

# Pacific Reef Assessment and Monitoring Program

## Benthic REA monitoring summary: northern Mariana Islands 2017<sup>1</sup>

### About this summary

This summary provides an overview of the most recent survey efforts conducted in the Northern Mariana Islands in 2017 by the Ecosystem Sciences Division (ESD) of the NOAA Pacific Islands Fisheries Science Center as part of the Pacific Reef Assessment and Monitoring Program (Pacific RAMP). A more detailed assessment of coral populations, reef community structure, and the potential impacts of the 2014–2015 bleaching events for Guam and the Commonwealth of the Northern Mariana Islands will be summarized in future ESD publications.

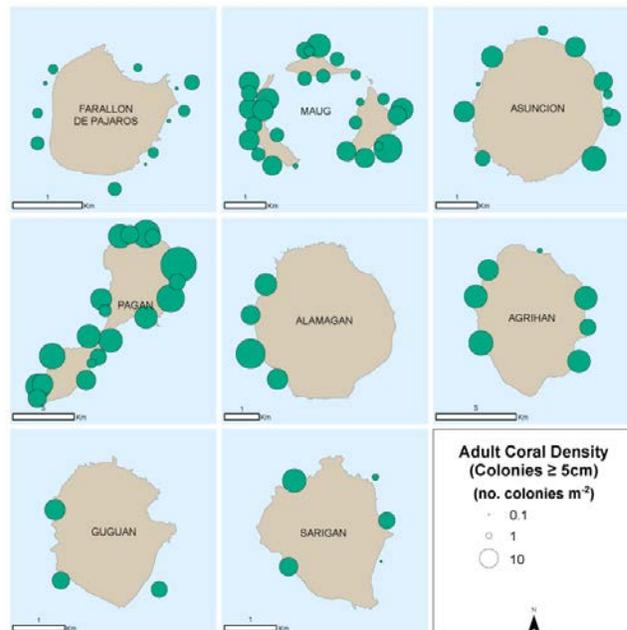
### Sampling effort

- Coral reef ecological monitoring surveys in the Northern Mariana Islands were conducted on May 27 – June 21, 2017.
- Surveys were conducted at 89 sites across 8 islands.
- Coral demographic metrics, partial mortality, and condition were surveyed using belt transects; benthic community structure will be assessed from photoquadrat digital images.

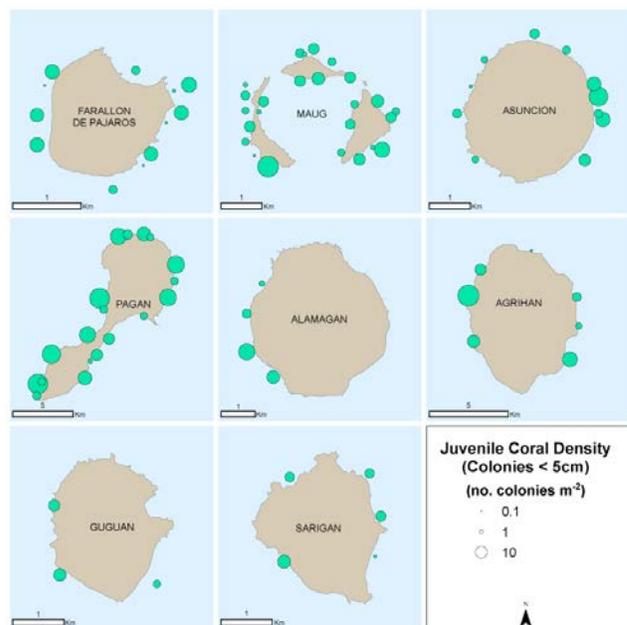
**Table 1. Fore-reef area (km<sup>2</sup>) and number of sites surveyed (n) for the three depth categories surveyed in each of the Northern Mariana Islands.**

