

NOAA Coral Reef Watch  
**Seasonal Coral Bleaching Thermal Stress Outlook**  
(Experimental product, 2x2 degree spatial resolution)

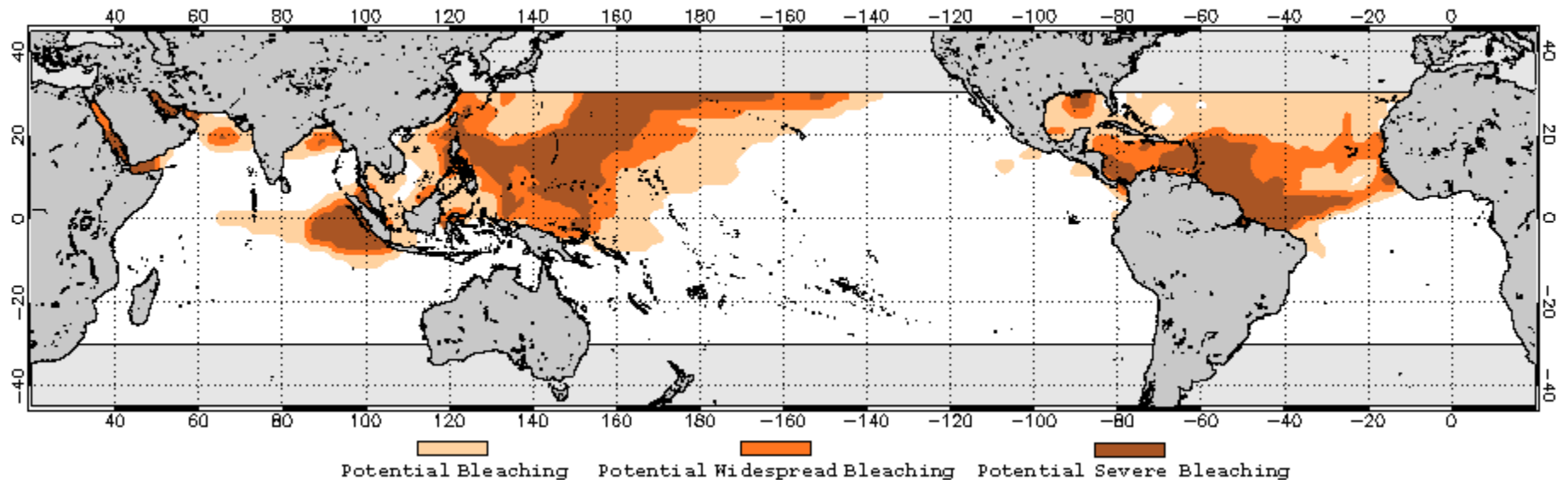
**June 2010 NOAA Coral Reef Watch Thermal Stress Guidance Through September 2010**

**[Note: The Bleaching Outlook is an experimental product and this guidance should be used as an indicator of potential general patterns rather than a precise predictor of thermal stress at any location. Actual conditions may vary due to model uncertainty, subsequent changes in climatic conditions, extreme localized variability, or weather patterns.]**

The NOAA Coral Reef Watch (CRW) [Coral Bleaching Thermal Stress Outlook](#) indicates that there is a high potential for coral bleaching in the Caribbean in 2010. The 2009-2010 El Niño ended in May 2010. However, the Caribbean typically experiences elevated temperature during the second year of an El Niño event. Since the beginning of 2010, sea surface temperatures (SSTs) in most of the Caribbean region and tropical Atlantic Ocean have been observed more than 1°C above the normal (see the SST anomaly figure below), based on Coral Reef Watch's climatology. This pattern is similar to, but has persisted much longer than, what occurred during the same time period in 2005.

