Summary – Caribbean Coral Bleaching Response Conference Call
November 23, 2005

Attendees: See List at end.

Action Items:

1) By December 1, 2005, Federal Agencies should identify if they have ongoing or planned activities or resources that can be applied the CRTF resolution goals. Please copy the co-chairs of the USCRTF Bleaching Workgroup

   Cliff McCreedy – NPS/DOI
   Colleen Charles – USGS/DOI
   Mark Eakin – NOAA/NESDIS. Mark.Eakin@noaa.gov
   Tom Hourigan – NOAA/NMFS. Tom.Hourigan@noaa.gov

2) Mark Eakin (NOAA) circulated a draft standardized form for coordinated responses on bleaching observations. This has now been uploaded to a NOAA website: http://coralreefwatch.noaa.gov/caribbean2005. We would encourage those who have conducted bleaching observations to use this spreadsheet.

3) Friday - December 2, 2005. NOAA will convene a small meeting for interested partners in the Miami area. The purpose is to take advantage of the expertise in South Florida & the presence of a number of scientists who will be attending the Deep-sea Coral Symposium this week. If you are interested in attending please contact Theo Brainerd (Theo.Brainerd@noaa.gov; 305-361-4284)

   Location: NOAA/National Marine Fisheries Service
   Southeast Fisheries Science Center
   Virginia Key, FL
   Time: 4:30 – 6:00 PM

4) Follow-up conference call the week of December 5th. Date & Time TBA (probably late in the week).

Brief Meeting Summary:

This initial meeting brought together Federal agency representatives and a large number of academic and NGO partners. The discussions identified key partners & resources and explored development of a 3-phase response approach to the bleaching event:

Phase I (now) – The initial response;
Phase II - Near-term reporting and assessment;

Phase III - Longer-term capacity-building for monitoring and incorporation of bleaching impacts into planning and management.

U.S. Coral Reef Task Force Agency Response:

We began by reviewing the U.S. Coral Reef Task Force resolution passed in Palau calling for mobilizing efforts across the region (in collaboration with the International Coral Reef Initiative) to monitor and assess short and long term impacts to learn from the event. The resolution asked each member to identify to the Steering Committee technical, financial, or additional resources they can provide to assist in the phase I documentation and assessment of this event. DOI and NOAA have offered to lead this effort. Currently the Washington-based points of contact for this effort are Cliff McCreedy (NPS) and Colleen Charles (USGS) and Mark Eakin and myself for NOAA.

Agencies were requested to a summary of potential agency/bureau/program responses to the bleaching event. The following are key Task Force Agency actions currently identified:

NOAA:

- NOAA/NESDIS has provided ongoing satellite Sea Surface Temperature (SST) analysis of the event, and is collating information on the extent of the bleaching from throughout the region (in concert with ReefBase & the Coral List). We hope to have a web-site up soon to facilitate communication as well as a multi-author note on the initial linkage of observed SST anomolies and initial bleaching reports. Contact: Mark Eakin.
- NOAA/NMFS – Andy Bruckner has collated initial information on individuals conducting on-the-ground monitoring in USVI & Puerto Rico. He will be visiting some of his monitoring sites in coordination with the University of Puerto Rico during the week of December 5th.
- NOAA/NESDIS Workshop on "Satellite Tools" for coral reef/climate monitoring tentatively planned for USVI in January 2006. This might provide an opportunity fro additional coordination on the bleaching response. Contact: Al Strong, NOAA/NESDIS
- NOAA/NOS/NCCOS conducted surveys in USVI (in conjunction with the National Park Service) and Puerto Rico during the bleaching event and is analyzing information. Contact: Mark Monaco.
- NOAA/NOS/NCCOS will work with NASA on potential NASA/AVIRIS flights in Puerto Rico & USVI (See NASA below). Contact: Mark Monaco, Mark Eakin.
- NOAA is collecting IKONOS Satellite imagery for USVI (St. John, E. St. Croix) and Puerto Rico (La Parguera) that may be of some use. Contact: Steve Rohman.
- NOAA/NMFS Southeast Fisheries Science Center is coordinating with several long term monitoring efforts in Florida (Contact: Margaret Miller), and has some socio-economic work ongoing in Puerto Rico that may provide useful information on this aspect of impacts.
- NOAA/NOS/IA is coordinating with ReefCheck to see if we can facilitate some

of their volunteer activities in areas of the Eastern Caribbean.

