



National Coral Reef Monitoring Program: Calcification Rates of Crustose Coralline Algae Derived from Calcification Accretion Units (CAUs) Deployed across the Pacific Remote Island Areas since 2011

Pacific Islands Fisheries Science Center

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Data Set (DS)

Parent: Pacific Remote Island Areas

Project (PRJ) | ID: 32956

* **Discovery**

* **First Pass**

» **Metadata Rubric**

Item Identification

* » Title	National Coral Reef Monitoring Program: Calcification Rates of Crustose Coralline Algae Derived from Calcification Accretion Units (CAUs) Deployed across the Pacific Remote Island Areas since 2011
Short Name	NCRMP: CAUs PRIAs
* Status	In Work
* » Abstract	<p>Calcification accretion units, or CAUs, are used to assess the current effects of changes in seawater carbonate chemistry on calcification and accretion rates of calcareous and fleshy algae in the Hawaiian and Mariana Archipelagos, American Samoa, and the Pacific Remote Island Areas as part of the NOAA National Coral Reef Monitoring Program (NCRMP).</p> <p>Laboratory experiments reveal calcification rates of crustose coralline algae (CCA) are strongly correlated to seawater aragonite saturation state. Predictions of reduced coral calcification rates, due to ocean acidification, suggest that coral reef communities will undergo ecological phase shifts as calcifying organisms are negatively impacted by changing seawater chemistry.</p> <p>Deployed on the seafloor for a period of time, CAUs allow for recruitment and colonization of CCA and hard corals. By measuring the change in weight of the CAUs, the reef carbonate accretion rate can be calculated for that time period. Monitoring net accretion over successive deployments allows for the detection of changes in calcification rates over time.</p> <p>The calcification rate data described here are from CAUs that have been retrieved and replaced at existing, long-term monitoring sites during NOAA Pacific Islands Fisheries Science Center (PIFSC), Coral Reef Ecosystem Program (CREP) led NCRMP missions around the Pacific Remote Island Areas in 2014 and 2015, in accordance with protocols developed by Price et al. 2012. There are typically (but not always) five CAU sites established at each location CREP visits with five units deployed at each site.</p> <p>CAUs are composed of two 10 x 10 cm flat, square, gray PVC plates, stacked 1 cm apart, and are attached to the benthos using stainless steel threaded rods. Calcareous organisms, primarily crustose coralline algae and encrusting corals, recruit to these plates and accrete/calcify carbonate skeletons over 2-3 year deployments. Due to the simple, low-cost design and analysis, statistically robust numbers of calcification plates can easily be deployed, recovered, and processed to provide estimates of net calcification.</p> <p>This study provides information about spatial patterns of algal calcification and accretion rates and serves as a basis for detecting changes associated with changing seawater chemistry due to ocean acidification. In conjunction with benthic community composition data (separate NCRMP dataset), the calcification rates will aid in determining the magnitude of how ocean acidification affects coral reefs in the natural environment. The data can be accessed online via the NOAA National Centers for Environmental Information (NCEI) Ocean Archive.</p> <p>Analysis of these data will expand scientists' capacity for assessing coral reef resilience regarding the effects of ocean acidification outside of controlled laboratory experiments. These data can also be used in comparative analyses across natural gradients, thereby assisting efforts to determine whether key reef-building taxa can acclimatize to changing oceanographic environments. These data will have immediate, direct impacts on predictions of reef resilience in a higher carbon dioxide (CO₂) world and on the design of reef management strategies.</p>
* Purpose	<p>The NOAA National Coral Reef Monitoring Program (NCRMP) details a long term approach to provide an ecosystem perspective via monitoring climate, fish, benthic, and socioeconomic variables in a consistent and integrated manner. The NCRMP is intended to coordinate various NOAA Coral Reef Conservation Program (CRCP) biological, physical, and human dimensions activities into a cohesive NOAA-wide effort. Through the implementation of the NCRMP, NOAA will be able to clearly and concisely communicate results of national-scale monitoring to national, state, and territorial policy makers, resource managers, and the public on a periodic basis.</p> <p>To support a long-term Coral Reef Conservation Program for sustainable management and conservation of coral reef ecosystems and the NOAA Ocean Acidification Program (OAP), calcification and accretion rates of reef-building crustose coralline algae are measured in order to establish a baseline for change due to ocean acidification within the coral reef environments the NOAA Coral Reef Ecosystem Program (CREP) monitors. SCUBA divers deploy in-house developed calcification accretion units (CAUs) at foreereef study sites established by the ongoing Pacific Reef Assessment and Monitoring Program (RAMP).</p>
Notes	