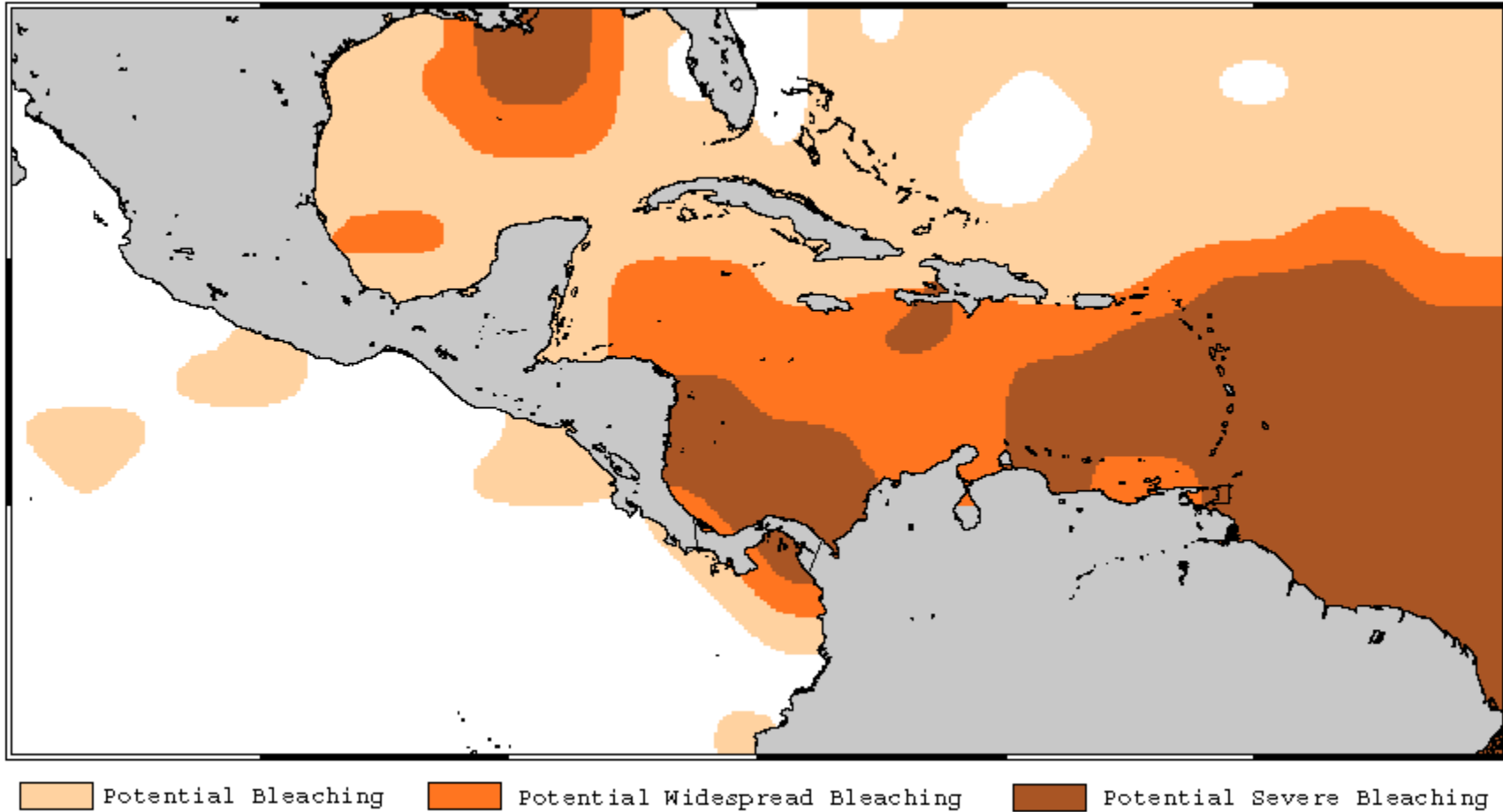
The outlook shows that thermal stress in the northwestern Pacific will increase during the next few months. The Philippines, Guam, CNMI (Commonwealth of the Northern Mariana Islands), FSM (Free States of Micronesia), and the surrounding areas may experience high thermal stress levels. High thermal stress that has caused coral bleaching in Southeast Asia is expected to subside in the coming weeks.

