

CORAL BLEACHING
Saint Barthelemy and the wider Caribbean
2006 Report St Barthelemy (Initial)
November 2006



Bleached coral St Barth 2006

Dr. Deborah Brosnan
Sustainable Ecosystems Institute : Tsunami Reef Action Fund
P.O Box 80605 Portland Oregon 97280.
Tel 503 246 5008
Email: brosnan@sei.org

St Barthelemy Tel 590 690 699658

CORAL BLEACHING
Saint Barthelemy and the wider Caribbean
2006 Report St Barthelemy (Initial)

by

Dr. Deborah Brosnan
Sustainable Ecosystems Institute (Brosnan@sei.org)
P.O Box 80605 Portland Oregon 97280. Tel 503 246 5008

OVERVIEW

In summer 2005 the Caribbean region experienced an unprecedented outbreak of coral bleaching. Initially it appeared to be centered in waters adjacent to the U.S. Virgin Islands, but soon reports of bleaching came in from the Florida Keys and Texas' Flower Garden Banks in the north, to Tobago and Barbados in the southern Antilles, to Panama and Costa Rica in the west.

Bleaching was both widespread and intense with colonies representing 42 species completely white in many reefs. Scientists in Puerto Rico noted that 85 to 95 percent of coral colonies were bleached in some of their reef areas. Reefs in Grenada were also bleached with close to 70 percent of colonies suffering impact to some degree. The pattern was repeated throughout the region and in many places it appears that over half of the affected colonies did not recover when temperatures cooled and conditions improved. St Barthelemy (St Barths) also experienced coral bleaching and here too it seems that all reefs were affected to some degree.

Coral Bleaching: Cause and Effects

Coral bleaching occurs when zooxanthellae (the algae that live within the coral) are either expelled or leave their coral hosts. Without zooxanthellae corals lose their color and turn snow white. (Figure 1. adjacent image shows coral partially bleached in Colombier (2005).) Coral bleaching has been primarily associated with increased ocean temperatures which stress corals. Bleaching is increasing in frequency and severity worldwide (NOAA 2005). Global climate change is considered one of the main causes. Bleached corals can often recover if conditions improve in a relatively short time frame, but if stress persists then the corals die. Moreover, it appears that bleaching weakens corals and makes them more susceptible to disease. Bleached and dead corals are susceptible to overgrowth by algae which can lead to further declines in corals and reef integrity. Scientists know relatively little about the detailed dynamics of zooxanthellae that inhabit corals but much research is currently underway. Some evidence suggests that certain strains or species



of zooxanthellae may be able to withstand bleaching and thus improve the chance of survival for corals.

Worldwide coral reefs are under threat of extinction, thus bleaching events which weaken and kill corals are of major concern. Monitoring and research is essential to help understand bleaching and to find ways to protect and sustain these endangered reef ecosystems.

Monitoring Ocean Temperatures and Predicting Bleaching Events.

Because bleaching seems to be a stress response to sustained increases in ocean temperatures governments and researchers are now using remote satellite data to track ocean conditions and develop predictive models. Using remote sensing techniques, The National Oceanic and Atmospheric Administration (NOAA) began issuing bleaching warning for coral reefs in several parts of the world where thermal stress is recorded. Probability of bleaching is expressed in an index of Degree Heating Weeks (DHW) Each DHW unit represents one week of temperatures 1 degree C above the maximum highest monthly average. Accumulated over three months, DHWs above four are virtually always accompanied by considerable bleaching, whereas levels above eight are believed to present increased coral mortality and inability to recover. In 2005, thermal stress had reached Degree Heating Week (DHW) values of over 15 at some locations. Figure 2 shows DHW data for November 2006.

