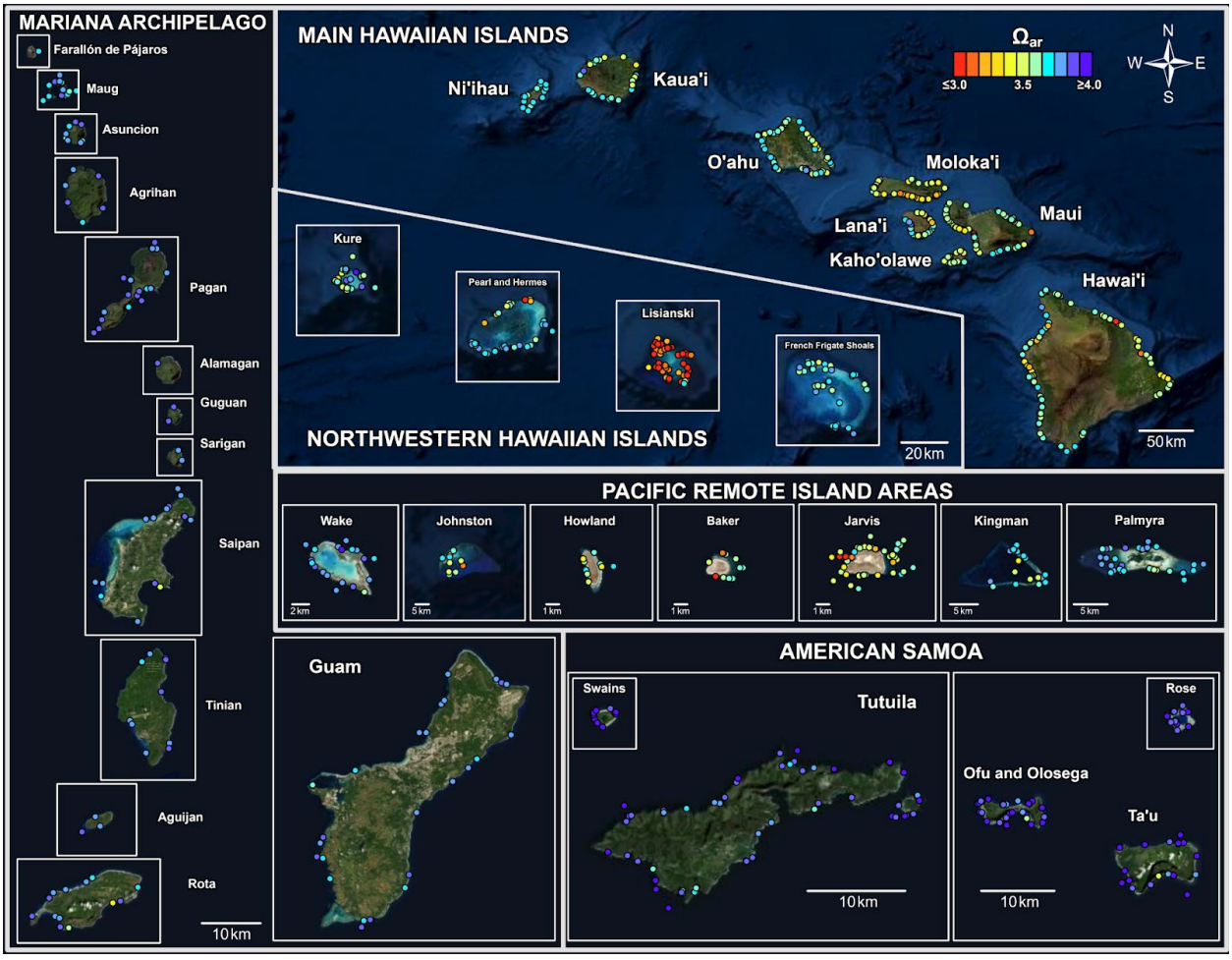
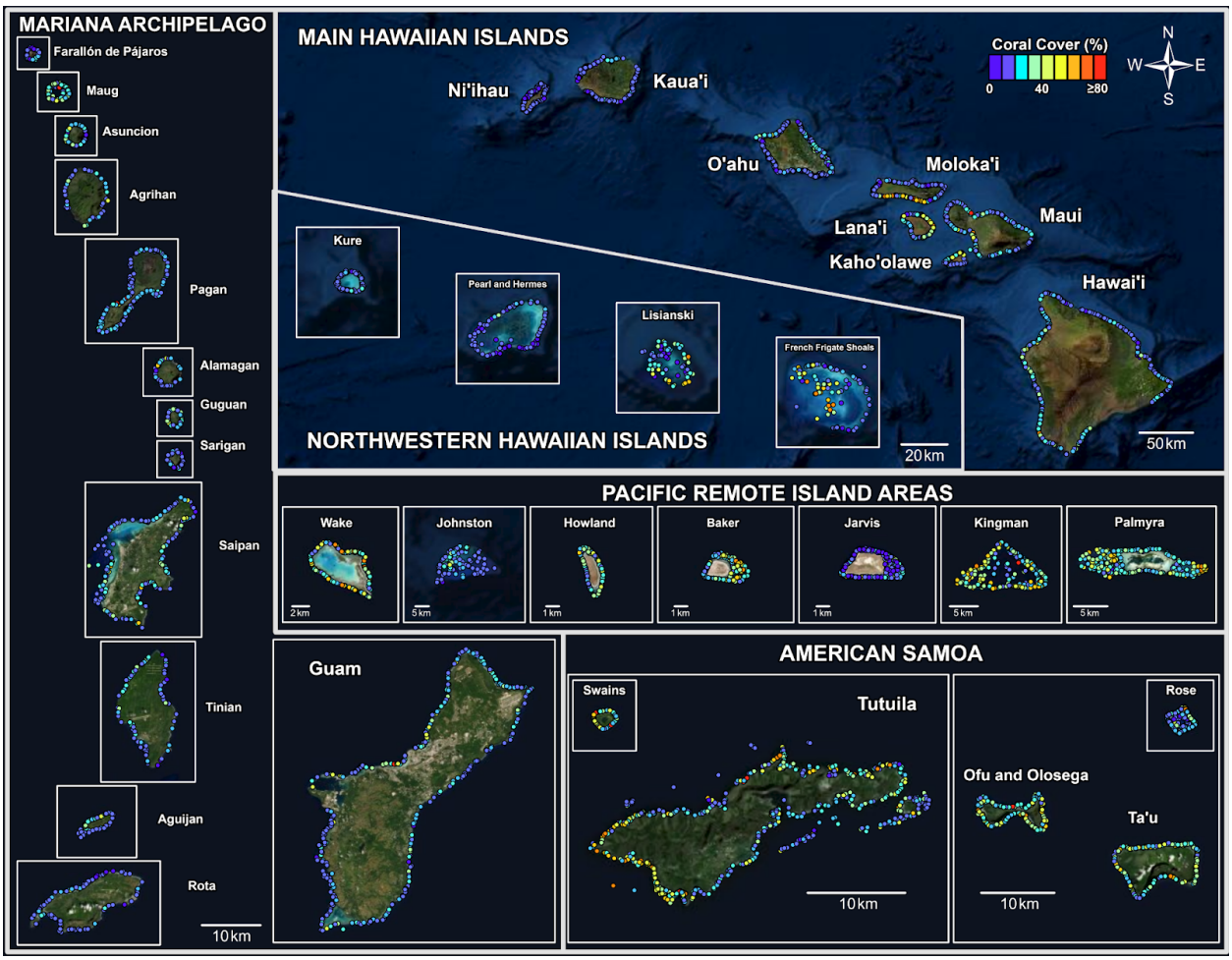
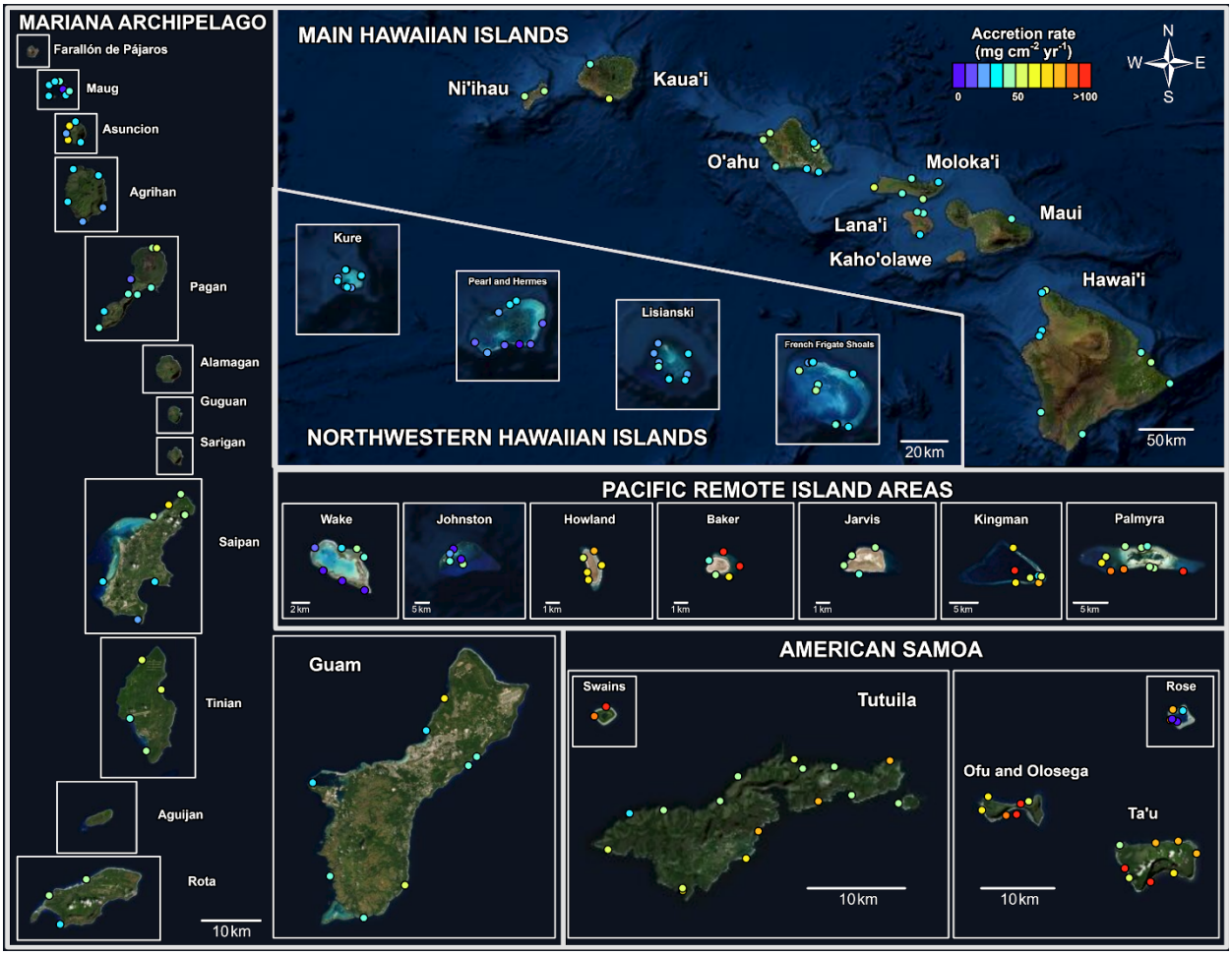