2010 Jun 08 NOAA Coral Reef Watch Coral Bleaching Thermal Stress Outlook for Jun-Sep 2010  
(Experimental Product)



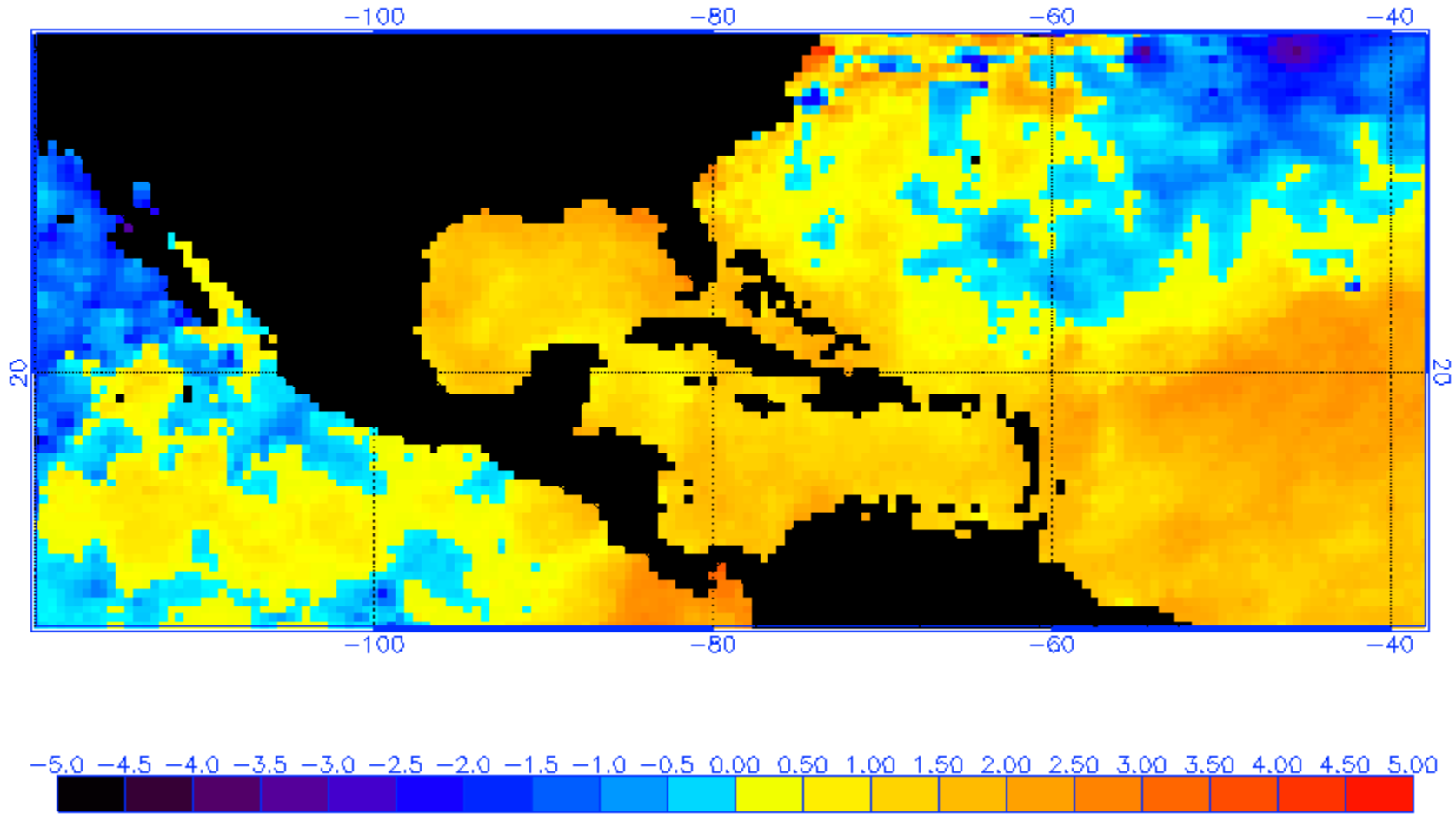
The following figure shows the current Caribbean 4-month cumulative thermal stress potential through September 2010.

2010 Jun 08 NOAA Coral Reef Watch Coral Bleaching Thermal Stress Outlook for Jun–Sep 2010  
(Experimental Product)



The following figure shows the current SST anomaly in the Caribbean region.

NOAA/NESDIS SST Anomaly (degrees C), 6/7/2010



**Caribbean Bleaching Outlook:**

The NOAA Coral Reef Watch (CRW) Coral Bleaching Thermal Stress Outlook indicates that there is a high potential for coral bleaching in the Caribbean in 2010. The 2009-2010 El Niño ended in May 2010. However, the Caribbean usually experiences elevated temperature during the year following an El Niño event. Since the beginning of 2010, sea surface temperatures (SSTs) in most of the Caribbean region and tropical Atlantic Ocean have been observed more than 1°C above the normal (see the SST anomaly figure above), based on Coral Reef Watch's climatology. This pattern is similar to, but has persisted much longer than, what occurred during the same time period in 2005. In 2005, a

