



# Pacific Reef Assessment and Monitoring Program

## Benthic REA monitoring summary: Howland and Baker Islands 2017<sup>1</sup>

### About this summary brief

This summary provides an overview of the most recent survey efforts conducted at Howland and Baker 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). Logistics limited surveying to one day at each island. In this restricted survey window, benthic surveys were prioritized to investigate the impacts of the 2015-2016 El Niño sea-warming event on the coral reef community. A more detailed assessment of coral populations and reef community structure from Howland and Baker Islands will be summarized in future ESD publications.

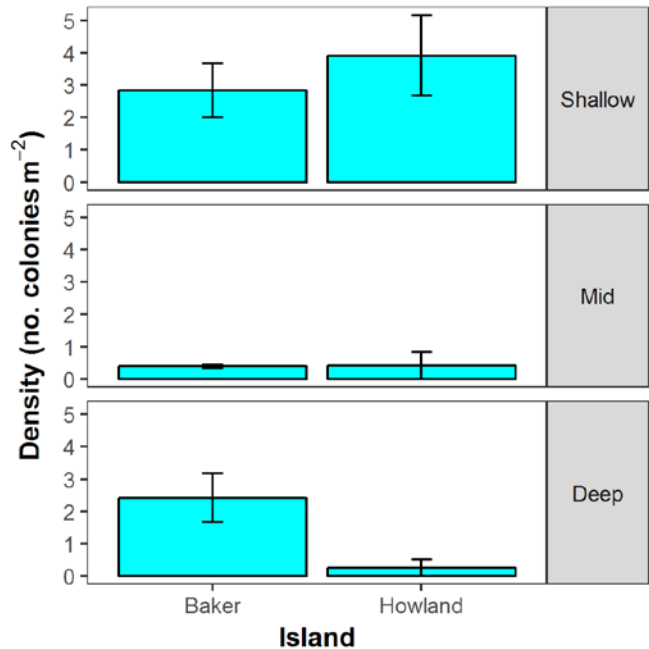
### Sampling effort

- Coral reef Rapid Ecological Assessment (REA) surveys at Howland and Baker Islands were conducted on April 10–11, 2017.
- Surveys were conducted at a total of 43 sites around Howland and Baker Islands.
- Belt transects were used to survey juvenile (colonies < 5 cm) coral abundance. Benthic cover was surveyed using 1) visual estimates within 15-m- diameter cylinders and 2) photoquadrat digital images taken along transects (data not shown).

### Overview of data collected

**Table 1. Forereef area (km<sup>2</sup>) and number of benthic cover and juvenile coral surveys performed at Howland and Baker Islands within three depth categories: shallow (0–6 m), mid-depth (> 6–18 m), and deep (> 18 m).**

| Island  | Depth          | Area (km <sup>2</sup> ) | No. of surveys |                |
|---------|----------------|-------------------------|----------------|----------------|
|         |                |                         | Benthic cover  | Juvenile coral |
| Baker   | <i>Shallow</i> | 2.1                     | 7              | 2              |
|         | <i>Mid</i>     | 1.2                     | 5              | 3              |
|         | <i>Deep</i>    | 0.6                     | 4              | 2              |
| Howland | <i>Shallow</i> | 1.1                     | 5              | 2              |
|         | <i>Mid</i>     | 0.4                     | 5              | 2              |
|         | <i>Deep</i>    | 0.2                     | 4              | 2              |



**Figure 1. Mean density of juvenile coral colonies (± SE) grouped by island within three depth categories: shallow (0–6 m), mid-depth (> 6–18 m), and deep (> 18 m).**

<sup>1</sup>PIFSC Data Report DR-17-038. Issued 02 November 2017.

