Coral settlement and early post-settlement survivorship: Experimental studies of factors that affect recruitment success

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Coral Life Cycles

Broadcast spawners
1-2 cycles per year
many gametes

Brooders
many cycles
few larvae/cycle

Days - weeks in plankton

Hours - days to settlement

1 - 3 years

Decades
THE IDEAL SITUATION
19 colonies from 8 species
CARIBBEAN CORAL REEFS HAVE LOST MUCH OF THEIR LIVE CORAL COVER, BUT RECRUITMENT RATES HAVE BEEN LOW AND CORAL POPULATIONS ARE NOT RECOVERING VERY QUICKLY OR AT ALL.

WHY NOT?

Poor settlement?

Poor post-settlement survivorship?
We need to understand factors that affect coral recruitment success in order to understand coral reef resilience, and to be able to develop management interventions to help with coral restoration and recovery.
Factors that Affect Post-Settlement Survivorship

- competition with surrounding encrusting organisms
- species composition of encrusting community
- predation
- nutritional resources/access to light

Affected by...

- grazer community composition
- weather, tides, storms
- water quality conditions
- plain ol' LUCK???
PROPOSED 'Post-Settlement' RESEARCH:

1. Settlement plates Pre-settled (in lab) with cultured larvae, mapped and then examined monthly after deployment

2. Deploy plates along environmental gradients of interest using subset of CRES recruitment sites

3. Settle plates with 3 different coral species with different sizes and recruitment dynamics (*M. faveolata, A. palmata and D. strigosa*)
METHODS

• These methods have been used in Florida to study survivorship of *M. faveolata*, *M. cavernosa* and *A. palmata* settlers.

• Similar approach to be used in Parguera to:
  – Compare sites
  – Examine natural settlement rates
  – Post-settlement survivorship rates
Coral larvae usually settle next to but not on CCA; often cryptic and difficult to locate.

Fluorescent microscope helps quickly find the newly settled corals.
M. faveolata
two weeks old

A. palmata two
weeks old
CORAL CULTURING FROM SPAWN

(1) Collect spawned gamete bundles

(2) Fertilize in bucket (on boat or in lab)

(3) Culture coral larvae in the laboratory until they are mature enough to settle (4 to 8 days depending on species)

(4) Place larvae in mesh chambers or aquaria with aged settlement plates until larvae settle

(5) Settled spat mapped on plates under a microscope and then plates deployed on reef; plates are retrieved and re-examined to follow survivorship
PROGRESS

• April 2005
  – 250 limestone settlement plates shipped to PR for experiments

• June 1-6, 2005
  – Deployment of settlement plates for “curation period”
    • Buoy site - 30 plates at 20 m
    • Turrumote – 30 plates at 5 m and 30 plates at 10-12 m
    • Pelotas – 15 plates at 5 m (to much bioerotion)
    • Enrique – 20 plates at 5 m and 20 plates at 10-12 m
  – Extraction from CCA (*Peissonellia sp.*) that has been found to induce coral larvae settlement to isolate fraction to be tested in August
  – Pre-proposal submitted to CCRI-CMRC rfp to expand this study so we can understand the process of early coral spat settlement.
Near future

• August 20–30
  – Bring colonies to Lab – place in tanks
  – Bring “cured” plates to lab
  – Allow corals to spawn and eggs to be fertilized – larvae development - settlement
  – Settlement in controlled environment
  – Count and map number of settlers in each plate.
  – Re-deploy to field