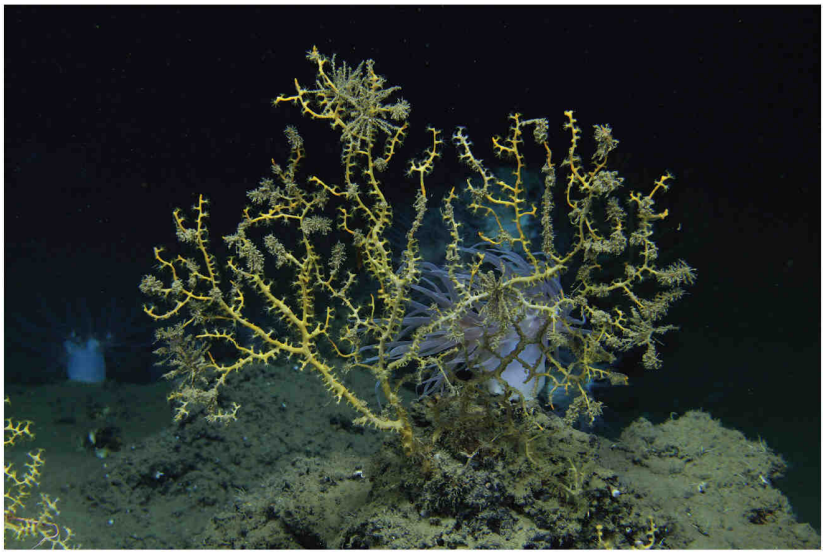

Figure 3. **Paramuricea biscaya** ***colony in November 2012 at MC297 with the patchy hydroid covering characteristic of corals affected by the Macondo spill. Photographs: Charles R. Fisher.***

found and attributed to a decrease in the surface area of corals covered by floc. Furthermore, colonies observed with low levels of floc on their surface in 2010 (less than 20% coverage) were likely to exhibit apparently complete recovery of the floc-covered branches by March 2012. However, the degree of initial visible impact was significantly correlated with lasting damage and secondary colonization by hydroids by March 2012. These data indicate that the effect on the coral colony is cumulative and not a simple reflection of the response of individual polyps or branches to the exposure (Hsing et al. 2013).

Hsing and colleagues (2013) also found that the impact and subsequent response were patchy on several spatial scales. Not only was the level of visually apparent impact on adjacent corals often very different but so, too, was the impact within a coral colony. As a result, hydroids exhibited a patchy distribution on moderately affected corals by March 2012, with apparently healthy branches intermingled with the dead portions of branches heavily colonized by hydroids. The appearance of these corals was very distinctive (figure 3) and proved to be a powerful diagnostic tool for recognizing other corals affected in a similar way and during a similar period but not discovered until after the original floc on the corals was no longer present.

To determine whether there were additional coral communities in the vicinity of the Macondo wellhead, two cruises using towed cameras and autonomous underwater vehicles were used to explore the seafloor. These surveys resulted in the identification of five previously unknown discrete sites hosting colonial corals within 30 km of the Macondo wellhead (Fisher et al. 2014). The corals at each newly discovered site were then surveyed using a remotely operated vehicle (ROV) for evidence of recent deleterious impact.

Two newly discovered communities, one (MC297) located 6 km south of the Macondo wellhead and 13 km from the site in MC294 and another (MC344) 22 km southeast of the Macondo wellhead, were determined to host coral communities that had also been affected by the spill. At the MC297 site, a total of 69 octocoral colonies present in two localized areas and separated by approximately 370 m were imaged. Of the 69 colonies imaged, 47 exhibited the characteristic patchy hydroid colonization pattern on at least 5% of the colony, and two others had no living tissue. The death of these two corals was attributed to the Macondo blowout, because they had died recently enough to still retain small dead branches. The number of colonies affected in the coral communities at MC294 and MC297 were similar (72% and 68%, respectively), although 16% of the corals at MC297 showed signs of impact on over 50% of the colony, compared with 8% in this condition at MC294 at this point in time (Fisher et al. 2014). The coral community in MC344 at a depth of 1875 m exhibited a smaller but notable level of impact that was still apparent in October 2011. At this site, 23% of the 30 corals imaged showed evidence of impact on more than 5% of their colony, but none showed an impact on over 50% of the colony. This site is notable because of the distance from the spill and the fact that it is even farther below the depths at which deepwater hydrocarbon plumes that formed during the spill were reported (Reddy et al. 2012 and the references therein).

Sediment cores can reveal the history of oil contamination at a site and can help distinguish recent deposition from ongoing natural oil seepage, which would result in relatively elevated oil levels throughout the top 10 centimeters (cm) of a core, whereas recent deposition of oil would result in higher oil concentrations in the upper 1 cm relative to the deeper strata. Somewhat elevated oil concentrations in sediments are expected in proximity to deepwater coral communities, because the carbonates on which corals are normally found in the deep GOM (Fisher et al. 2007, Cordes et al. 2008) form in areas with current or historical seepage (Roberts et al., 2010). In fact, most sediments collected in the deep GOM contain some oil, which reflects basin-wide and atmospheric inputs (e.g., Sassen et al. 1994).

Oil content was examined in sediments collected at 10 sites associated with deepwater coral communities located between 6 and 194 km from the Macondo wellhead (figure 4). The top 0–1 cm and 5–10 cm sections of the sediment cores were analyzed for the total amount of saturated hydrocarbons and PAHs by Alpha Analytical Laboratories, and the data are available at *www.gulfspillrestoration.noaa.gov/oil-spill/gulf-spill-data* (for detailed methods, see the