

PACIFIC ISLAND ISLANDS NETWORK – NATIONAL PARK SERVICE

2019 BLEACHING SURVEY METHODOLOGY SUMMARY: PHOTOQUADRATS

CORAL COVER: A split panel field sampling design was implemented for monitoring, with 30 randomly selected sites sampled annually on hard substrata in an isobath between 10 and 20 meters depth. Fifteen of the sites were fixed (permanent) and revisited annually. The remaining sites were randomly selected each year and labeled as temporary since they were not revisited. At each site one diver photographed the substrate at 1 m intervals along the 25 m transect at a perpendicular height of 0.5 m above the substrate. Total area sampled on each transect was approximately 4.7 m² (n=26 0.50 m X 0.36 m photoquadrats) for a total area of ~140 m² across all 30 sites, but actual area sampled varied according to surface topography/rugosity. Post-hoc image analysis of the photoquadrats was conducted using Photogrid© software (or other suitable software such as CPCe, <http://www.nova.edu/ocean/cpce/>) on each non-overlapping photoquadrat on a transect with 50 randomly selected points per quadrat image. Percent cover was tabulated (by lowest possible taxon, preferably species) for coral, macroinvertebrates, and other benthic substrate types (e.g., crustose coralline algae, turf algae, fleshy macroalgae, or sand). Percent cover for each taxa and major taxonomic group (coral - Scleractinian, coralline algae, turf algae, macroalgae, other invertebrates, and sand/substrate) were calculated by dividing the number of points identified for each taxa by the total number of points per transect and multiplying by 100%.

CITATION: Brown, E., D. Minton, R. Daniel, F. Klasner, L. Basch, A. Snyder, P. Craig, G. Dicus, K. DeVerse, and T. Jones. 2011. *Pacific Island Network benthic marine community monitoring protocol: Version 2.0. Natural Resource Report NPS/PACN/NRTR—2011/339. National Park Service, Fort Collins, Colorado.*

BLEACHING COVER: Building on method described above, whenever coral species were identified under any of the 50 randomly selected points, the coral colony was further assessed for bleaching. Next to the coral species name the presence of bleaching was designated as Yes or No. If there was bleaching, the coral was further assessed to determine if simply just bleached (BL) or bleached with presence of cyanobacteria or algal growth (BLA). Percent bleached cover was calculated by dividing the number of points of the 50 per photo that were on bleached coral along the entire transect by the total number of points that fell on coral per transect and multiplying by 100. For species of interest/the four most dominant scleractinian coral species (*Porites lobata*, *Porites compressa*, *Pocillopora meandrina*, and *Montipora capitata*) along the transect, the percent of coral bleached by species was calculated by dividing total number of coral points bleached for that species by the total number of all coral points for that species and multiplying by 100. Each photoquadrat image was also assessed as to whether any coral exhibited symptoms consistent with bleaching or disease in any part of the photoquadrat (regardless if point). "Yes" was recorded if coral disease or bleaching is present anywhere in the frame or a "No" if the corals appeared to be disease free and unbleached. When bleaching was present in the frame, the bleaching severity was assessed by a severity score that was assigned to each image. The severity score was a binned value (0%, 1-25%, 26-50%, 51-75%, or 76-100%) indicating an overall visual estimate of percent coral within the entire photo image that was bleached (i.e., this estimate did not use values from the 50 points generated by PhotoGrid).

CITATION(S):

- McCutcheon, A. L. and S. A. McKenna. (In revision) *Coral bleaching and Mortality on the Reefs within the Pacific Island Network National Parks. Natural Resource Report NPS/PACN/NRR—2018/XXXX*
- Brown, E., D. Minton, R. Daniel, F. Klasner, L. Basch, A. Snyder, P. Craig, G. Dicus, K. DeVerse, and T. Jones. 2011. *Pacific Island Network benthic marine community monitoring protocol: Version 2.0. Natural Resource Report NPS/PACN/NRTR—2011/339. National Park Service, Fort Collins, Colorado*
- Brown EK and Kozar K. 2019. *SOP #16: Benthic Image Analysis. Version 3.0. Pacific Island Network Benthic Marine Community Monitoring Protocol. Unpublished National Park Service Report, Pacific Island Inventory and Monitoring Network, Hawaii National Park, Hawaii*