Other Citation Details	
• Supplemental Information	<p>The National Coral Reef Monitoring Program (NCRMP) is a framework for conducting sustained observations of biological, climate, and socioeconomic indicators at 10 priority coral reefs across the U.S. and its territories. This integrated approach will consolidate monitoring of coral reefs under a uniform method in the Pacific, Atlantic, Caribbean, and the Gulf of Mexico for the first time. NCRMP is funded by the CRCP and supported by NOAA Fisheries, NOAA National Centers for Coastal Ocean Science (NCCOS), and many other partners. The Coral Reef Ecosystem Program (CREP) at NOAA Fisheries is leading ocean and climate change monitoring in the U.S. Pacific Islands Region.</p> <p>The climate component of NCRMP in the Pacific provides a comprehensive view of climate change impacts on coral reef ecosystems and helps identify areas of resilience and vulnerability. The key indicators used to identify and monitor climate-driven trends include 1) thermal stress caused by changes in sea temperature, 2) ocean acidification resulting from changes in carbonate chemistry, and 3) ecological impacts by collecting data on coral growth rates, erosion, and community structure to understand the impacts of thermal stress and ocean acidification on the ecosystem. Each year, CREP scientists work closely with CRCP and partners during Reef Assessment and Monitoring Program (RAMP) missions to collect data using moored oceanographic (subsurface temperature recorders) and ecological (calcification accretion units [CAUs] and autonomous reef monitoring structures [ARMS]) instruments stationed at fixed sites in the Pacific Ocean, and water samples collected by divers. The in-situ data and satellite-based observations are also used in modeling efforts. Innovative analysis techniques are used to develop products that give fellow scientists, managers, decision makers and the public a better understanding of a region's resources and how they are changing over time.</p>

Keywords

Theme Keywords

Thesaurus	Keyword
CoRIS Discovery Thesaurus	Numeric Data Sets > Calcification Rate
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Aquatic Habitat > Reef Habitat
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Algal Cover
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Algal Growth > Calcification Rate
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Calcareous Macroalgae
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Crustose Coralline Algae
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Encrusting Macroalgae
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Fleshy Macroalgae
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Reef Monitoring and Assessment
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Vegetation > Algae > Reef Monitoring and Assessment > Calcification Accretion Unit (CAU)
CoRIS Theme Thesaurus	EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment
CoRIS Theme Thesaurus	EARTH SCIENCE > Oceans > Coastal Processes > Coral Reefs
CoRIS Theme Thesaurus	EARTH SCIENCE > Oceans > Ocean Chemistry > Calcification
CoRIS Theme Thesaurus	EARTH SCIENCE > Oceans > Ocean Chemistry > Carbonate Chemistry
CoRIS Theme Thesaurus	EARTH SCIENCE > Oceans > Ocean Chemistry > Ocean Acidification
CRCP Project	1221
CRCP Project	409
CRCP Project	587
CRCP Project	743
CRCP Project	C204 Pacific Reef Assessment and Monitoring Program (Pacific RAMP): Biennial monitoring for the US Pacific Islands and Atolls
CRCP Project	National Coral Reef Monitoring Program
CRCP Project	Ocean Acidification - Quantification of Calcification and Accretion Rates of Corals and Crustose Coralline Algae across the Pacific Ocean
CRCP Project	Pacific Reef Assessment and Monitoring Program: Monitoring coral reef ecosystems of the US Pacific Islands and Atolls
ISO 19115 Topic Category	002
ISO 19115 Topic	biota