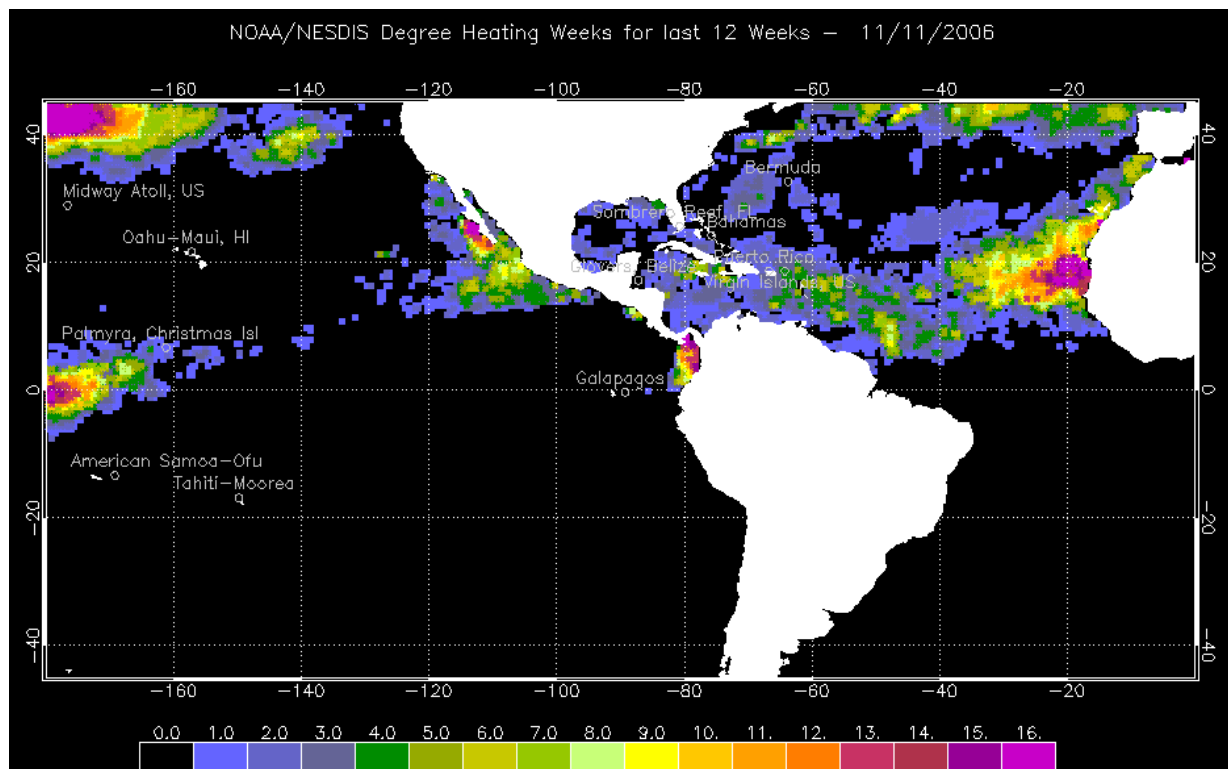


Figure 2. NOAA Data for November 2006. Note that waters in the region around St Barths has experienced an index value of from 1-6 (A degree heating week is equivalent to ocean temperatures exceeding the climatological maximum SST by 1 degree C for 1 week.)

ST BARTHELEMY 2005- Present

St Barths reported widespread bleaching in 2005. Many corals had turned completely white. (It was widely noted and reported in the local press.) Concern was high for the reefs which are an important part of St Barths natural heritage, a key source of fish for the island, and contribute significantly to the islands economy through snorkel and dive tourism. In 2005 we observed that in some reefs close to shore, notably, Lorient and Colombier, bleaching was over 50% and a similar patterns appeared to exist offshore e.g. Les Gross Islets (Brosnan pers obs 2005). Not all corals recovered, and we provide a series of time shots of one *Acropora* coral colony in Gross Islets as example of the change from healthy coral, to bleached one, to algal overgrown one.

Figure 3. Bleaching time sequence. *Acropora* (elkhorn) colony at Les Gross Islets 2003-2006.

		
2003-4 Healthy <i>Acropora</i> (elkhorn) coral colony	August 2005 Bleached <i>Acropora</i>	August 2006 Same colony dead and showing overgrowth by algae.

Bleaching Watches and Alerts: Summer 2006.

By March 2006, sea surface temperatures had reached summertime averages and scientists were concerned that the Caribbean region would face another major bleaching event. However, temperatures ameliorated and it appears that while bleaching occurred it was not as widespread as in 2005 (preliminary data). While several bleaching alerts were issued the number and severity of these alerts was greatly reduced from 2005.

