

Coral reefs of southeastern Dominican Republic hit by two simultaneous epizootic events

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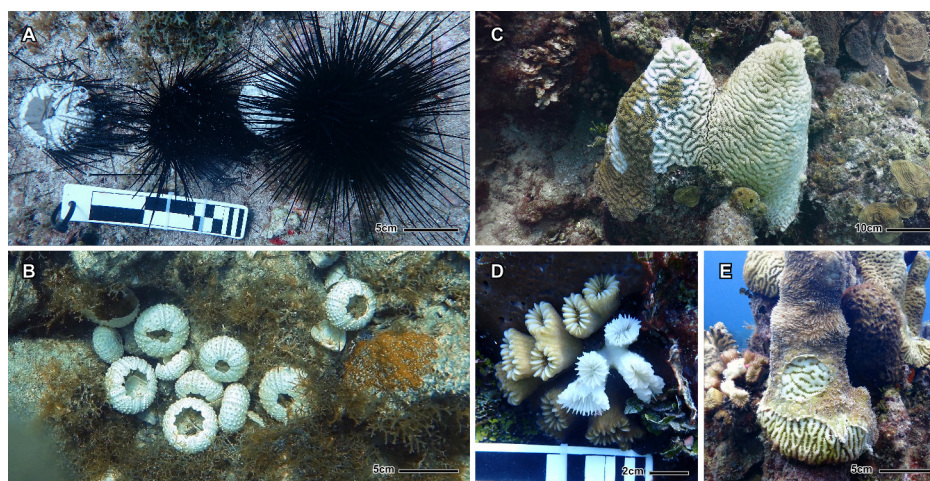
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During the past decades, Caribbean coral reefs have undergone rapid changes that have transformed the structure and function of these important ecosystems. In the 1980s, white band disease (Aronson and Precht 2001) and *Diadema antillarum* epizootic events occurred almost simultaneously, shifting reefs from a coral to an algal-dominated state (Lessios et al. 1984). Four decades later, a similar scenario is impacting the Caribbean region, where ongoing stony coral tissue loss disease (SCTLD) outbreaks (Alvarez-Filip et al. 2022) and extensive mortality of *D. antillarum* are being reported (AGRRA 2022).

Here, we present the first report of the ongoing *D. antillarum* die-off event in the Dominican Republic, and the simultaneous arrival of SCTLD in the southeastern coast of the country, within the Southeastern Reefs Marine Sanctuary. On 28 April, 2022, many *D. antillarum* tests were seen in one of the healthiest reefs at Catalina Island. Three sites in the northwestern coast of Catalina Island were evaluated using four belt transects of 30 × 4 m: Playa Cruceros (18.37095, -69.02219), La Punta (18.35671, -69.02607), and El Malpai (18.33981, -68.99858). Within each transect, pictures with scale reference were taken of all individuals, including dead (i.e., skeletons with and without spines attached; Panels A and B), diseased (i.e., urchins bearing early visible signs of the disease and/or showcasing unusual spine movement and attachment behavior; Panel A), and apparently healthy individuals (i.e., urchins bearing no macroscopic signs or showing no unusual behavior; Panel A). Individuals were categorized by their condition and their test diameter was measured from referenced photos using the software Image J. *Diadema antillarum* individuals were reported in the following Dead:Diseased:Healthy ratio in La Punta (1085:0:0), Playa Cruceros (128:0:1), and El

Maplai (318:40:106). Mortality seemed to be either recent (only dead individuals present: La Punta and Playa Cruceros; Panel B) or ongoing (diseased and apparently healthy individuals present: El Malpai; Panel A). The diameter of dead individuals averaged 5.47 (1.05) cm at La Punta, 5.37 (0.98) cm at Playa Cruceros, and 6.48 (1.35) cm at El Malpai. Diseased individuals at El Malpai averaged 6.58 (1.53) cm and apparently healthy 6.86 (2.25) cm. As of July 2022, the disease has spread over 19 km towards the southeastern coastline following the same pattern, severely affecting many *D. antillarum* populations.

Almost simultaneously, early signs of SCTLD were observed close to Saona Island (18.148975, -68.789885) in February 2022. By mid-April, it was confirmed that the disease had spread out towards the northwest to Peñon reef site (18.252833, -68.778967). In this site, using three belt transects of 10 × 2 m, we counted all colonies and categorized them by their condition (H = Healthy, SCTLD, or RD = Recently Dead). Eight species showing active macroscopic signs of the disease were observed with the following H:SCTLD:RD ratios: *Dendrogyra cylindrus* (0:1:0), *Dichocoenia stokesii* (0:1:1), *Diploria labyrinthiformis* (4:3:3), *Eusmilia fastigiata* (4:8:2), *Meandrina* spp. (5:5:18), *Montastraea cavernosa* (20:3:1), *Pseudodiploria strigosa* (0:1:1), *Orbicella annularis* (11:1:0), *Orbicella faveolata* (14:1:1), and *Orbicella franksi* (19:2:0). From the total observed colonies of these species (127), 60.63% were apparently healthy, 18.89% bared macroscopic signs of SCTLD, and 20.47% were recently dead. The disease was more prevalent in *E. fastigiata* (30.77%; Panel D), *Meandrina* spp. (19.23%; Panel C), *D. labyrinthiformis* (11.54%), and *M. cavernosa* (11.54%). However, most of the recently dead colonies found were *Meandrina* spp. (66.67%; Panel C). Reports of the progress of SCTLD affecting more species and individual colonies in this site are ongoing, and the disease has continued to spread towards the northwest.

These two epizootic events occurring concurrently is reminiscent of what was seen in the 1980s. While it is still uncertain how fast the mortality of urchins and corals is occurring, recent observations indicate that both are rapidly spreading across reefs. Reports of massive coral and urchin die-offs in the area are increasing, highlighting recent observations of whole adult dead *D. cylindrus* colonies (Panel E). Thus, together, these epizootic events may produce rapid shifts on reefs of the Dominican Republic and perhaps across the Caribbean if the phenomenon of co-occurrence continues to escalate throughout the region. In the near future, through the Dominican Reef Network (RAD in Spanish), reef health evaluations and *D. antillarum* surveys will be conducted across the country to have a better perspective of the spatial extent of these phenomena.

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