Category	
NODC DATA TYPES Thesaurus	CALCIFICATION
NODC Observation Types Thesaurus	laboratory analyses
NODC Platform Names Thesaurus	HI'IALAKAI
NODC Project Names Thesaurus	Coral Reef Conservation Program
NODC Project Names Thesaurus	CORAL REEF STUDIES
NODC Project Names Thesaurus	National Coral Reef Monitoring Program
NODC Project Names Thesaurus	Ocean Acidification Program
NODC Project Names Thesaurus	Pacific Reef and Assessment Monitoring Program
NODC Submitting Institution Names Thesaurus	US DOC; NOAA; NMFS; Pacific Islands Fisheries Science Center; Ecosystem Sciences Division; Coral Reef Ecosystem Program
None	Calcification Plate
None	Coral Reef Ecosystem Division
None	Coral Reef Ecosystem Program
None	CRED
None	CREP
None	Ocean Acidification
None	Pacific Islands Fisheries Science Center
None	PIFSC
None	RAMP
None	Reef Assessment and Monitoring Program
None	Settling Plate

Temporal Keywords

Thesaurus	Keyword
None	triennial

* Spatial Keywords

Thesaurus	Keyword
CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Baker Island (00N176W0001)
CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Howland Island (00S176W0001)
CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Jarvis Island (00S160W0001)

CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Johnston Atoll (16N169W0001)
CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Kingman Reef (06N162W0001)
CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Palmyra Atoll (05N162W0001)
CoRIS Place Thesaurus	COUNTRY/TERRITORY > United States of America > USA Minor Outlying Islands > Wake Atoll (19N167E0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Baker Island > Baker Island (00N176W0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Howland Island > Howland Island (00S176W0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Johnston Atoll > Johnston Atoll (16N169W0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Line Islands > Jarvis Island (00S160W0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Line Islands > Kingman Reef (06N162W0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Line Islands > Palmyra Atoll (05N162W0001)
CoRIS Place Thesaurus	OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Wake Atoll > Wake Atoll (19N167E0001)
NODC Sea Area Names Thesaurus	Equatorial Pacific Ocean
NODC Sea Area Names Thesaurus	Pacific Remote Islands Marine National Monument
None	Pacific Remote Island Areas
None	PRIA

Stratum Keywords

Thesaurus	Keyword

Physical Location

• » Organization	Pacific Islands Fisheries Science Center
• » City	Honolulu
• » State/Province	HI
• Country	USA
• » Location Description	

Data Set Information

• Data Set Type	CSV Files
• Maintenance Frequency	As needed
• Data Set Publication Status	Published
• Data Set Publication Date	2016-12
» Data Presentation Form	Table (digital)

Source Media Type	Online
• Entity Attribute Overview	A data dictionary describing each column provided in the data set is included in the NCEI archive package as a comma-separated file. The columns provided in the dataset include the location where the CAUs were deployed (REGION_NAME, ISLAND, SITE, LATITUDE, and LONGITUDE), when they were deployed and recovered and the duration in water (DEPLOYMENT_MISSION, RECOVERY_MISSION, DEPLOYMENT_DATE, RECOVERY_DATE, RECOVERY_YEAR, DAYS_IN_WATER, and YEARS_IN_WATER), information about the CAUs (SERIALNUMBER, CAU_UNIT), and the calculated rate of calcification (CALCIFICATION_RATE_BY_UNIT).
Entity Attribute Detail Citation	
Entity Attribute Detail URL	https://inport.nmfs.noaa.gov/inport/item/36078
Distribution Liability	While every effort has been made to ensure that these data are accurate and reliable within the limits of the current state of the art, NOAA cannot assume liability for any damages caused by errors or omissions in the data, nor as a result of the failure of the data to function on a particular system. NOAA makes no warranty, expressed or implied, nor does the fact of distribution constitute such a warranty.
Data Set Credit	PIFSC Coral Reef Ecosystem Program and partners
» Instrument	Not applicable
» Platform	Not applicable
» Physical Collection / Fishing Gear	Calcification Accretion Units (CAUs) are composed of two 10 x 10 centimeter (cm) flat, square, gray PVC plates, stacked 1 cm apart and are deployed on individual stainless steel stakes driven into the benthic substrate. Calcareous organisms recruit to these plates and accrete/calcify carbonate skeletons over 2-3 year deployments.

Support Roles

» At least one Distributor Org, one Metadata Contact, one Point of Contact, and one Data Steward should be listed.