Between Sept 1-11th 2006, values of from 1-3 DHW were recorded consistently in the waters near St Barths. However prior to that there were few bleaching alerts in the Caribbean, the exception being Cuba which by April had values of 8 DHW, which rose to 13 DHW for most of August 2006. Although temperatures tend to be cooler and the threat of bleaching over by November bleaching alerts have been recorded later in 2006/ In November 2006 DHW values of from 2-6 (in other words some of the highest of the year for the area) have been recorded in waters around St Barths and surrounding islands. See Figure above.

Manta Tow Surveys

In St Barths we carried out a limited monitoring program to develop baseline bleaching information at several sites. Using standard manta tows we recorded the number of bleached colonies; % bleached corals: and % substrate information.

The goals were to establish gross baseline information and monitor changes at various intervals so that bleaching events could be tracked and evaluated both inside and outside the marine reserve.

At the end of May, before the start of the most intense bleaching season and when there had been no bleaching alerts for the area, manta tows were carried out at Toc Vers (within the reserve): Ile Le Boulanger (outside the reserve) (with the help of the Reserve Naturelle) on May 26th 2006. Subsequently on May 30th 2006 we carried out standard tows at Les Gros Islets (within the reserve) and Les Saintes (outside the reserve).

In mid- September during the normal height of the “bleaching season” and at a time when the area was under bleaching watch or alert, the tows were repeated at Les Gros Islets and Les Saintes. However weather and boat conditions prevented access to the other sites (We hope to repeat these later in the season.)

Key Results

A summary of bleaching results is presented in Table 1. Raw data are provided in the appendix at the end of this report and include bleaching, substrate, and location information. Because this report is preliminary and is part of an initial baseline dataset, we present the raw data and summaries only.

Between May and September 2006 the number of bleached corals doubled at Gros Islets, and increased by about two-thirds in Les Saintes.

Table 1. Data Summary

Date 2006	Location	Number of tows to complete site evaluation.	Total number of colonies bleached	Average number of colonies bleached per tow	Range: % of colonies bleached per tow
May 26	Toc Vers*	5	29	5.8	5-23%
May 26	Ile Le Boulanger*	4	25	6.25	10-20%
May 30	Gros Islets	8	36	4.5	0-25%
May 30	Les Saintes	10	80	8	5-30%
Sept 14	Gros Islets	8	78	9.5	0-40%
Sept 14	Les Saintes	10	119	11.9	5-50%

(*Note for Toc Vers and Boulanger data collected by Dr Brosnan and F Greaux only were used in this analysis.)

CONCLUSION

Corals have clearly suffered increased bleaching stresses since the formation of the marine reserve and many have not recovered. Following the pattern observed throughout the region bleaching in 2006 was not as severe as in 2005, nevertheless bleaching did occur.

All species appear to be affected. Bleaching occurred from just below the surface to about 20m deep. Several colonies that bleached and did not recover are being overgrown by algae.

Between August and September 2006, the number of bleached colonies increased at both Les Gros Islets and Les Saintes. The increased bleaching was recorded during a time of bleaching alert. It will be important to see how many of these corals recover as conditions improve.

Ongoing monitoring is necessary to track the fate of the coral reefs. Manta tows can provide gross baseline information but transect and other methods can provide information on individual coral colonies. We recommend that both types be carried out.

Coral reefs are a major part of St Barths' patrimony. They are a source of important fisheries, tourism revenue, and when healthy they protect the shoreline from erosion and storm damage. St Barths reefs have already suffered major declines through natural events (e.g. Hurricane Luis: disease outbreaks of corals), and human caused ones (runoff, pollution, overfishing, mechanical damage). Thus further loss of corals through bleaching and other natural or human-caused threats is of major concern. The level of discussion and reporting of the 2005 bleaching indicates that the reefs are important to the community and that intensive management and protection is needed as an environmental and economic priority.

Bleaching is a region wide phenomon and the cause is apparently a global one, little can be done on a local scale to prevent it. However, this makes it all the more important to maintain a substantial reserve of corals under protection so that there is a greater chance that enough will remain unbleached or recover to help sustain the reefs.