Supplementary Material



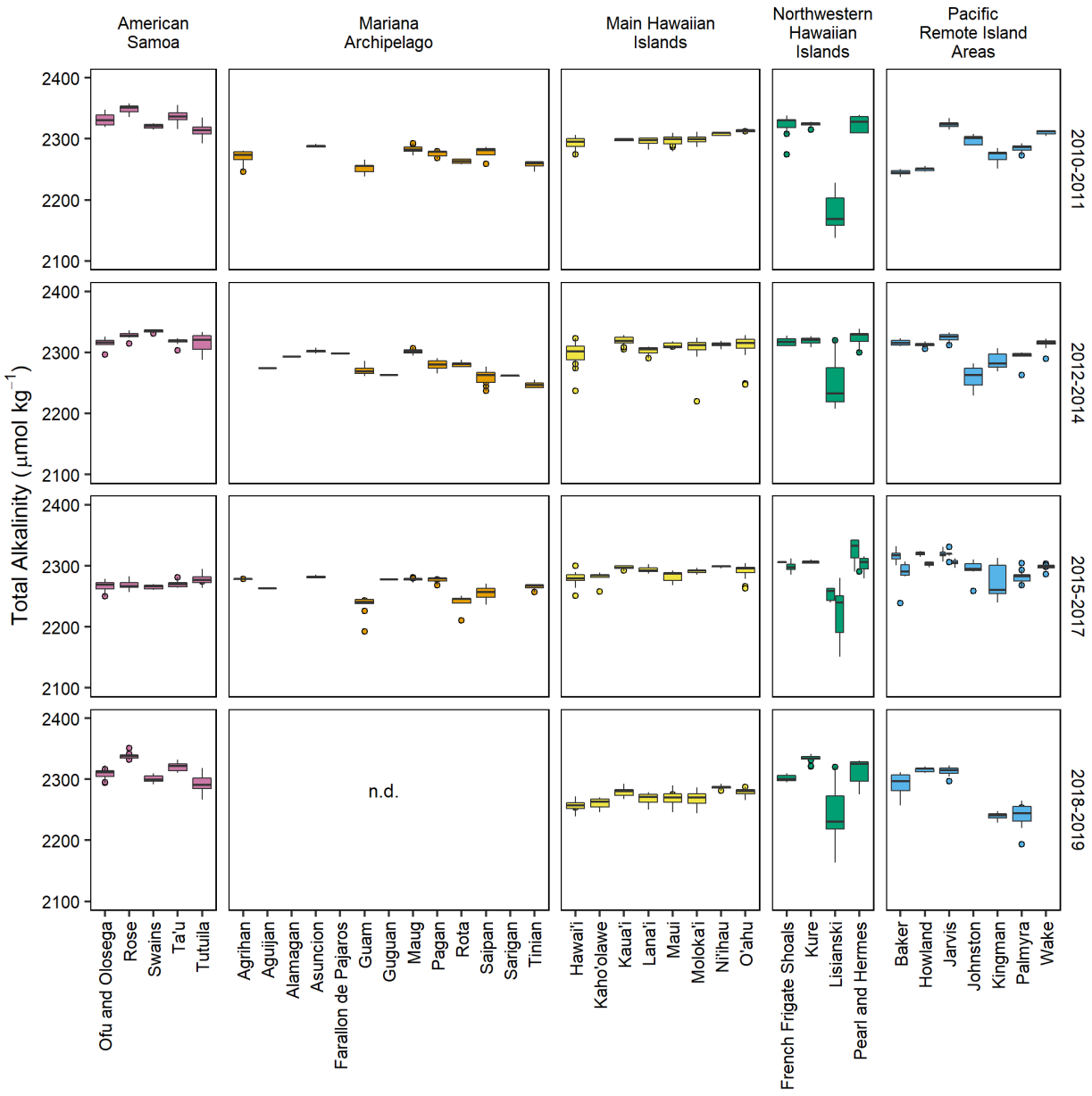
Supplementary Figure 1. Map of carbonate chemistry sample locations at 37 U.S. Pacific Islands surveyed as part of NOAA's Pacific Reef Assessment and Monitoring Program and National Coral Reef Monitoring Program, 2010–2019. Points are colored by Ω_{ar}, calculated from in situ Total Alkalinity (TA) and Dissolved Inorganic Carbon (DIC).