record breaking mass coral bleaching event in the Caribbean along with the most active hurricane season on record in the Atlantic Ocean followed such a pre-bleaching season SST anomaly pattern. The high SST anomaly in the Gulf of Mexico and Florida Keys began in mid-May after a dramatic increase in SST in early May (near 2°C increase over several days at some locations) after an extreme cold outbreak earlier this year in the eastern Gulf of Mexico and Florida area. This preheating increases the likelihood that temperatures will exceed bleaching thresholds during the coming season. The pattern and intensity of early-season SST anomalies is similar to what was seen in 2005. The high potential for thermal stress above levels required to cause bleaching as seen in the CRW bleaching outlook system indicates a high potential for significant bleaching in the Caribbean region for the 2010 bleaching season. In 2005, the active hurricane season greatly reduced the coral bleaching thermal stress in the Florida Keys and Gulf of Mexico. However, the lack of tropical cyclones around the Lesser Antilles did not allow storms to relieve much the thermal stress in the epicenter of the 2005 mass bleaching event.

**Pacific Bleaching Outlook:**

Low level bleaching thermal stress has already been observed in the western Pacific Ocean. As the summer comes in the northern hemisphere, our outlook shows that thermal stress in the northwestern Pacific will increase during the next few months. The Philippines, Guam, CNMI (Commonwealth of the Northern Mariana Islands), FSM (Free States of Micronesia), and the surrounding areas may experience thermal stress levels capable of causing coral bleaching.

**Indian Ocean Bleaching Outlook:**

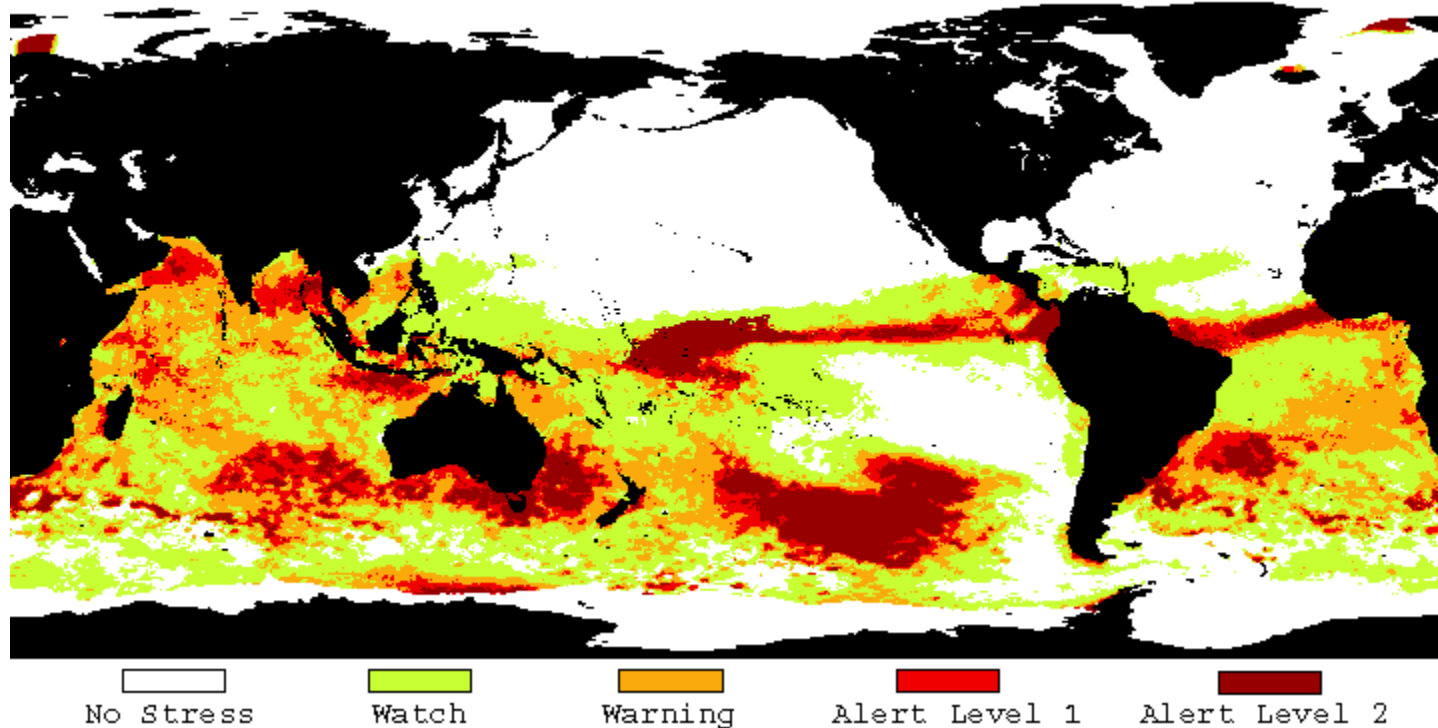
At the same time, thermal stress that has already been causing bleaching in the Indian Ocean and Southeast Asia are expected to dissipate in the next few weeks. Bleaching has been experienced in parts of the Maldives, Thailand, Cambodia, Indonesia, and the Philippines. Both satellite observations and the outlook model show a decrease in thermal stress levels, bringing relief to stressed coral reefs.

