Effects of bleaching stress on wound repair in *Montastrea faveolata*

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INTRODUCTION

• Coral bleaching events affect thousands of kilometers of reefs that may lead to coral mortality and/or increased susceptibility to stressors.

• There is limited information on how bleaching affects tissue growth during wound repair.

• Objective: We investigated wound repair responses in *M. faveolata* specimens to temperature and solar radiation stress.

METHODS

• *M. faveolata* colonies obtained from Florida Keys National Marine Sanctuary (FLNMS) and maintained at U.S. EPA Coral Research Laboratory (Gulf Breeze, FL).

• *M. faveolata* cut into three sided specimens (Figure 1).

• Two (temperature) x three (light) factorial design (Table 1)

Table 1. Description of experiment.

Exposure Period (days)	Recovery Period (weeks)	Culture temp (˚C)	Temperature Stress (˚C)	Light Treatment[a]	Daily Solar Radiation (W·h/m²) UVB	UVA	Visible
8	15	24	24-28	High	5.57	171	773
				Medium	2.10	69.4	384
				Low[b]	0.69	23.1	140

a. Simulates daily solar radiation exposure to coral in Florida Keys at depth 5-10 m (high), 10-20 m (medium), and 20-25 m (low)[1].
b. Low treatment approximates culture and recovery solar radiation levels.

• Bleaching endpoints measured before and after exposure:
- •Photosystem II efficiency ($\Delta F_v/F_m$)
- •Zooxanthellae density
- •Pigment/polyp (chl a, chl c2, peridinin, xanthins) [2]
- •Protein content

• Camera jig (Figure 2) used to help estimate changes in live surface area by 2D digital masks before and after exposure and throughout recovery (Figure 3).

Figure 1. *M. faveolata* specimen

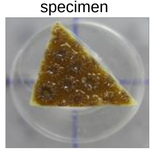
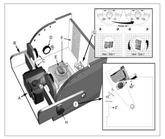


Figure 2. Camera jig



RESULTS

Figure 3. Change in live surface area before (t-18) and after exposure (t_0) and during recovery (t_{13}, t_{72}) of experiment.

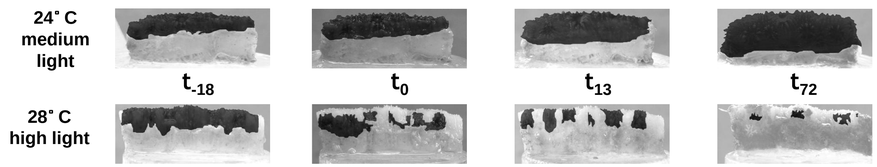


Figure 4. Change in live surface area in *M. faveolata* after exposure (day 0) and during recovery. Letters indicate significant contrasts at the end of exposure (grey box) or at the end of recovery by Tukey's HSD test.

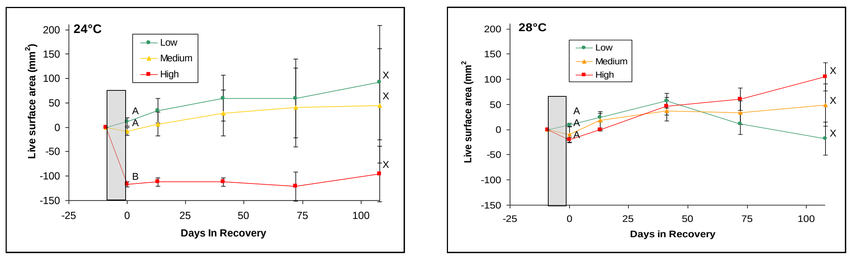


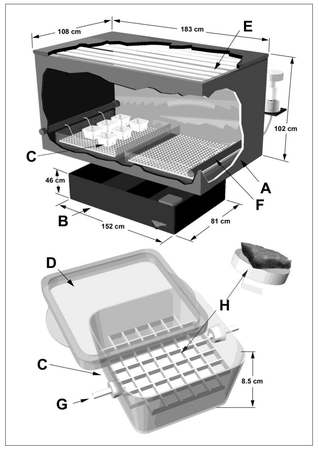
Table 2. Pearson correlation coeffeficients (r) between bleaching endpoints and rate of tissue change during the exposure period and during recovery. P-values are indicated as **, 0.001<p<0.01; *0.01<p<0.05.

Period	Fv/Fm	Zooxs/polyp	C2/polyp	ChlA/polyp	Perdinin/polyp	Xanthin/polyp
Exposure	0.51*	0.50*	0.57*	0.65**	0.61**	0.51*
Recovery	0.04	0.29	0.24	0.32	0.27	0.34

• Bleaching endpoints were significantly correlated with wound repair at the end of exposure but not at the end of recovery.

• Exposure to high solar radiation at both 24˚ and 28˚C caused tissue loss at the end of exposure.

Figure 5. Schematic diagram of solar simulator.



CONCLUSIONS

• *M. faveolata* did not bleach in the absence of elevated solar radiation. Modeling studies have predicted that *M. faveolata* are moderately sensitive to temperature compared to other Caribbean species of scleractinian corals and that solar radiation significantly increased the probability of bleaching [3].

•Effects of high solar radiation on tissue growth were only significantly different at the end of exposure. Corals under high solar radiation exposure at 24˚C never fully recovered from bleaching.

• These results indicate that bleaching events cause transient reductions in tissue growth rates under stress but can have variable impacts on longer term growth of scleractinian corals.

REFERENCES

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