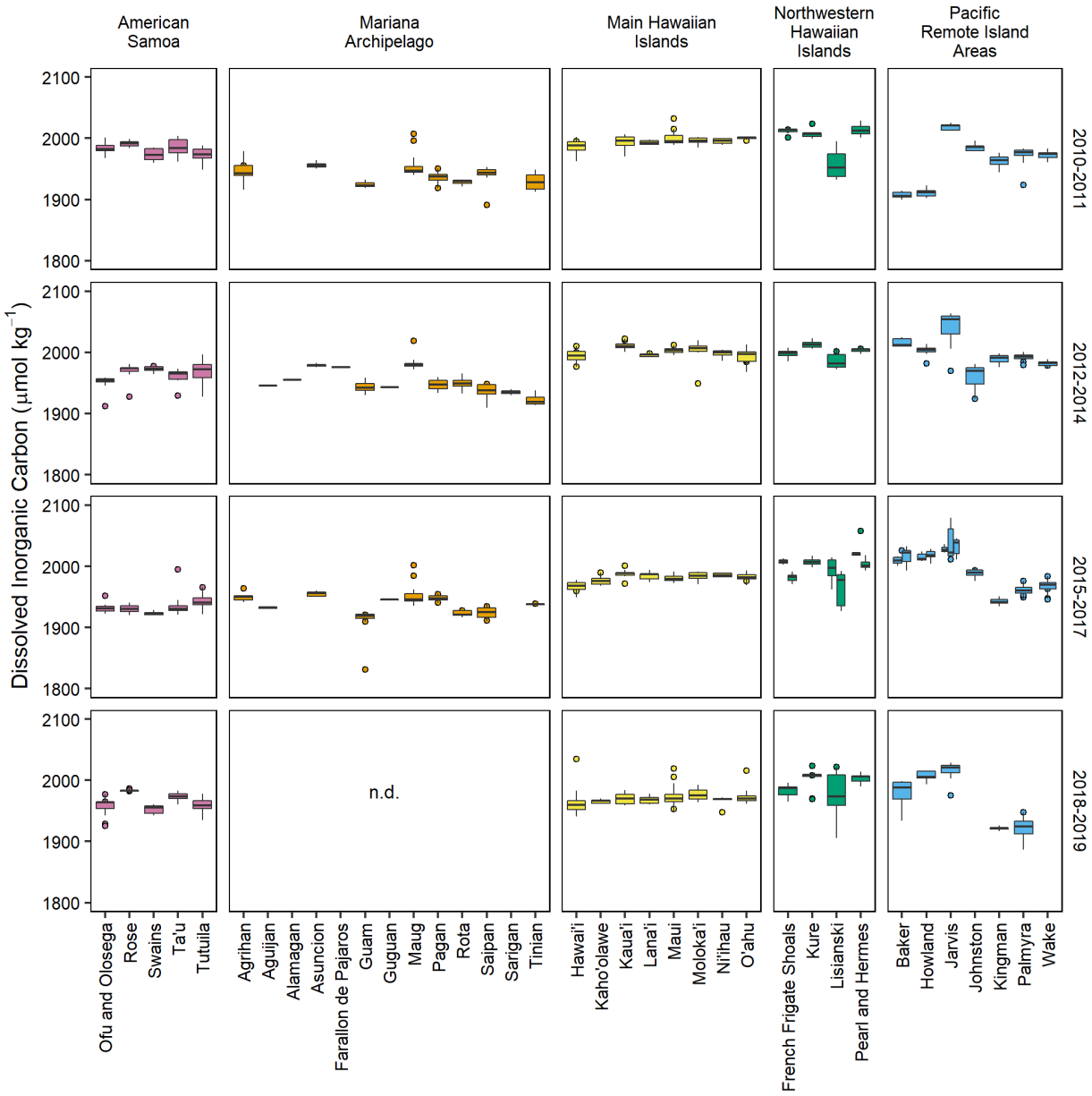
Supplementary Figure 2. Map of benthic survey locations at 37 U.S. Pacific Islands surveyed as part of NOAA's Pacific Reef Assessment and Monitoring Program and National Coral Reef Monitoring Program, 2010–2019. Points are colored by percent live coral cover.