ACKNOWLEDGEMENTS

Thanks to Franciane Greaux and the Marine Reserve (La Reserve Naturelle) who provided use of the boat and participated in the transect tows at Toq Vers and Boulanger. Thanks to Jean Aubin and to Claude Aubin, and to Dr. Don Comb for providing *Lytechinus*. Sponsored by SEI and the Reef Action Fund.

APPENDIX: RAW DATA

Toc Vers May 26 2006

starting time c 13:00

Tow #	GPS	Starting depth m	Ending depth m	# bleached	% bleached	Total % coral cover	% algae	% rock/bare substrate	sand	other
1	N17 56" 42.7 W62 49 13.8	10		5	9	15	35	45	20	
2	N17 56" 33.4 W62 49 15.2	5		8	8	23	30	50	20	
3	N17 56.30.0 W 62 4.10.6	8		3	5	17	40	40	20	
4	N17 56.25.9 W 62 49.09.1	3		5	3	10	15	25	60	
5	N17 56.24.0 W 62 4.05.5	5		11	4	5	25	25	50	
				TOTAL	29					
				AVERAGE	5.8					

Le Boulanger May 26 2006

Starting tim c. 14:00

Tow number	GPS	Starting depth m	Ending depth m	# bleached	% bleached	Total % coral cover	% algae	% rock/bare substrate	sand	other
1	N17 57.23.3 W62 52.32.3	9	5	13	15	15	20	65		
2	N17 57.20.4 W62 52.31.5	5	8	2	10	45	10	45		
3	N17 57.16.3 W62 52.31.3	8	7	3	20	60	5	35		
4	N17 57.15.8 W 62 35.3	7	6	7	10	35	30	35		
ending	N 17 18.1 W52 .21.9									
				TOTAL	25					
				AVERAGE	6.25					

Gros Islets May 30 2006

starting time 14:30

Tow number	GPS	Starting depth m	Ending depth m	# bleached	% bleached	Total % coral cover	% algae	% rock/bare substrate	sand	other
1		9		0	0	10	10		75	5
2				0	0	<5	70	<5	25	
3				6	20	20	5	70	5	
4				10	25	15	5	25	55	

5	20	6	10	20	5	70	5
6		4	20	30		65	5
7		7	10	40		30	20
8	9	3	5	45	5	25	25
		TOTAL		36			
		AVERAGE		4.5			

Les
Saintes May 30 2006

15:00

Tow number	GPS	Starting depth m	Ending depth m	# bleached	% bleached	Total % coral cover	% algae	% rock/bare substrate	sand	other
1		12		10	20	25		70		5
2				15	15	25		70		5
3				20	30	35		50	10	5
4				3	5	10	35	45	10	
5		3		4	10	25	10	50	10	5
6				2	<5	20	<5	60	10	10
7				1	<5	15		75		10
8				9	20	25	5	65		5
9				3	10	10	20	55	10	5
10		12		13	15	25	5	60		10
				TOTAL		80				
				AVERAGE		8				

Gros
Islets

Sep-14 2006

starting time

10:30

Tow number	GPS	Starting depth m	Ending depth m	# bleached	% bleached	Total % coral cover	% algae	% rock/bare substrate	sand	other
1		9		4	0	10	10		75	5
2				3	0	<5	70	<5	25	
3				6	20	20	5	70	5	
4				10	25	15	5	25	55	
5		20		22	35	20	5	70		5
6				14	25	30		65		5

7		16	10	40		30	20
8	9	3	5	45	5	25	25
9							
		TOTAL		78			
		AVERAGE		9.75			

Les
Saintes

Sep-14 2006

12:00

Tow number	GPS	Starting depth m	Ending depth m	# bleached	% bleached	Total % coral cover	% algae	% rock/bare substrate	sand	other
1			12	32	50	25		70		5
2				7	25	25		70		5
3				25	50	35		50	10	5
4				5	5	10	35	45	10	
5			3	6	10	25	10	50	10	5
6				7	10	20	<5	60	10	10
7				10	20	15		75		10
8				14	25	25	5	65		5
9				3	10	10	20	55	10	5
10			12	10	15	25	5	60		10
				TOTAL		119				
				AVERAGE		11.9				