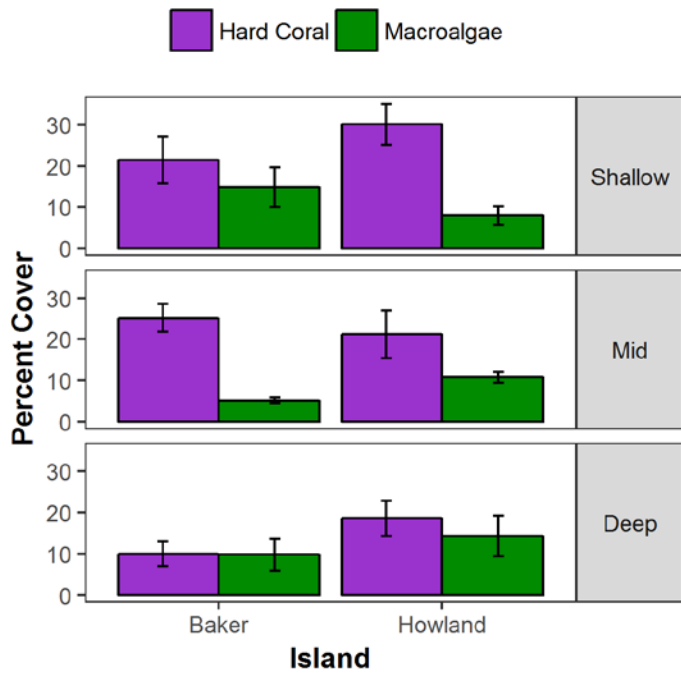


Figure 2. Mean percent cover of hard coral and macroalgae ( $\pm$  SE) from visual estimates, grouped by island within three depth categories: shallow (0–6 m), mid-depth (> 6–18 m), and deep (> 18 m).