* » Support Role	Data Steward
* » Date Effective From	2016-12-16
Date Effective To	Present
* » Person	Charles W Young
Address (Mailing)	1845 Wasp Blvd. Bldg 176 Honolulu, HI 96818 USA
* » Email Address	charles.young@noaa.gov
Phone Number	
Fax	
Business Hours	
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	Email preferred

* » Support Role	Data Steward
* » Date Effective From	2013

Date Effective To	2016-12-15
* » Person	Paula WL Misa
Address (Mailing)	1845 Wasp Blvd. Bldg 176 Honolulu, HI 96818 USA
* » Email Address	paula.misa@noaa.gov
Phone Number	808-725-5458
Fax	
Business Hours	
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	Email preferred

* » Support Role	Distributor
* » Date Effective From	2015-11-17
Date Effective To	Present
* » Person	Brian Beck
Address (Mailing)	1315 East-West Highway Bldg SSMC3, Room 4620 Silver Spring, MD 20902
* » Email Address	brian.beck@noaa.gov
Phone Number	301-713-4844
Fax	
Business Hours	
* Organization	National Centers for Environmental Information - Silver Spring, Maryland (NCEI-MD)
Organization Address:	NOAA/NESDIS E/OC SSMC3, 4th Floor, 1351 East-West Highway Silver Spring, MD 20910-3282
Organization Phone	(301) 713-3277
Organization Business Hours	
Contact Instructions	Email preferred

* » Support Role	Distributor
* » Date Effective From	2011
Date Effective To	2015-11-16
* » Person	Troy T Kanemura

Address (Mailing)	1845 Wasp Blvd. Bldg 176 Honolulu, HI 96818 USA
* » Email Address	troy.kanemura@noaa.gov
Phone Number	(808)725-5422
Fax	
Business Hours	
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	Email preferred

* » Support Role	Metadata Contact
* » Date Effective From	2011
Date Effective To	Present
* » Person	Annette M DesRochers
Address (Physical)	1845 Wasp Blvd. Bldg 176 Honolulu, HI 96818 USA
* » Email Address	annette.desrochers@noaa.gov
Phone Number	(808)725-5461
Fax	
Business Hours	8 am - 5 pm
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	Email preferred

* » Support Role	Originator
* » Date Effective From	2011
Date Effective To	Present

* Organization	NOAA Coral Reef Conservation Program (CRCP) (CRCP)
Organization Address:	1305 East West Highway 10th Floor Silver Spring, MD 20910-3281
Organization Phone	(301) 713-3155
Organization URL	http://coralreef.noaa.gov
Organization Business Hours	
Contact Instructions	

* » Support Role	Originator
* » Date Effective From	2011
Date Effective To	Present
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	

* » Support Role	Point Of Contact
* » Date Effective From	2015
Date Effective To	Present
* » Person	Thomas Oliver
Address (Mailing)	1845 Wasp Blvd. Bldg 176 Honolulu, HI 96818 USA
* » Email Address	thomas.oliver@noaa.gov
Phone Number	(808)725-5444
Fax	
Business Hours	
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	Email preferred

* » Support Role	Point Of Contact
* » Date Effective From	2011
Date Effective To	2014
* » Person	Charles W Young
Address (Mailing)	1845 Wasp Blvd. Bldg 176 Honolulu, HI 96818 USA
* » Email Address	charles.young@noaa.gov
Phone Number	
Fax	
Business Hours	
* Organization	Pacific Islands Fisheries Science Center (PIFSC)
Organization Address:	1845 Wasp Blvd. Honolulu, HI 96818 USA
Organization Phone	808-725-5300
Organization URL	http://www.pifsc.noaa.gov
Organization Business Hours	8:00 a.m. - 4:30 p.m.
Contact Instructions	Email preferred

* » Support Role	
* » Date Effective From	
Date Effective To	
* » Person	
* and/or Organization	
* Contact Instructions	

* » Support Role	
* » Date Effective From	
Date Effective To	
* » Person	
* and/or Organization	
* Contact Instructions	

* » Support Role	
* » Date Effective From	

Date Effective To	
* » Person	
* and/or Organization	
* Contact Instructions	

Extents

Currentness Reference	Ground Condition
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Extent Group 1