- NOAA is currently reviewing grant proposals – including monitoring proposals from Florida, USVI & Puerto Rico and will work with the affected jurisdictions on their response needs.
- Over the longer term, NOAA will work with partners to coordinate monitoring

Department of the Interior:

The National Park Service and USGS have extensive ongoing monitoring activitries associated with both Virgin Islands National Park (VINP) and Buck Island Reef National Monument (BIRNM). See attached notes from November 18, 2005 Conference Call. Jeff Miller (NPS) provided an update on the latest situation in St. John & St. Croix. Caroline Rogers (USGS) reported on ongoing monitoring of elkhorn coral colonies.

Andrew Gude (FWS) identified planned collaborations with NOAA that may provide some opportunities for looking at impacts in Navassa in the spring or fall of 2006.

NASA

Liane Guild & Jeff Meyers from NASA Ames Research Center, reported on past work in Puerto Rico, where there is good coverage from a 2004 AVIRIS sensor. She identified the possibility of NASA flying AVRIS in Puerto Rico and/or USVI.

Subsequent to the meeting, she has been working with Roy Armstrong (U. of Puerto Rico) and Mark Monaco and Tim Battista of NOAA on points for generating flight lines for the AVIRIS on the Twin Otter. They have identified the possibility of overflights in early December.

EPA

EPA Region 2 has identified an interest in continuing to be involved in discussions on responses. They are supporting existing monitoring in the area (e.g., in coordination with USVI DPNR).

The EPA Gulf Ecology Division will be in USVI St. Croix for about 2 weeks in early Feb 2006. They will characterize stony corals using colony identification, size, and partial mortality using 50 m2 radial belt transects. We are able to provide gross bleaching information; that is, bleaching, paling or no bleaching on a colony-by-colony basis. We anticipate sampling about 50 randomly selected locations around St. Croix which could net a couple thousand colonies. Contact: William S. Fisher

Updates from monitoring & bleaching impacts in the Caribbean region:
We had a very informative discussion of ongoing efforts and initial results from the region. Overall, as with previous reports, the bleaching was the worst recorded in most areas, and significant mortality has been reported in many areas. Waters have since

cooled throughout the region, and color is returning to many bleached corals. The items below are not meant to be comprehensive:

USVI

- Rick Nemeth (U. Virgin Islands) reported on monitoring at 25 sites and 6 *Acropora* sites in USVI. He expects his teams to visit these sites again in early or mid 2006.
- Melissa Keys reported on bleaching in St. Croix.
- USGS & NPS – See attached notes.

Puerto Rico

- Rich Appledorn (U. Puerto Rico) reported on monitoring activities that were providing information:
    - Edwin Hernandez has been documenting bleaching spatial and temporal patterns at some permanent monitoring sites off eastern PR. This includes permanent transects in Culebra (Peninsula Flamenco, Playa Carlos Rosario, Culebrita, Impact Beach and Luis Pena) and Fajardo (Palominitos south, Palominitos east). There are records of these sites before and during bleaching. They are planning to revisit these sites later in January to check them after bleaching. Three of the permanent Culebra sites have been sampled three times during this event. Data on coral bleaching, mortality and/or recovery has been recorded using a combination of line transects and belt transects (10 x 2 m) on 12 replicate transects per site. The other approach used has been 30 m long point count video transect s in many sites. This has been a random/haphazard approach just checking on the relationship between community structure and bleaching/mortality responses.
    - Ernesto Weil monitoring bleaching for CRES and a DNR project.
    - Reni Garcia has been monitoring deeper areas around Puerto Rico. Bleaching was observed down to more than 140 feet.
- Bernhard Riegl (NCRI) reported on major satellite-based mapping of the South shore of Vieques and six monitoring sites.

Wider Caribbean:

- John Ogden highlighted the work done through the CARICOMP network. He has provided an e-mail contact list for the region.

- Phil Kramer (TNC) identified AGRRA sites in the Eastern Caribbean & Mexican Caribbean. He also reported on the monitoring efforts in Florida in response to the earlier bleaching this year.

- Andrew Baker (U. Miami) stressed the value of gathering genetic samples for study of changes in zooxanthellae, and offered to provide a sampling kit to interested collaborators.