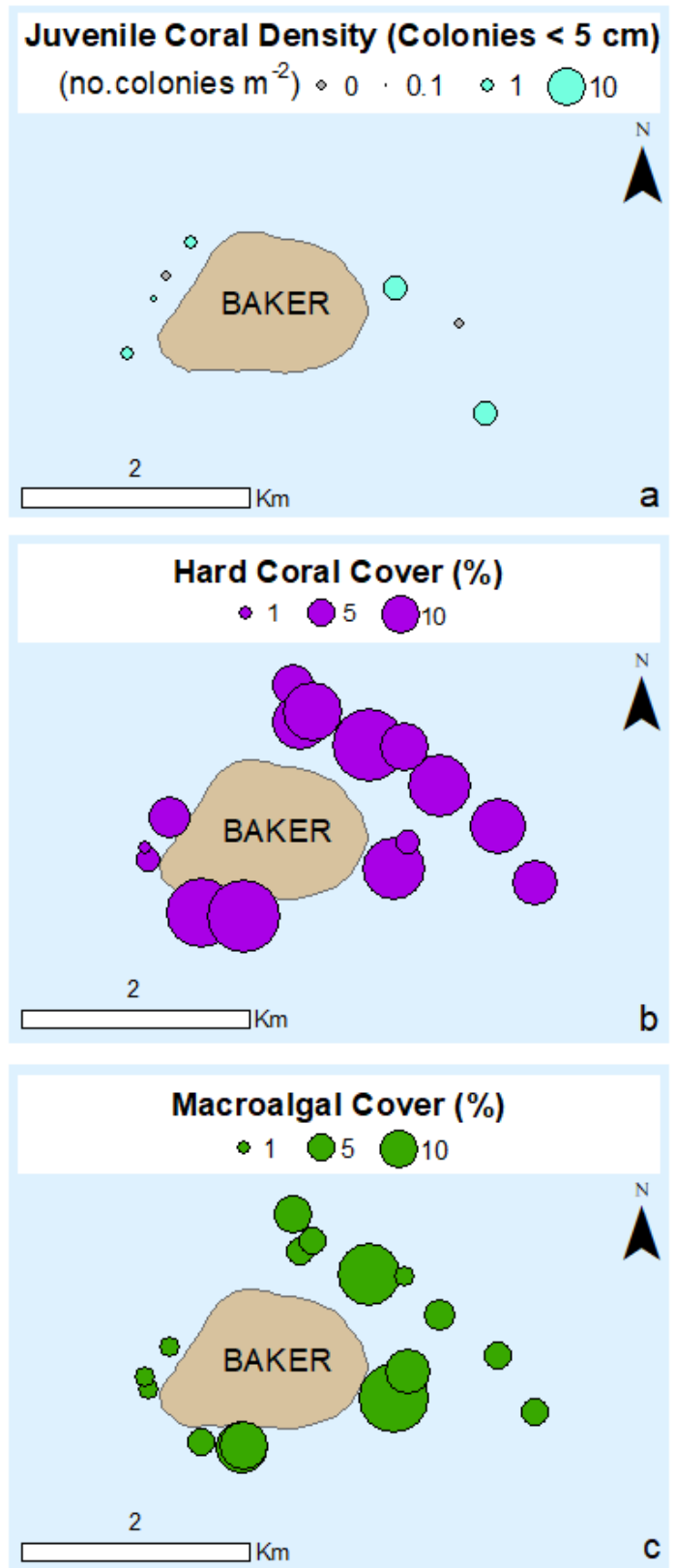
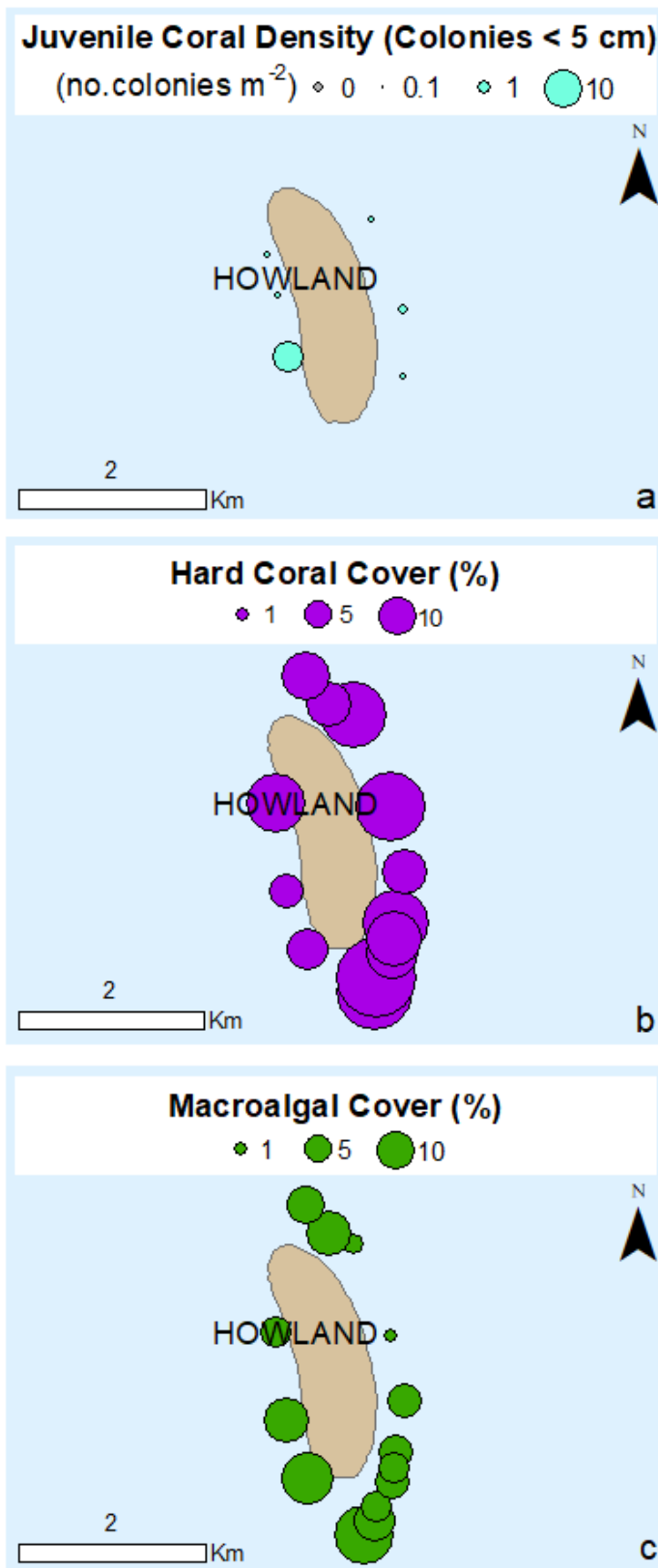


Figure 3. Mean (a) juvenile coral density, (b) hard coral cover, and (c) macroalgal cover at Baker Island survey sites.