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### Current Bleaching Conditions:

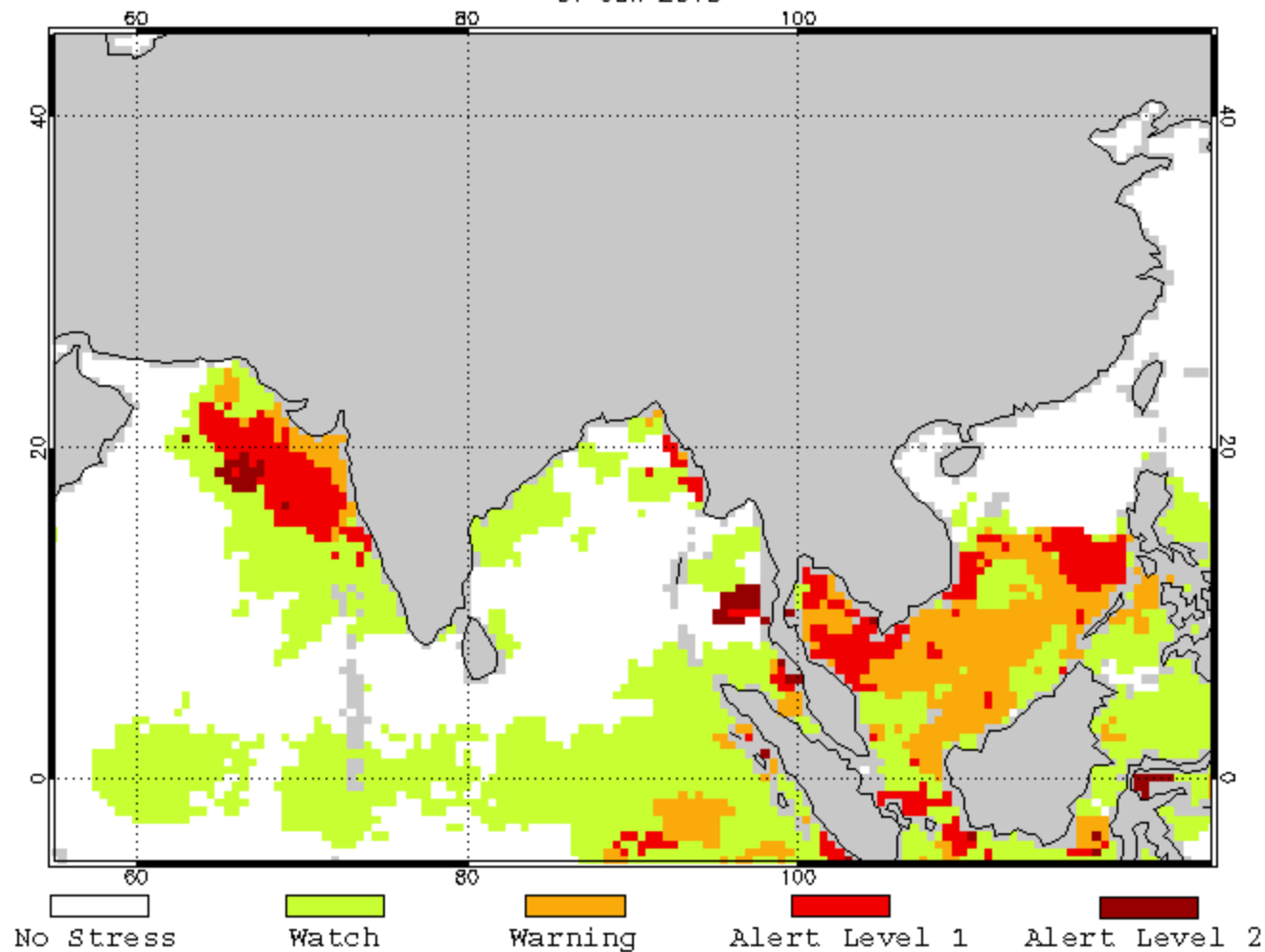
With the 2009-2010 El Niño, the Indian Ocean has been experiencing significant coral bleaching thermal stress since the beginning of this year (see the figure below) in a spatial pattern similar to that seen in 1998. Most of the northern Indian Ocean and Southeast Asia regions have been experiencing intensive thermal stress. Significant bleaching has been reported in Maldives, both sides of the Thailand Peninsula (Andaman Sea and Gulf of Thailand), Cambodia, Indonesia, and the Anilao region of the Philippines. Bleaching was observed in the southwest and northeast Madagascar earlier this year. The image below shows the maximum level of bleaching thermal stress experienced in January-May 2010.

