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Forum - Letter to the editor

## Unusual synchronous spawning by green algae (Bryopsidales), after the passage of Hurricane Wilma (2005)

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Synchronous conspecific gamete release by siphonous green algae has been considered equivalent to coral mass spawning events (Clifton 1997, Hay 1997). Gametes of one to several species of these algae are released at dawn in pulses lasting between 5 and 20 min (Clifton 1997). Apart from Clifton's work (op. cit., Clifton and Clifton 1999), little is known of the phenology of these algae, possibly because the reproductive process is so rapid. The thalli achieve fertility within 36 to 96 h, depending on the species (Clifton and Clifton 1999). Within the subsequent 12 to 96 h, there is total disintegration of the thalli (holocarpic: Clifton and Clifton 1999).

In Panama, peak seasonal reproduction was between March and June (Clifton 1997), and Vroom et al. (2003) reported reproductive thalli of *Halimeda tuna* (Ellis et Solander) Lamour. on reefs in Florida Keys between late August and mid-September in different years. Our study area, Puerto Morelos reef lagoon (20°50' N, 86°50' W) in the Mexican Caribbean Sea, was visited at least once a month from 1998 until the present, and gametangia-bearing thalli of *Halimeda incrassata* (Ellis) Lamour. were seen on January 29, 1998, September 1, 2000, February 3, 2003, August 15 and 24, 2005. Reproductive *Udotea abbottiorum* Littler et Littler was observed on August 10, 2002 and February 13, 2005, and on the latter date, *Penicillus dumentosis* (Lamour.) Blainville was also in its reproductive phase.

On December 1, 2005, we observed an unusually large number of siphonous green algal thalli with ripe or empty gametangia in the seagrass beds at Puerto Morelos reef lagoon. Amongst these species were *Caulerpa prolifera* (Forsskål) Lamour., *C. paspaloides* (Bory) Greville, *Penicillus lamourouxii* Decaisne, *P. capitatus* Lamarck, *P. dumetosus*, *Rhipocephalus phoenix* (Ellis et Solander) Kütz., *R. oblongus* (Decaisne) Kütz., *Halimeda incrassata*, *Udotea flabellum* (Ellis et Solander) Lamour., *U. abbottiorum*. The frequency of the reproductive thalli varied between ~2 and 10% of large mature individuals,

depending on the species and location within the reef lagoon. When we returned on December 8, 2005, not a single reproductive thallus was found. What differentiates this phenomenon from previously reported green algal spawning events is the time of year (late autumn) and the fact that all dominant species of siphonous green algae in the seagrass beds reproduced.

This unusual spawning event may be related to the passage of Wilma, a major category 4–5 hurricane, which passed over Pto. Morelos reef lagoon between October 21–23, 2005, sustaining major hurricane-force winds over ~60 h. Oceanographic equipment (AwaC Acoustic Doppler Profiler, Nortek AS, Norway) located on the fore reef at 20 m depth registered a drop in seawater temperature from 29 to 19°C within 12 h during the passage of the hurricane. The reduced temperature event lasted ~18 h, followed by rapid recovery to 25–26°C once the hurricane had passed (unpublished data, Hydrographic and Meteorological Service, Unidad Académica Puerto Morelos). Temperatures in the reef lagoon commonly vary between 24 and 31°C (Ruiz-Rentería et al. 1998). The thermal anomaly registered during Wilma, may have been the trigger for the unusual mass spawning of the green algae. In this context, it is interesting to note that the unusual timing of sexual reproduction also occurred in the two dominant seagrasses in this area, *Thalassia testudinum* Banks ex König (first flower buds found 4–6 weeks earlier than usual on January 13, 2006) and *Syringodium filiforme* Kütz. (fully developed cymes found 6–8 weeks earlier than usual on December 1, 2005). Hurricanes are known for their damage to the marine biota due to the excessive winds and waves, increased sedimentation or freshwater runoff, but the possible effects of sudden decreases in temperature on marine organisms have not been studied. The frequency of intense hurricanes such as Wilma is expected to increase in the course of this century (Emanuel 2005), based on the predicted rise in sea surface temperatures (probably related to global warming, enhancing the energy available to the storms). The effects on the timing of sexual reproduction by marine flora (and possibly fauna) of sudden drops in temperature, as a result of hurricanes, in tropical systems that normally experience relatively constant thermal regimes, merit further investigation.

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