Extent Description	Pacific Remote Island Areas (PRIA) including Baker, Howland, Jarvis, and Wake islands, Kingman Reef, and Johnston and Palmyra atolls.
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Extent Group 1 / Geographic Area 1

* » W° Bound	-176.623861
* » E° Bound	-159.9791194
* » N° Bound	16.7633668
* » S° Bound	-0.38235459
* » Description	Phoenix (Baker and Howland) and Line Islands (Jarvis, Kingman, and Palmyra), and Johnston Atoll. These six of the seven PRIA are routinely surveyed as part of the American Samoa RAMP (ASRAMP) missions (Johnston, Baker and Howland during the first leg of ASRAMP, and Jarvis, Kingman, and Palmyra during the last leg of ASRAMP).

Extent Group 1 / Geographic Area 2

* » W° Bound	166.5983406
* » E° Bound	166.6515781
* » N° Bound	19.31627096
* » S° Bound	19.27067868
* » Description	Wake Island, one of the seven PRIA, is routinely surveyed as part of the Mariana Archipelago RAMP (MARAMP) missions.

Extent Group 1 / Vertical Extent

Vertical Minimum	
Vertical Maximum	
Coordinate Reference System URL	

Extent Group 1 / Time Frame 1

* » Time Frame Type	Range
* » Start	2012-03-02
End	2015-04-27
Alternate Start As Of Info	HA1201
Alternate End As Of Info	HA1501
Description	Date first CAU was deployed during ASRAMP 2012, and date last CAU was recovered during ASRAMP 2015.

Extent Group 1 / Time Frame 2

* » Time Frame Type	Range
* » Start	2011-03-23
End	2014-03-20
Alternate Start As Of Info	HA1101
Alternate End As Of Info	HA1401
Description	Date first CAU was deployed during MARAMP 2011, and date last CAU was recovered during MARAMP 2014.

Access Information

* » Security Class	Unclassified
* Security Classification System	Not applicable
Security Handling Description	Not applicable
• Data Access Policy	<p>Coral Reef Ecosystem Program (CREP) Data Sharing Recommendations, version 9.0 updated August 12, 2015:</p> <p>CREP welcomes the opportunity to collaborate on research issues contributing to the scientific basis for better management of marine ecosystems. CREP has a very diverse set of field activities that generates large volumes of data using an array of data collection protocols.</p> <p>The following recommendations are for your consideration as you use this data:</p> <ol style="list-style-type: none"> 1) Data analyses should take all field exigencies into account. The most effective way to do this would be active collaboration with CREP principal investigators. 2) In all presentations, product releases, or publications using data generated by CREP, proper acknowledgement of both CREP and the individuals responsible for data collection is expected. Citing the DOI (if available) is preferred, a non-DOI example is listed below. 3) If you collect or generate data for the same study areas, CREP requests that you share relevant information on complimentary data collections. 4) Those receiving data are strongly urged to inform the CREP Data Management Team of any errors and discrepancies that are discovered during the course of using these data. They are further urged to bring to the attention of the Team all problems and difficulties encountered in using these data. This information is necessary in order to improve the collections and to facilitate more efficient and economical data processing and retrieval. The users are asked to supply copies of any missing data that may be located, and to provide information as to significant subsets and special aggregations of data that are developed in using the material provided. <p>Example citation:</p> <p>"This publication makes use of data products provided by the Coral Reef Ecosystem Program (CREP), Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), with funding support from the NOAA Coral Reef Conservation Program (CRCP) and the NOAA Ocean Acidification Program. The analysis and interpretations presented here are solely that of the current authors"</p>
» Data Access Procedure	Data can be accessed online via the NOAA National Centers for Environmental Information (NCEI) Ocean Archive.
• » Data Access Constraints	None
• Data Use Constraints	<p>Please cite NOAA Coral Reef Ecosystem Program (CREP) when using the data.</p> <p>Suggested Citation:</p> <p>Coral Reef Ecosystem Program; Pacific Islands Fisheries Science Center (2016). National Coral Reef Monitoring Program: Calcification Rates of Crustose Coralline Algae Derived from Calcification Accretion Units (CAUs) Deployed across the Pacific Remote Island Areas since 2011. NOAA's National Center for Environmental Information, https://inport.nmfs.noaa.gov/inport/item/36069.</p>
Metadata Access Constraints	None

Metadata Use Constraints	None
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URLs

URL	http://www.coris.noaa.gov/monitoring/
URL Type	Online Resource
File Resource Format	HTML
Description	NOAA National Coral Reef Monitoring Program website.

