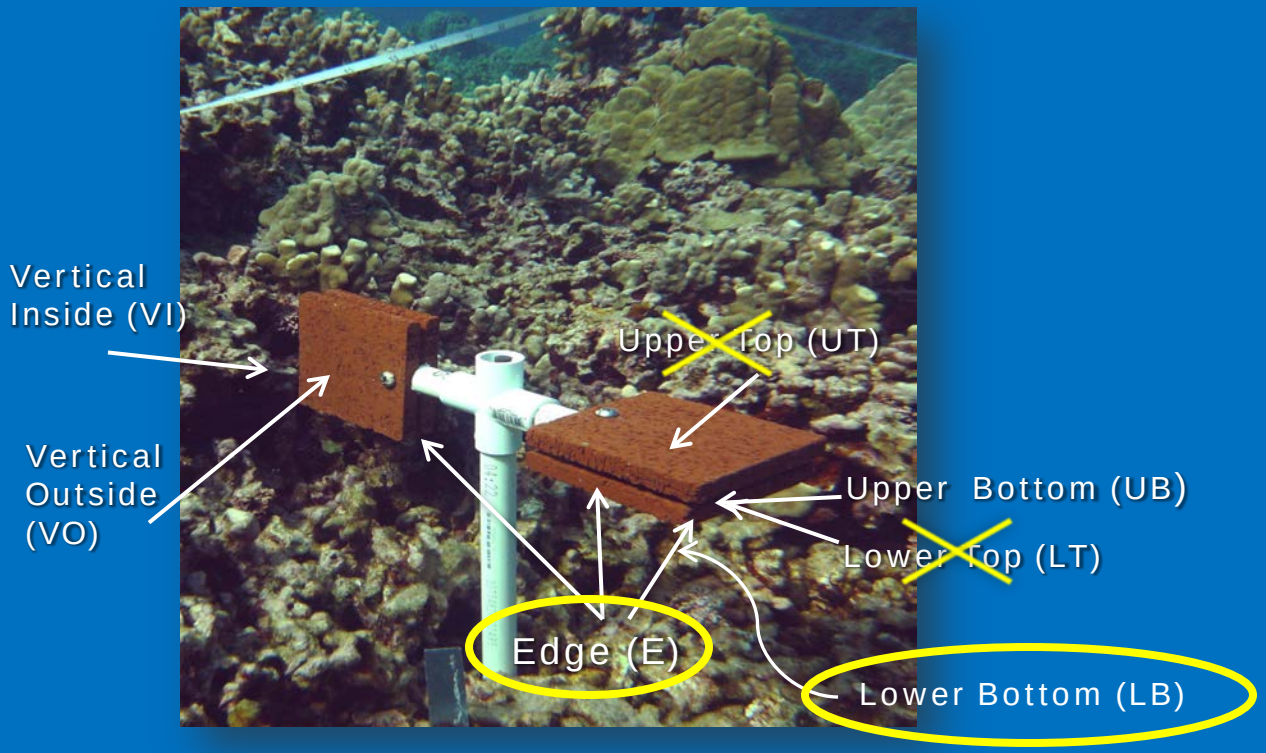
Inside 1.244, 2.433

Offshore: higher settlement (43.7 ± 9.6 s.e.m. m^2*90days^{-1})

Inshore: lower settlement (7.9 ± 2.2 s.e.m. m^2*90days^{-1})

Edge and lower bottom surface: more settlement
Upper top and lower top: less settlement

Light and smothering were major limiting factors.



2011 summary and conclusion

- Two major types of environment: inshore and offshore, characterized by light, temperature, salinity, and depth

- Significantly less settlement was found in inshore reef than offshore reef

- Settlement limited by available light:

  Inshore: suspended solids/sediments, smothering
  Offshore: depth

2014 accomplishment

- Environmental conditions at Pelekane Bay following a recent heavy rain event have been assessed through aerial photo documentation and shoreline surveys through helicopter surveys by PI.

- Settlement tiles have been deployed at 34 sites in Pelelane and Kawaihae, 3 sites at Puakō.

- Total suspended solids and photosynthetically active raditaion (PAR) were measured at each site.