Island	Deep	n <sub>deep</sub>	Mid-depth	n <sub>mid</sub>	Shallow	n <sub>shallow</sub>
FDP	368.6	3	686.8	5	329.2	4
Maug	877.3	6	1,907.0	13	354.4	8
Ascuncion	640.4	4	1,308.0	4	537.7	4
Agrihan	1,128.5	2	1,624.1	2	710.7	3
Pagan	5,713.6	4	4,925.0	7	4,490.6	8
Alamagan	4,556.4	1	518.0	1	3,431.9	2
Guguan	696.1	1	730.4	1	573.2	1
Sarigan	883.1	1	298.2	2	794.3	2

### Overview of data collected

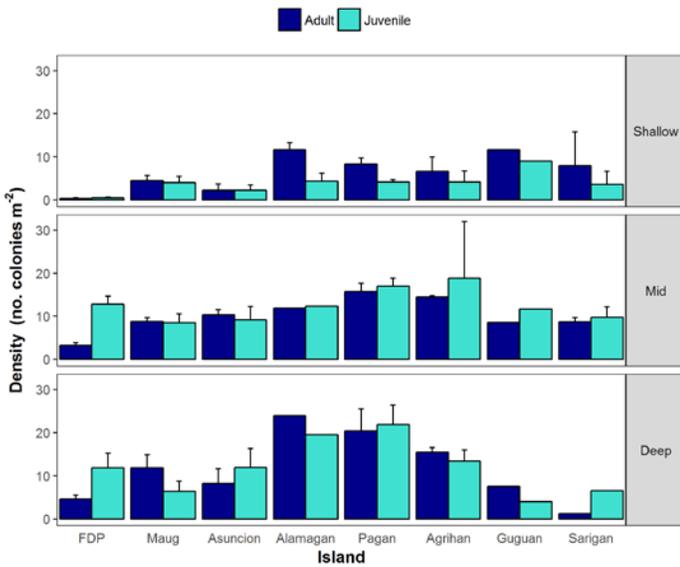


**Figure 1. Mean density of adult coral colonies (Scleractinia ≥ 5 cm) at survey sites.**

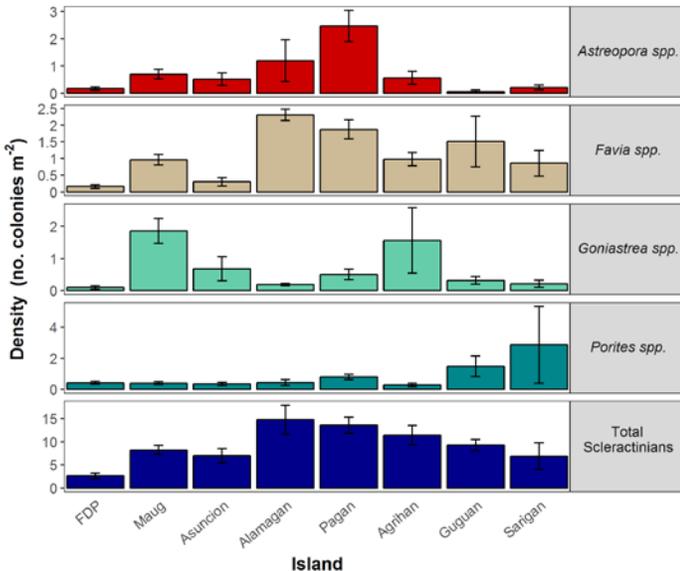


<sup>1</sup>PIFSC Data Report DR-17-037.  
Issued 20 October 2017.