URL	http://www.pifsc.noaa.gov/cred/pacific_ramp.php
URL Type	Online Resource
File Resource Format	PHP
Description	Official NOAA Coral Reef Ecosystem Program website, Pacific Reef Assessment and Monitoring Program (Pacific RAMP).

URL	http://www.pifsc.noaa.gov/cred/ocean_acidification.php
URL Type	Online Resource
File Resource Format	PHP
Description	Pacific Islands Fisheries Science Center, Coral Reef Ecosystem Program official website, Ocean Acidification page.

URL	http://www.pifsc.noaa.gov/cred/img/calcium_accretion_unit_after_two_years_sm.jpg
URL Type	Browse Graphic
File Resource Format	JPEG
Description	A CAU two years after deployment.

URL	https://www.pifsc.noaa.gov/library/pubs/DR-16-007.pdf
URL Type	Online Resource
File Resource Format	PDF
Description	Summary report of baseline surveys and installations conducted in 2015 in the National Marine Sanctuary of American Samoa. This report includes the calcification accretion unit (CAU) methodology.

URL	
URL Type	
File Resource Format	
Description	

URL	
URL Type	

File Resource Format	
Description	

URL	
URL Type	
File Resource Format	
Description	

Activity Log

Activity Time	
Activity Type	
Responsible Party	
Description	

Activity Time	
Activity Type	
Responsible Party	
Description	

Activity Time	
Activity Type	
Responsible Party	
Description	

Issues

Issue Date	
Author	
Issue	

Issue Date	
Author	
Issue	

Issue Date	
Author	

Issue	
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Technical Environment

Description	PIFSC Oracle database view: V_CALCIFICATION_RATE_BY_UNIT
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Data Quality

Representativeness	
Accuracy	Prior to processing the calcification accretion unit (CAU) samples, laboratory analysts are trained to properly use relevant lab equipment (analytical balance, vacuum filtration pump, etc.) and are familiarized with the data entry tool/spreadsheet. Laboratory analysts are also required to go through the CAU Processing Standard Operating Procedure and other training materials.
Analytical Accuracy	
Quantitation Limits	
Bias	
Comparability	
Completeness Measure	Calcification Accretion Units (CAUs) that have been deployed may not have been recovered due to logistical constraints of the following mission or could not be found when divers returned to the site. This can be quantified by comparing the number of recovered units to the number of units originally deployed (typically, 5 units per site).
Precision	
Analytical Precision	
Field Precision	
Sensitivity	
Detection Limit	
Completeness Report	<p>The calcification rate and ratio of calcified materials to fleshy materials are determined for each Calcification Accretion Unit (CAU) recovered by the NOAA Coral Reef Ecosystem Program (CREP). Scripps Institution of Oceanography (Scripps) staff may conduct additional analyses of specific units to determine functional group coverage and to determine species recruitment rates based on the results of analyzed photos collected during the unit recovery and disassembly process.</p> <p>Additionally, data from the CAUs processed in 2012 that do not meet the processing criteria set in 2012—that is, if the difference between the final two subsequent dry weights exceeds 0.2 grams, then those data have been omitted from the final dataset described herein.</p>
Conceptual Consistency	The sampling procedure is based on the protocols developed by Price et al. 2012. While this project followed the same overall protocols, slight modifications were made after the first set of recovered Calcification Accretion Units (CAUs) were processed in 2012. Specifically, the following changes were implemented in 2013: 1) camera settings (adjusted to fit laboratory light conditions), and 2) use of freshwater in lieu of seawater during plate photo-documentation (seawater was not readily available in the new facility). Further, the processing procedures were also modified in 2013 such that the acceptable criteria for samples to be considered completely dry was set to 0.1 grams