NOAA Coral Reef Watch Maximum Satellite Coral Bleaching Alert Area Jan–May 2010



Significant bleaching thermal stress decreased then disappeared in the Bay of Bengal in northeastern Indian Ocean following the path of the Tropical Storm 1B in May, 2010 (see the image below). However, the thermal stress has persisted and even increased in the other areas in the northern Indian Ocean and Southeast Asia. The rainy season has just started and is expected to relieve the high thermal stress in these regions and promote the recovery of bleached corals.

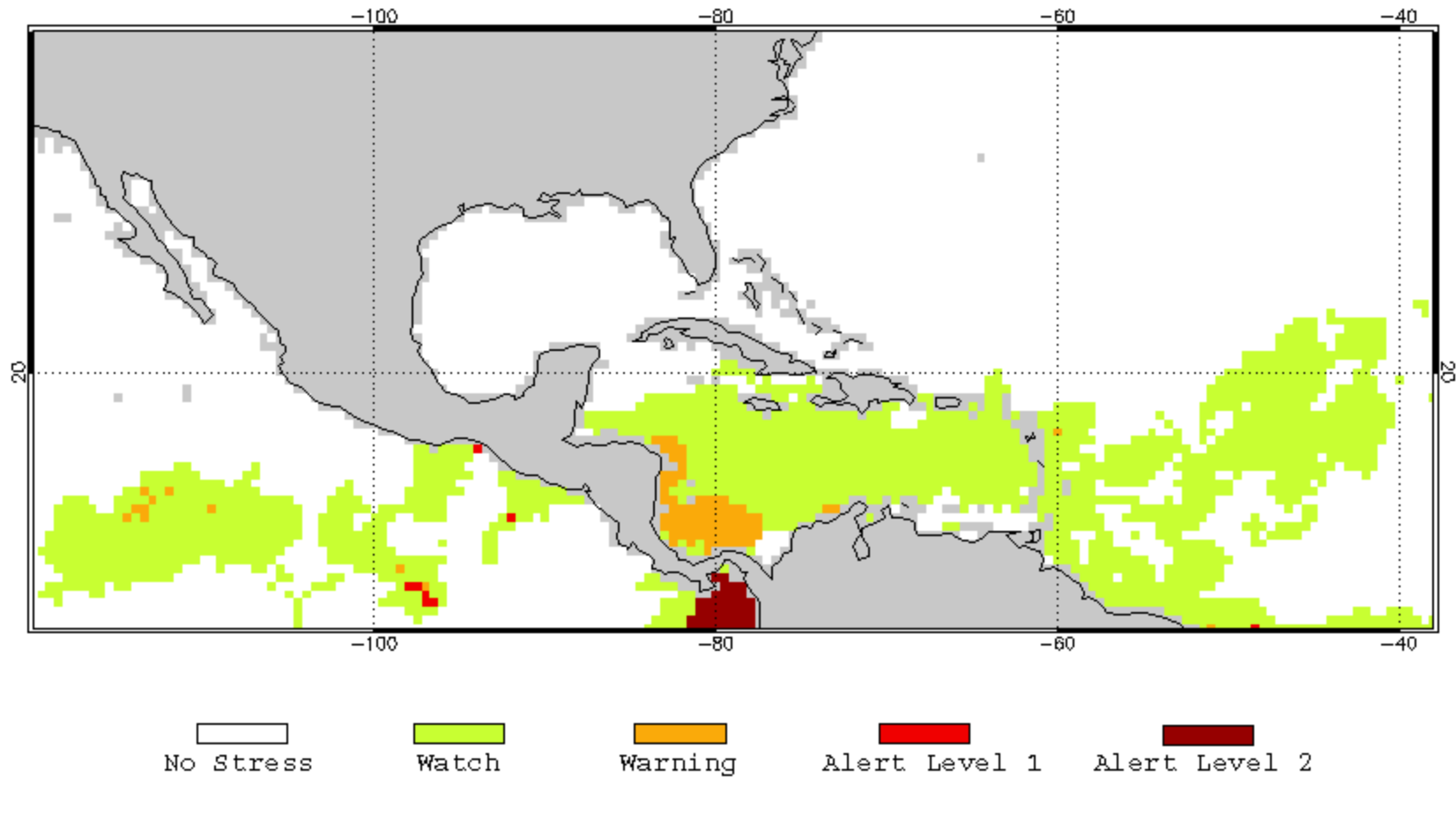
NOAA Coral Reef Watch Satellite Coral Bleaching Alert Area  
07 Jun 2010



