vibration, and polyp retraction was often observed during imaging. Nonetheless, many branches in the category of no visible impact, including most that changed from the visibly impacted category, did not have the same appearance as branches on corals with no visible signs of impact to any part of the colony. They were often not colored the same and many did not show extended polyps during any visits (Figure 3f). The health of these branches and corals is still suspect (Garrabou et al. 2009), and the final outcome for the colonies cannot be predicted.

Another consideration with respect to the ultimate fate of these corals is that the hydroids that have colonized the portions of the skeleton with no remaining gorgonian soft tissue may have a secondary deleterious impact on the remainder of the colony. Colonization of dead coral skeleton by hydroids has been reported many times for both littoral and deep-sea environments (Henry et al., 2008). Similarly, hydroid colonization of non-living glass sponge stalks in the deep sea has been previously reported (Beaulieu 2001). Hydroid colonization was still expanding on some *Paramuricea biscaya* during the visits between October 2011 and March 2012, though the final outcome of this process is also not known. Because cold-water corals are slow-growing with low metabolic rates (Roark et al., 2009), it is likely to be many years before any not-yet-obvious and sub-acute effects of exposure to effluent from the Deepwater Horizon blowout are fully manifested.

To better understand the progression of visible impact on coral branches from one category to another and how the level of initial impact affects the prognosis for survival of the corals, we developed a technique to track the fates of individual branches on the subset of 14 individual corals imaged in acceptable resolution in November or December 2010 and in March 2012 (Figure 4). The initial level of impact determined during one of the 2010 visits, within 5 months of when the well was capped, correlated highly with both the probability of recovery by the impacted portions and the probability that those portions would subsequently be colonized by hydroids (Figure 7b). The corals most lightly impacted with adherent floc initially were more likely to recover from the impact, suggesting a cumulative effect of floc on the colony that impacts the survival of individual polyps and branches. This suggestion is consistent with past work that found a similar correlation between degree of impact ("lesion perimeter") and recovery capacity in gorgonians, which the authors attributed to regeneration of damaged coral tissue facilitated by nearby healthy polyps (Cerrano et al., 2005). Similarly, the more lightly a coral was impacted initially, the lower the probability of extensive subsequent hydroid colonization to the impacted portions, again suggesting a cumulative effect on the ability of the corals to fight off hydroid colonization rather than polyp-by-polyp die-off. The corals that had initial impact visible on 20% or less of the colony recovered completely from the impact and showed no evidence of subsequent hydroid colonization, suggesting that this level of impact is recoverable for at least these gorgonian corals.

This finer-scale analysis also detected a variety of rare transitions from one state to another. Transitions from hydroid colonization to other categories only occurred on small portions of a few branches. In six cases the transition was to damaged tissue or exposed skeleton (Figure 8a to 8b), in two cases the apical portion of a branch colonized by hydroids apparently died and fell off (Figure 8c to 8d), and in three cases an apparent transition of a few centimeters of a branch from hydroid colonization to no visible impact (but not expanded polyps) was recorded (Figure 8e to 8f). Taken together, these data suggest that recovery from hydroid colonization is unlikely, as has been reported for *Paramuricea clavata* (Cerrano et al., 2005; Linares et al., 2005). Although branch loss was rare in these 14 corals through March 2012, the more general analyses of median percent impact to the site reported above did not account for branch loss, which is likely to become more significant over time. The techniques developed allow tracking of individual branches of gorgonians and therefore direct measurement of the changes in states of portions of the coral from their previous conditions. These techniques can detect loss of relatively small portions of the corals, as well as small increments of growth for future studies. If used as a component of baseline/monitoring studies, they will allow early detection of impacts at levels that would not be apparent with the transect style of monitoring.

Only five colonies of colonial corals other than *P. biscaya* were present at this study site, so little can be concluded concerning the tolerance of these species to the conditions that impacted *P. biscaya*. Some observations are nonetheless notable. The single individual of *Acanthogorgia aspera* present at the site (Figure 9c) experienced a high level of initial impact (71% of colony in late 2010), with subsequent tissue loss and hydroid colonization over the course of the study. The white apical branches on the single large *Paragorgia regalis* (Figure 9a) was one of the first observed indications of impact to this site when the ROV first approached the site in November 2010. Immediately adjacent to this coral were *P. biscaya* that were heavily impacted on the first visit, making it likely that this large colony experienced significant exposure to the conditions that caused the responses seen in *P. biscaya*. Although four small terminal branches apparently died and fell off, two others seemed to have recovered and the vast majority of the colony itself appeared to be in good health during every visit (> 97%). This species may be better able to cope with exposure to hydrocarbons or dispersant than *P. biscaya*. On the other hand, the disappearance between October 2011 and March 2012 of an entire colony of what appeared to be only lightly impacted *Swiftia pallida* (Figure 9b) suggests that recognizing impact to this species may be more difficult.

At least 70 ophiuroids were present in the area with corals that was followed for this study. Although there was no clear pattern to the movement of ophiuroids off or onto coral hosts at this site, these associates clearly moved over the course of this study. Some may have departed the site over the course of this study, but this