

occurred coincidentally in the same time frame as the DW1 blowout, or other local cause. The absence of this second community, at the same stage of postimpact injury progression 11 km away from MC294, indicates that the impact cannot be explained by a more localized event. That this is the only coral community discovered to date that is closer to the Macondo wellhead than the MC294 community and the fact that most other communities further away do not show similar visible signs of impact provide additional evidence linking the current state of both communities to the DW1 blowout.

Although most other deep-sea coral communities we have visited in the Gulf did not show widespread visual evidence of recent acute impact, evidence of injury was found at one other site near the Macondo wellhead. This site is lease block MC344 at 1,850-1,950 m depth in 27 km east of the wellhead. At this site 30 corals were photographed. The visual evidence of impact to this community in November 2011 was much less severe than that observed at MC294 or MC297. Fourteen coral colonies exhibited evidence of recent impact noted by both observers. Most of these had only small areas impacted either because the corals were quite small or because only small portions of the

abundant taxa at all of the sites below 1,000 m normally maintain living preys over their entire surface. These animals obtain food from, and exchange respiratory gases with, the bottom water bathing their exposed surfaces. In essence, they are constantly sampling the water surrounding them. If exposed by waterborne agents, they cannot move nor cover their exposed tissues except by exuding a thin layer of mucus. If there is a significant impact to a portion of the colony, it may be recorded as damaged tissue, bare skeletons, or epasic encrustation on that portion of the colony (9, 18, 27). If a colony dies, its skeleton remains attached to the sea floor for years, slowly losing smaller branches and providing a record of its existence and death. Because these colonial animals normally live for many hundreds of years, natural death is a rare event (18). As a result, these types of corals are reliable visual historians of anthropogenic impact to the deep-sea benthos.

The time course and sequence of events that occur over the first 18 mo after deep-sea oil/gas colonies are acutely impacted by a toxic waterborne agent has been well described (18). The documented timeline allowed for the recognition of acute impact to other sites, even after the initial appearance of the impact had changed, and the original causative agent(s) may have been removed with

that observed at MC294 or MC297. Fourteen coral colonies exhibited evidence of recent impact noted by both observers. Most of these had only small areas impacted, either because the corals were quite small or because only small portions of the corals were impacted, although six corals showed visible evidence of impact to over 10% of the colony. Although largely minor,

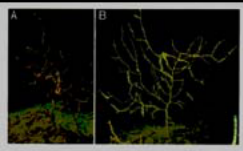


Fig. 5. (A and B) Two *Paramuricea* sp. from MC344 in November 2011 with apparently healthy and visibly unhealthy and dead portions of the colonies apparent.

over little about deep-sea fauna and communities, and therefore the full spectrum of ecosystem services derived from deep-sea biota and habitats is largely unknown. Accumulating baseline data on conditions in different deep-sea habitats as well as monitoring for changes in these habitats will prove to be critical when scientists are asked to evaluate the inevitable impacts these ecosystems will experience and provide input or mitigation.

Methods

Site selection. The acoustic amplitude maps used in this study were generated from 3D seismic data acquired by the oil industry and provided to GOMPA as required by the permitting process. Although these data were shot and recorded primarily for exploration targets thousands of meters below the surface, they are also useful in characterizing changes in seafloor lithology, high positive anomalies are acoustically faster than both seafloor and soft bottom mud resulting in strong responses on the amplitude maps. High positive can be indicators of hydrocarbon migration pathways that have disturbed the seismic response on vertical cross-sections. Typically, at lateral or cross-section hydrocarbon migration, high positive responses are associated with the presence of authigenic carbonates formed as a byproduct of bacterial activity in shallow