Attendees:

DOI

Jeff Miller – NPS – South Florida/Caribbean Inventory and Monitoring Network
Caroline Rogers – USGS Caribbean Field Station
Andrew Gude – USFWS - Andrew_Gude@fws.gov
Susan White - USFWS

NOAA

Mark Eakin, NESDIS/ORA
Alan E Strong, NESDIS/ORA
Jessica Morgan, NESDIS/ORA
Randy Clark, NOS/NCCOS
Kimberly Woody, NOS/NCCOS
Randy Clark, NOS/NCCOS
Arthur Paterson, NOS/IA
Shauna Slingsby, NMFS/HC
Margaret Miller, NMFS/SEFSC
Michael Dowgiallo, NOS/NCCOS
Theo Brainerd, NMFS/SEFSC
Ron Hill, NMFS/SEFSC
Dana Williams, NMFS/SEFSC
Mark Monaco, NOS.NCCOS
Chris Jeffreys, NOS?NCCOS
Gabrielle Dorr, NMFS/HC
Tom Hourigan, NMFS/HC
Andy Bruckner, NMFS/HC

NASA

Liane S. Guild - NASA Ames Research Center
Jeff Meyers

EPA

Charles LoBue
William FIsher

UVI
Rick Nemeth
Marcia Taylor

U. Puerto Rico
Rich Appledorn

TNC
Phil Kramer
Mark Drew

AGGRA
Judy Lang

U. Miami RSMAS
Andrew Baker
Robert Ginsburg

NCRI/Nova Southeastern Univ.
Bernhard Riegl
Richard Dodge

USF
John Ogden

Boston University
Mindy Richland

Department of Interior. NPS-USGS Response to 2005 Virgin Islands Bleaching Event November 18, 2005 Conference Call

Attendees:
Cliff McCreedy – NPS/DOI Co-Chair CRTF Bleaching Committee
Colleen Charles – USGS/DOI Co-Chair CRTF Bleaching Committee
Gary Davis – NPS Visiting Chief Scientist, Ocean Programs
Karen Koltes – DOI Office of Insular Affairs
Jeff Miller – NPS – South Florida/Caribbean Inventory and Monitoring Network
Rob Waara - NPS – South Florida/Caribbean Inventory and Monitoring Network
Caroline Rogers – USGS Caribbean Field Station
Erinn Muller - USGS Caribbean Field Station
Zandy Hillis-Starr – NPS - Buck Island Reef National Monument
Andrew Gude – FWS National Wildlife Refuge System
Carl Beavers – Florida Fish and Wildlife Research Institute
Mark Eakins – NOAA - NESDIS

NPS-USGS Summary:

Long term coral reef monitoring and current assessments of bleaching are yielding some *preliminary* findings at both Virgin Islands National Park (VINP) and Buck Island Reef National Monument (BIRNM). The 2005 episode is the most severe ever observed. Extensive bleaching has occurred across hard coral species to depths of 30 meters and to some extent on gorgonia. Elkhorn coral (*Acropora palmata*), recently proposed for listing as threatened under the Endangered Species Act, was one of the last species to bleach but one of the most severely affected with partial or complete mortality of many colonies within BIRNM and VINP. These losses of elkhorn coral could drastically affect recruitment, re-growth and recovery after historic losses from hurricanes and disease. Coral species and individual coral colonies within species have varied in their response to bleaching and recovery. On a wide range of species as of November 21st, some coral colonies are regaining normal coloration while many others remain severely bleached. Preliminary observations at Dry Tortugas NP and Biscayne NP found a relatively low incidence of bleaching occurred during this period.

1. Buck Island Reef National Monument, St. Croix.

BIRNM on St. Croix was expanded to 19,015 acres in 2001 and established as a fully protected marine reserve. Extensive elkhorn reefs around Buck Island were severely damaged by Hurricane Hugo in 1989. Recent regrowth of A. palmata could be dramatically hindered by the 2005 bleaching event and subsequent stress and mortality. BIRNM has longterm coral monitoring programs underway at various sites within the park, and has initiated additional site surveys in response to bleaching this year. NPS South Florida/Caribbean Inventory and Monitoring Network (SFCN) also conducted episodic monitoring of a 40,000 m2 site at South Fore Reef at BIRNM, where extensive re-coloring of corals was observed November 7-8. As of Nov 14 BIRNM also has observed some recovery from the recent bleaching event. NOTE: NOAA NCCOS Biogeography Program is conducting intensive assessments of fish, conch, and benthic habitat in 120 randomly selected sites on St. Croix, about half (60) within BIRNM. NPS Natural Resource Challenge funds, BIRNM and SFCN staff contribute to these biogeographic assessments at BIRNM, VINP and Virgin Islands Coral Reef National Monument.