**Figure 2. Mean density of juvenile coral colonies (Scleractinia, < 5 cm) at survey sites.**



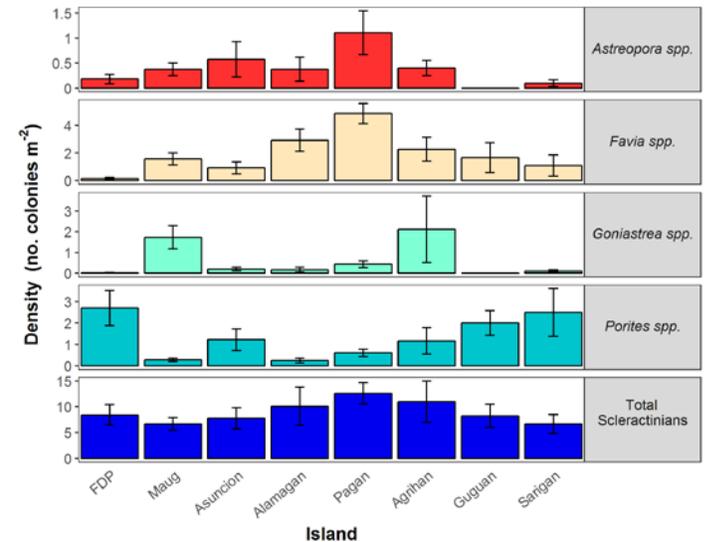
**Figure 3. Mean density of adult (dark) and juvenile (light) coral colonies ( $\pm$  SE) grouped by island within three depth categories: shallow (0–6 m), mid-depth (> 6–18 m), and deep (> 18–30 m).**



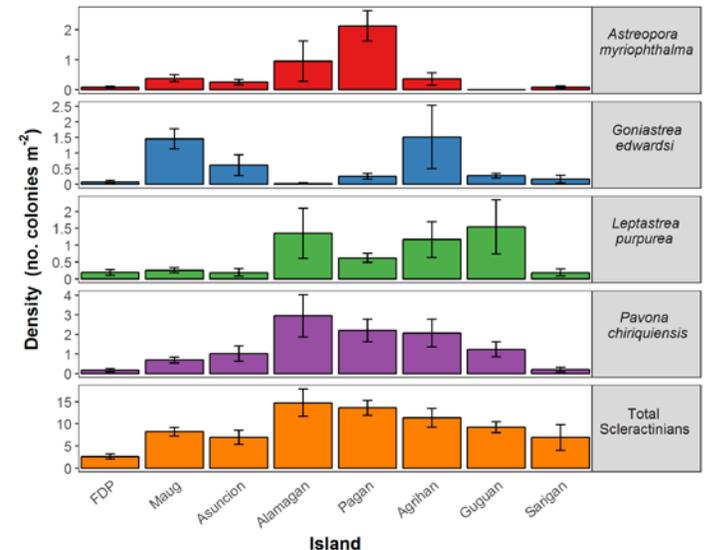
**Figure 4. Mean island-wide density of adult colonies ( $\pm$  SE) for total scleractinians and the four most abundant genera: *Astreopora*, *Favia*, *Goniastrea*, and *Porites*.**

## Coral condition and threatened species

The percent of adult colonies exhibiting signs of bleaching, disease, or COTS predation lesions are shown in Table 2. ‘Disease’ was defined as the combination of all identified diseases and lesions. ‘Bleaching’ included all levels of bleaching extent and severity. ‘COTS’ was defined as recent coral mortality attributable to COTS predation. The Endangered Species Act threatened species *Acropora globiceps* was commonly observed across the northern islands.



**Figure 5. Mean island-wide density of juvenile coral colonies ( $\pm$  SE) for total scleractinians and the four most abundant genera: *Astreopora*, *Favia*, *Goniastrea*, and *Porites*.**



**Figure 6. Mean island-wide density of adult colonies ( $\pm$  SE) for the four most abundant species and total scleractinians.**

**Table 2. Percent of adult coral colonies that exhibited bleaching, disease, and COTS predation lesions in the Northern Mariana Islands.**

Island	n	% bleaching	% disease	% COTS
FDP	1 2	11.63	2.52	0.00
Maug	2 7	4.02	0.64	0.00
Asuncion	1 2	1.21	9.01	0.00
Agrihan	7	3.37	0.50	0.00
Pagan	1 9	1.17	2.04	0.00
Alamagan	4	0.37	3.37	0.00
Guguan	3	0.00	2.84	0.00
Sarigan	5	3.75	8.07	0.00