	instead of 0.2 grams—that is, if two subsequent dry weights do not fall within the identified acceptable range (0.1 grams), the drying process will continue until this criteria is met.
» Quality Control Procedures Employed	Prior to processing a batch from each region/jurisdiction, laboratory analysts inventory the recovered Calcification Accretion Units (CAUs) to ensure all units are accounted for and all serial numbers assigned to each unit match field data records. The Data Manager additionally performs quality control checks on the site deployment data and the recovery data for further accuracy. Once all CAUs from the jurisdiction have been processed, the dataset is checked by the analysts to ensure: 1) all CAU plates have been processed, 2) there are no missing cell values, and 3) calculations for net weight of calcified materials are correct. The dataset is then turned over to the Data Manager for further quality control procedures and data ingestion into the NOAA Coral Reef Ecosystem Program's master database.

Data Management

» Have Resources for Management of these Data Been Identified?	Yes
» Approximate Percentage of Budget for these Data Devoted to Data Management	Unknown
» Do these Data Comply with the Data Access Directive?	Yes
» Is Access to the Data Limited Based on an Approved Waiver?	No
» If Distributor (Data Hosting Service) is Needed, Please Indicate	
» Approximate Delay Between Data Collection and Dissemination	Unknown
» If Delay is Longer than Latency of Automated Processing, Indicate Under What Authority Data Access is Delayed	
» Actual or Planned Long-Term Data Archive Location	NCEI-MD
» Approximate Delay Between Data Collection and Archiving	Unknown
» How Will the Data Be Protected from Accidental or Malicious Modification or Deletion Prior to Receipt by the Archive?	NOAA IRC and NOAA Fisheries ITS resources and assets.

Lineage

» Lineage Statement	Assembled calcification accretion units (CAUs) are attached to the benthos using stainless steel threaded rods. There are typically five CAU sites established at each location (island) the NOAA Coral Reef Ecosystem Program (CREP) visits with five CAUs deployed at each site (n=25 per location). Calcareous organisms, primarily crustose coralline algae and encrusting corals, recruit to these CAUs and accrete/calcify carbonate skeletons over 2-3 year deployments. Once recovered from the seafloor, the CAUs are processed to provide estimates of net calcification, percent cover, and vertical accretion rates. CAUs have been deployed and replaced at existing, long-term monitoring sites during Pacific Reef Assessment and Monitoring Program (RAMP) cruises, in accordance with protocols developed by Price et al. 2012.
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Sources

Citation Title	NOAA Coral Reef Ecosystem Program (CREP) Calcification Accretion Unit (CAU) Assembly, Deployment, and Recovery Standard Operating Procedure (2015)
Originator/Publisher	Pacific Islands Fisheries Science Center
Publish Date	2015-08-01
Extent Type	
Extent Start Date/Time	
Extent End Date/Time	
Citation URL	http://data.nodc.noaa.gov/coris/data/NOAA/nmfs/pifsc/cred/cau/CAU1_Assembly_Deployment_Recovery_CRED_SOP_2015.pdf
Scale Denominator	

Citation Title	NOAA Coral Reef Ecosystem Program (CREP) Calcification Accretion Unit (CAU) Laboratory Analysis Standard Operating Procedure (2015)
Originator/Publisher	Pacific Islands Fisheries Science Center
Publish Date	2015-09-01
Extent Type	
Extent Start Date/Time	
Extent End Date/Time	
Citation URL	http://data.nodc.noaa.gov/coris/data/NOAA/nmfs/pifsc/cred/cau/CAU2_Sample%20Processing_CRED_SOP_2015.pdf
Scale Denominator	

Citation Title	Price NN, Martz TR, Brainard RE, Smith JE (2012) Diel Variability in Seawater pH Relates to Calcification and Benthic Community Structure on Coral Reefs. PLoS ONE 7(8): e43843. doi:10.1371/journal.pone.0043843
Originator/Publisher	Scripps Institution of Oceanography, University of California San Diego
Publish Date	2012-08-28
Extent Type	
Extent Start Date/Time	
Extent End Date/Time	
Citation URL	http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043843
Scale Denominator	

Citation Title	
Originator/Publisher	
Publish Date	
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Process Steps