A. palmata. Park monitoring includes 46 colonies established in February, 2005, initially to document diseases with USGS and private contractor assistance. Incidence of bleaching, disease

and predation are now recorded. Sites were monitored photographically on a monthly basis starting in February and bimonthly starting in August. Some of these include long term monitoring sites (20-meter transects). A. palmata is severely affected, with partial or complete mortality of many colonies ocurring from this bleaching event. A distribution survey for A. Palmata in the park was conducted in 2004. In response to bleaching in September, NPS began surveying a subset of random points from this survey consisting of colonies over one meter in size. 75 survey points have been completed with an additional 20-25 to be surveyed by Nov 25. Last week, NPS with Florida Fish and Wildlife Research Institute conducted monitoring of longterm coral transects, including coral cover, live tissue, algae and bleaching on 16, 20-meter transects. Analysis is pending.

Massive Corals: Observing some recovery and re-pigmentation of massive corals. Many D. strigosa and some M. annularis colonies appear to have completely regained coloration. P. astreoides colonies are still bleached with some partially recovering. Black band disease observed on a back reef site in association with bleached colonies. Some colonies are recovering from BB but others are still afflicted. At another site, majority of Millepora on top of reef crest is dead from bleaching. During the week of November 21, NPS will survey D. strigosa and M. annularis at 150 colonies of each species.

Virgin Islands National Park, St. John

VINP contains a marine area of 5,640 acres including shallow water coral reefs. The area is open to recreational and traditional methods of fishing. (The adjacent Virgin Islands Coral Reef National Monument (12,708 acres) is closed to fishing except for hand line fishing for blue runner at Hurricane Hole and bait fishing.) VINP and NPS-SFCN have conducted long term coral monitoring since 1999 at five sites within VINP. During the current bleaching event, SFCN has conducted video monitoring at all five long term monitoring sites in VINP and one site in BIRNM, utilizing 20 randomly selected transects within reef areas that vary in size from 8,000-20,000 square meters. Monitoring transects established at two locations (in 1989 and 1990) by Dr. Caroline Rogers also have also been resampled during this event. USGS also has been monitoring bleaching of Elkhorn in four zones around St. John each month (see below) during the event. All of these sites have at least one in situ temperature data logger, collecting data every two hours.

USGS Overview – BIRNM and VINP

U.S. Geological Survey (USGS) works with NPS in BIRNM and VINP to conduct coral monitoring with a primary focus on coral diseases, and more recently on bleaching. Currently USGS monitors four sites distributed around St. John with 450 A. Palmata colonies at least once a month. USGS notes that distribution of bleaching is variable - healthy colonies are sometimes observed immediately adjacent to beached colonies. Mortality can occur within 3-4 weeks, resulting in partial or total colony death. Elkhorn colonies within Haulover Bay in VINP have been monitored monthly since February 2003. Limited data on genotypic diversity are available from this site. These show that some genotypically distinct colonies are less susceptible to bleaching. Further study of different susceptibility of different genotypes to disease and bleaching is warranted to evaluate possible resistance. USGS also has observed extensive mortality of elkhorn corals within Hawksnest Bay from an unidentified disease that does not grossly resemble white band or white pox.

Recommendations:

1. Develop protocol for bleaching assessments. Predict and monitor start of event, monitor through end of event and document recovery. How many sites, what are we documenting? NPS immediate response identified bleached colonies – how to accurately measure extent of total area or colonies bleached? Take advantage of existing monitoring programs wherever possible.

2. Organize Response Team. Consider using CDHC or similar approach to respond to bleaching events. How many people from which agencies, what capacities? Include a data management professional and establish a centralized data portal. In addition to CDHC, include CARICOMP, AGGRA, Universities, TNC-FKNMS Florida Reef Resiliency Project and other efforts.

3. Provide data compilation assistance to MPA managers. For example, BIRNM is conducting a coral reef ecosystem data synthesis workshop in spring, 06 with USGS, NPS- SFCN, NOAA Biogeography Program and others.

4. Correlate NPS-USGS assessment and monitoring data (coral condition and in-situ temperature/water quality observations) with remote sensing of SSTs and integrate with Al Strong/AOML.

5. Coordinate with NOAA Biogeography Program observations.

6. Engage dive operators in volunteer assessments using U/W video and still photographs. Request assistance from Coral Reef Alliance, PADI Project AWARE other NGOs to organize outreach to dive operators.

7. Study Acropora palmata as possible sentinel species. Why is it normally resistant to bleaching? What genetic variations might be more resistant? Where do these colonies occur? Conduct research on different zooxanthellae classes and other factors that might explain the difference in bleaching susceptibility of different coral species.

8. Explore other biological and ecological responses to high SSTs and bleaching. What was effect on 2005 coral spawning season? BIRNM observed dramatic reduction in number of female turtles coming to nest during peak SSTs, then increase after subsidence of SSTs.

9. Explore collaborations with CRTF member areas that fall outside NPS or other managed areas in USVI and other areas.