**Figure 4.** Mean (a) juvenile coral density, (b) hard coral cover, and (c) macroalgal cover at Howland Island survey sites.

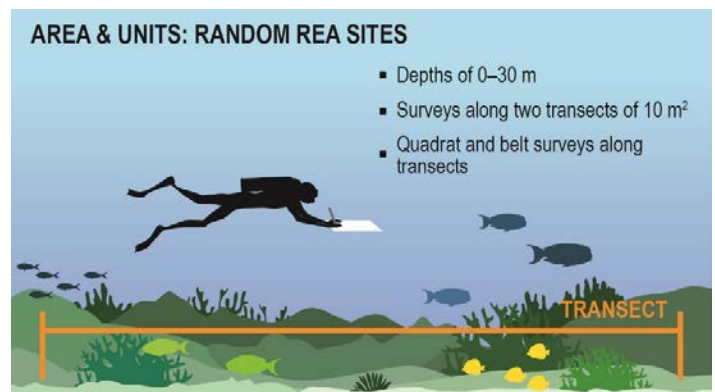
## Survey sampling design

A stratified random sampling design was employed to survey coral reefs around Howland and Baker Islands. All forereef hard-bottom habitat across three depth strata (shallow [0–6 m], mid-depth [ $> 6$ –18 m], and deep [ $> 18$ –30 m]) was sampled. Allocation of sampling effort was proportional to reef hard-bottom habitat area within each depth stratum. Sites (geographic coordinates) were randomly selected within each stratum.

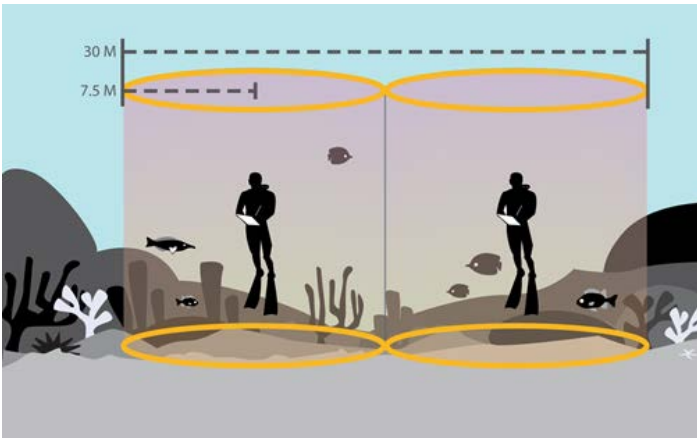
## Survey methods

*Juvenile coral density:* Surveys at each site were conducted within two belt transects (Figure 5). Juvenile coral colonies ( $< 5$  cm) were surveyed within  $3 \text{ m}^2$  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).

*Benthic community composition:* Rapid visual assessments of reef composition were conducted within two stationary 15-m-diameter cylinders per site (Figure 6). The percent cover of encrusting algae, fleshy macroalgae, and hard corals were estimated within each cylinder. Photographs were taken along transects placed across each cylinder and along each juvenile coral belt transect to be archived for future analysis.



**Figure 5.** Schematic of the method used to conduct demographic surveys of coral populations and benthic community structure at Rapid Ecological Assessment (REA) sites.



**Figure 6. Schematic of the method used to visually estimate benthic community structure at Rapid Ecological Assessment (REA) sites.**

The present summary focuses only on juvenile colony density and the results of visual estimates of benthic community composition. 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 size structure, frequency of occurrence, total colony abundance for juvenile corals. 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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