Temperatures across much of the western tropical Pacific are slightly above normal at the moment, except in the eastern South China Sea along the west coast of the Philippines where bleaching has been reported.

Low level bleaching thermal stress has already been present in the Caribbean region. The stress started to appear at the beginning of May at the eastern end of the Caribbean. It now covers most of the southern Caribbean region. In the Caribbean, bleaching-level thermal stress usually does not appear across such a wide area this early in the year. The year of 2005 was an exception and showed the similar thermal stress pattern. Given that the record breaking mass coral bleaching event occurred in 2005, the development of this year's thermal stress in the Caribbean needs to be monitored closely.

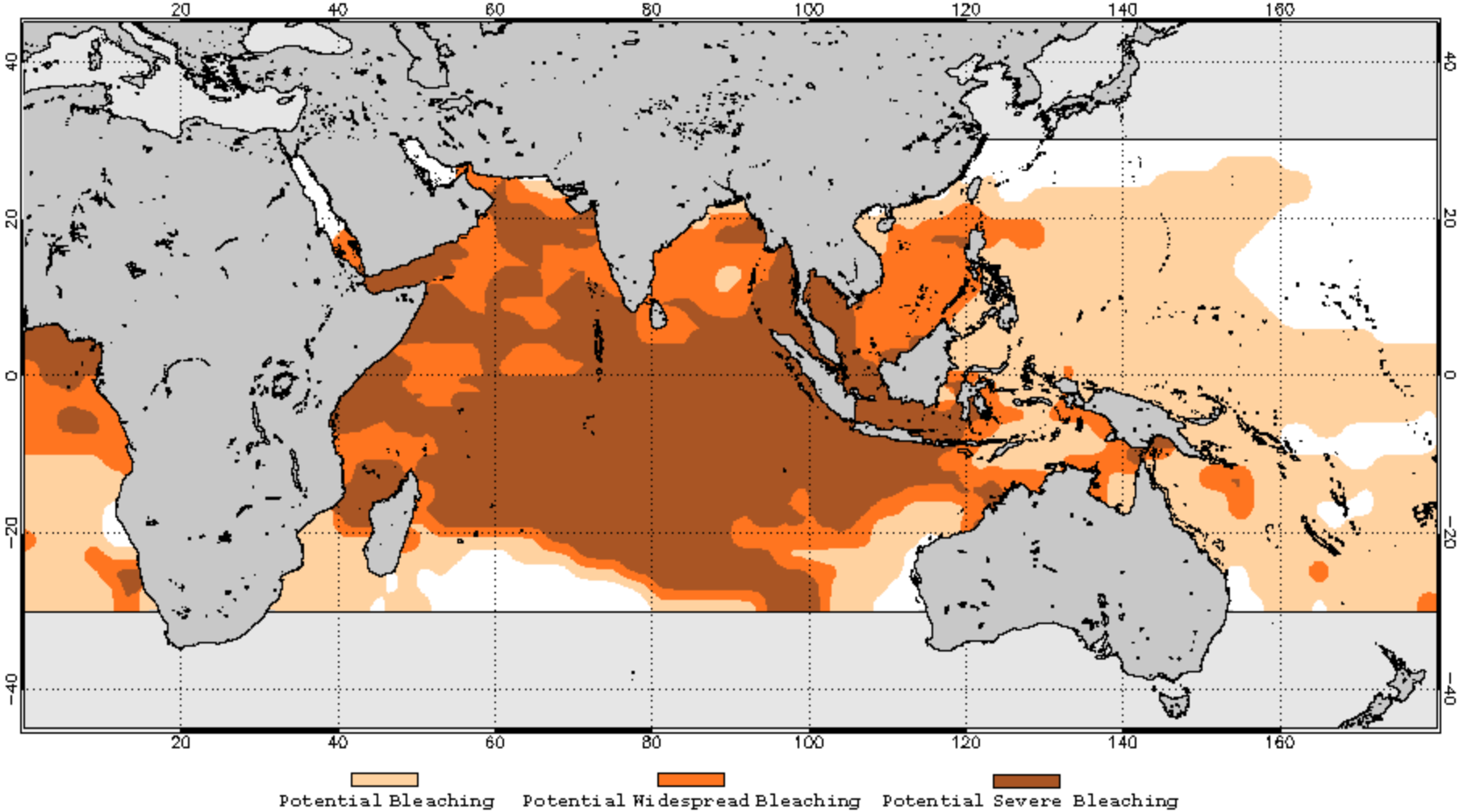
NOAA Coral Reef Watch Satellite Coral Bleaching Alert Area  
03 Jun 2010