Process Step Number	1
» Description	<p>CALCIFICATION ACCRETION UNIT (CAU) ASSEMBLY, DEPLOYMENT and RECOVERY</p> <p>CAUs are composed of two 10 x 10 centimeter (cm) flat, square, gray PVC plates, stacked 1 cm apart.</p> <p>Five CAU units are deployed per site on individual stainless steel stakes driven into the substrate. The units are deployed in a clustered group with the spacing between each unit being 0.5 to 5 meters. CAU sites are situated at an average depth of 15 meters. Units are placed so the CAU plates are ~10 cm above the surface substrate and the top of the CAU plate is parallel to the surface of the water.</p> <p>CAU units are recovered from the seafloor 2 to 3 years after deployment. Refer to the data files for the individual CAU site to determine the exact deployment time of a specific unit.</p> <p>Refer to the NOAA Coral Reef Ecosystem Program (CREP) Calcification Accretion Unit (CAU) Assembly, Deployment, and Recovery Standard Operating Procedure (2015) for a detailed description of the protocols.</p>
Process Date/Time	2015-08-01 00:00:00
Process Contact	Charles W Young
Phone (Voice)	
Email Address	charles.young@noaa.gov
Source	NOAA Coral Reef Ecosystem Program (CREP) Calcification Accretion Unit (CAU) Assembly, Deployment, and Recovery Standard Operating Procedure (2015)

Process Step Number	2
» Description	<p>CALCIFICATION ACCRETION UNIT (CAU) LABORATORY ANALYSIS</p> <p>Once CAU units are recovered they are disassembled and each plate is rinsed with saltwater to remove loose sediment, sand and mobile fauna. The plates are photographed and individual images are captured of the Upper Plate, Top Side; Upper Plate, Bottom Side; Lower Plate, Top Side; Lower Plate, Bottom Side. These images are later analyzed to determine benthic composition on each plate surface. If pieces of calcified material fall off during the photographing process, the pieces are retained with the plate for the dissolution process.</p> <p>After the plates have been photographed they are rinsed with fresh water and placed on a pre-weighed drying plate along with any dislodged pieces, and left to begin drying at room temperature for 24 hours and to allow excess water to be removed. The drying plate assembly is then placed in the oven to dry at 60 degrees Celsius. If the difference in weights is less than 0.2 grams, the plates are considered dry and no further drying/weighing is required. If the difference in weights is greater than 0.2 grams the drying/reweighing process is repeated for as many 24-hour cycles as needed to obtain a difference of less than 0.2 grams. It should be noted that since the initial sample processing in 2012, the standard weighing protocol has since been improved such that the acceptable weight difference is 0.1 grams.</p> <p>Once the plates are dry, each plate is placed in 5% Hydrochloric Acid (HCl) solution to dissolve the calcium carbonate materials. The plate is scraped to remove all materials and rinsed with the 5% HCl solution. The plate is then placed in the oven at 60 degrees Celsius to dry for 24 hours before the dry plate is obtained. Through the entire dissolution process all 5% HCl rinse solution is preserved for later filtering.</p>

	<p>The 5% HCl rinse process is repeated on all materials removed from the plate until the dissolution process has stopped and all calcium carbonate material has been removed. The fleshy material and used 5% HCl rinse materials are then separated using a vacuum filtration pump by pouring the solution into a Buchner funnel, mesh layer and pre-weighed filter paper. The filter paper and fleshy material are then dried and weighed to determine the weight of fleshy algae present on each plate. The weight of calcified materials on each plate is determined by difference, where the initial weight of the dried plate (prior to the dissolution process) minus the fleshy material weight equals the weight of carbonate material dissolved. The resulting calcification rates are reported in units of grams/area/time.</p> <p>Refer to the NOAA Coral Reef Ecosystem Program (CREP) Calcification Accretion Unit (CAU) Laboratory Analysis Standard Operating Procedure (2015) for a detailed description of the protocols.</p>
Process Date/Time	2015-09-01 00:00:00
Process Contact	Charles W Young
Phone (Voice)	
Email Address	charles.young@noaa.gov
Source	NOAA Coral Reef Ecosystem Program (CREP) Calcification Accretion Unit (CAU) Laboratory Analysis Standard Operating Procedure (2015)

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Process Date/Time	
Process Contact	
Phone (Voice)	
Email Address	
Source	

FAQs

Date	
Author	
Question	