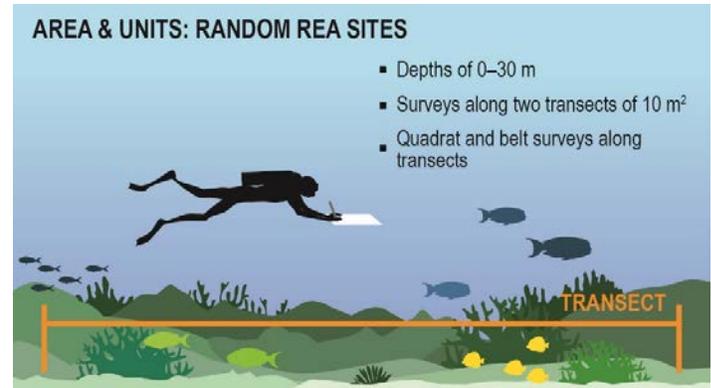
### Survey sampling design

A two-stage stratified random sampling design was employed to survey coral reefs within Guam and the Commonwealth of the Northern Mariana Islands. The stratification scheme sampled all fore-reef hard-bottom habitat across 13 islands and three depth strata (shallow [0–6 m], mid-depth [ $> 6$ –18 m] and deep [ $> 18$ –30 m]). Allocation of sampling effort was proportional to total strata area. Sites (geographic coordinates) were randomly selected within each stratum.

### Survey methods

Surveys at each site were conducted within two belt transects. Adult coral colonies ( $\geq 5$  cm) were surveyed within 10 m<sup>2</sup> on each transect. Colonies were identified to the lowest taxonomic level possible (species or genus), measured (maximum diameter to the nearest cm), and morphology was noted. In addition, partial mortality and condition of each colony was assessed.

Partial colony mortality was quantified as the percent of dead tissue (classified as ‘old dead’ or ‘recent dead’), and attributed to cause of mortality when evident. Conditions affecting each colony (e.g., disease and bleaching) were noted, along with the extent (percent of colony affected) and severity (ranging from moderate to acute).



**Figure 7. Schematic of the method used to conduct demographic surveys of coral populations and benthic community structure at Rapid Ecological Assessment (REA) sites.**

Juvenile coral colonies ( $< 5$  cm) were surveyed within 3 m<sup>2</sup> on each transect. Juvenile colonies were identified by a distinct tissue and skeletal boundary that distinguished them from fragments of larger adult colonies. Each juvenile colony was identified to the lowest taxonomic level possible (genus or species) and measured (both the maximum and perpendicular diameter to the nearest 2 mm).

The present summary focuses only on colony density and initial estimates of bleaching, disease, and COTS predation occurrence. The island-scale estimates presented here are generated from site-level means and are not weighted by reef area within depth strata. Our data also include island and strata estimates of coral size structure, frequency of occurrence, total colony abundance, mean proportion of partial mortality, and condition (e.g. disease and bleaching) prevalence. Estimates for strata are generated from site means. Forthcoming island-scale estimates (means and totals) will be weighted by area. These statistical survey design estimates of the full suite of coral population and community metrics will be included in future publications.

## About the monitoring program

Pacific RAMP forms a key part of the National Coral Reef Monitoring Program of NOAA's Coral Reef Conservation Program (CRCP), providing integrated, consistent, and comparable data across U.S. Pacific islands and atolls. CRCP monitoring efforts have these aims:

- Document the status of reef species of ecological and economic importance.
- Track and assess changes in reef communities in response to environmental stressors or human activities.
- Evaluate the effectiveness of specific management strategies and identify actions for future and adaptive responses.

In addition to the coral population and benthic community surveys outlined here, Pacific RAMP efforts include interdisciplinary monitoring of oceanographic conditions, fish population and assemblages, invertebrate diversity and abundance, microbial diversity and abundance coral reef habitat assessments and mapping, and studies of effects of climate change and ocean acidification on coral reefs. Data are available upon request.

## For more information

Coral Reef Conservation Program:

<http://coralreef.noaa.gov>

NMFS Pacific Islands Fisheries Science Center:

<http://www.pifsc.noaa.gov>

Related publications:

<http://www.pifsc.noaa.gov/pubs/credpub.php>

Additional information:

[http://www.pifsc.noaa.gov/cred/benthic\\_monitoring.php](http://www.pifsc.noaa.gov/cred/benthic_monitoring.php)

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