**Indian Ocean 2010 Bleaching Season Retrospective:**

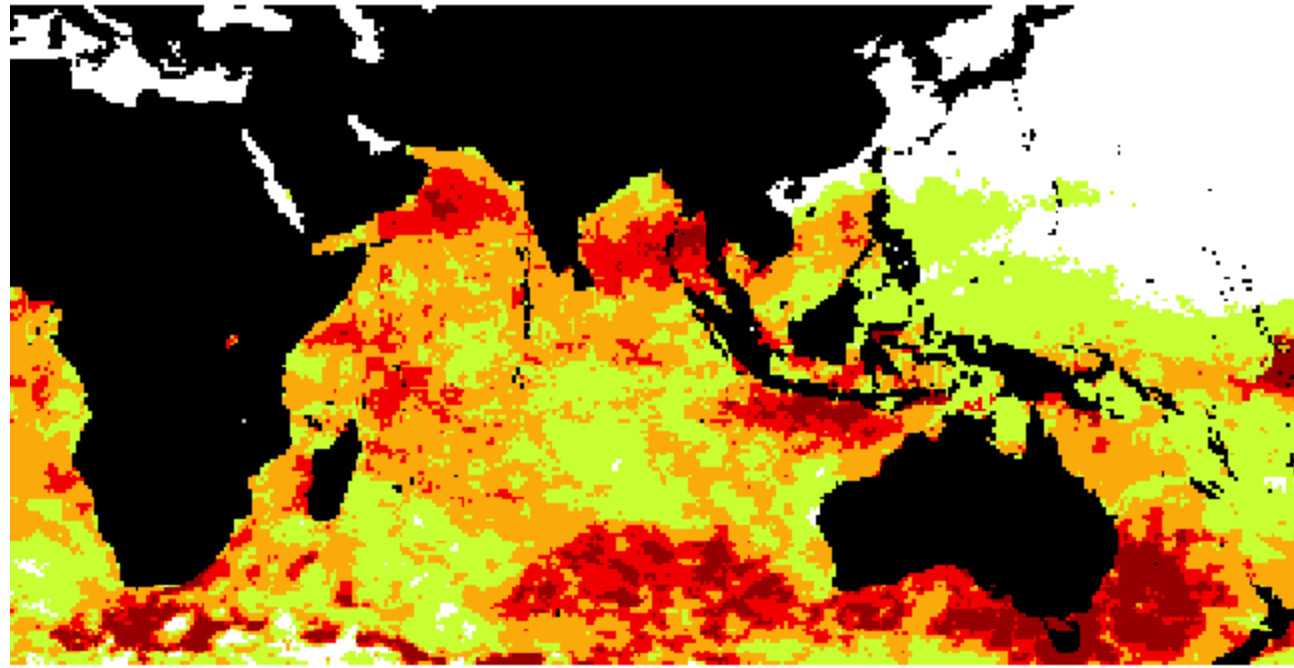
The CRW bleaching outlook has been predicting well the overall high thermal stress in the Indian Ocean since the beginning of 2010, indicating an active bleaching season for the Indian Ocean. However, the outlook did not predict the high thermal stress observed in the Bay of Bengal, instead it overestimated the thermal stress in the region off Sumatra where no long lasting thermal stress was observed. This is most likely caused by the relative low skill level of the LIM model (the SST prediction model of the CRW outlook system) in this region. Further evaluation and testing of a new scheme to refine the LIM are underway to improve the skill in this region. Thermal stress has been fading away in most of the Indian Ocean.

2010 Mar 16 NOAA Coral Reef Watch Coral Bleaching Thermal Stress Outlook for Mar-Jun 2010





NOAA Coral Reef Watch Maximum Satellite Coral Bleaching Alert Area Jan–May 2010



No Stress      Watch      Warning      Alert Level 1      Alert Level 2

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