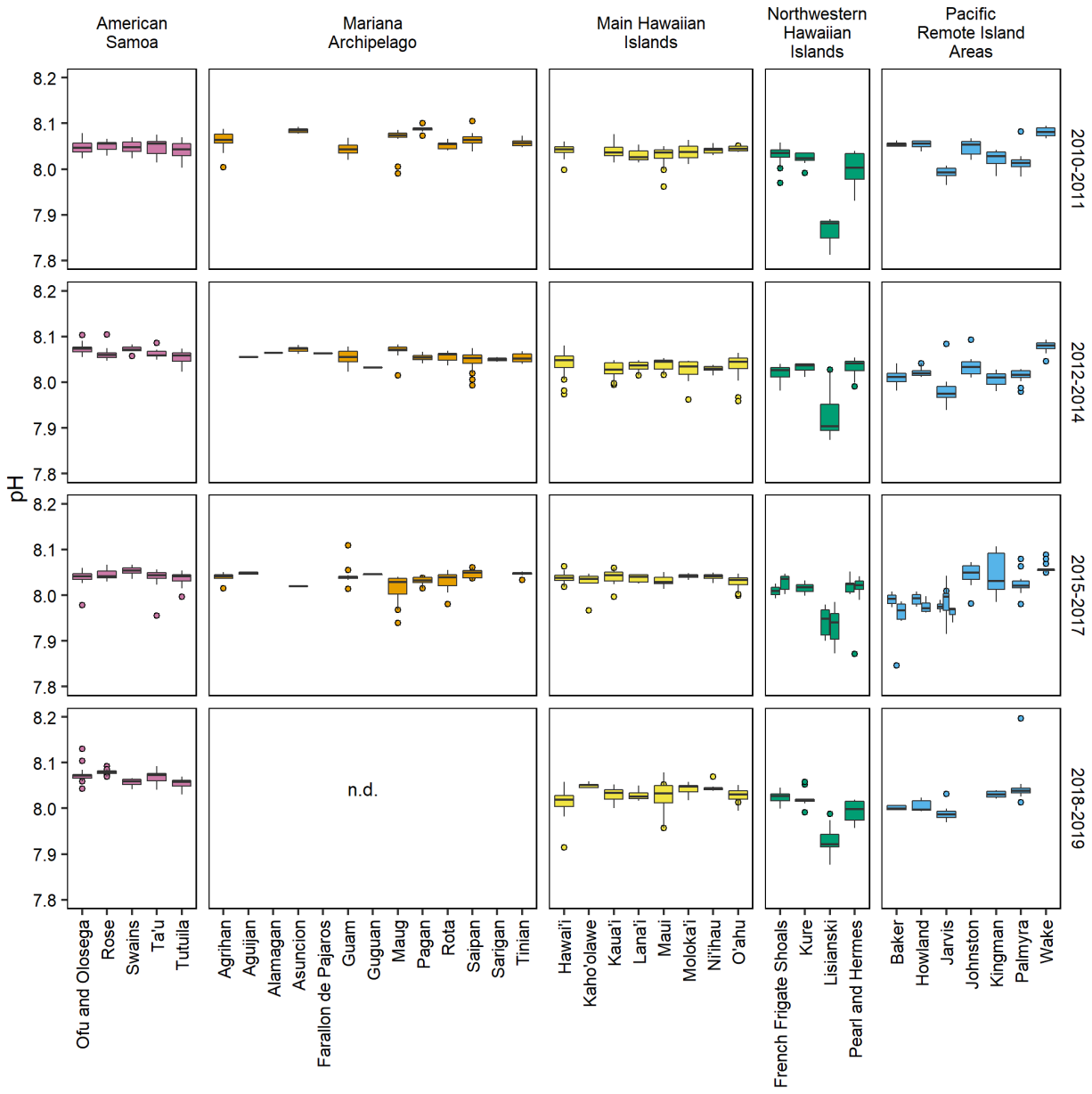
Supplementary Figure 3. Map of Calcification Accretion Unit (CAU) deployment locations at 31 U.S. Pacific Islands surveyed as part of NOAA's Pacific Reef Assessment and Monitoring Program and National Coral Reef Monitoring Program, 2010–2019. Points are colored by the average carbonate accretion rate measured at each site**.** Islands in the Mariana Archipelago with no data points did not have any CAU deployments.



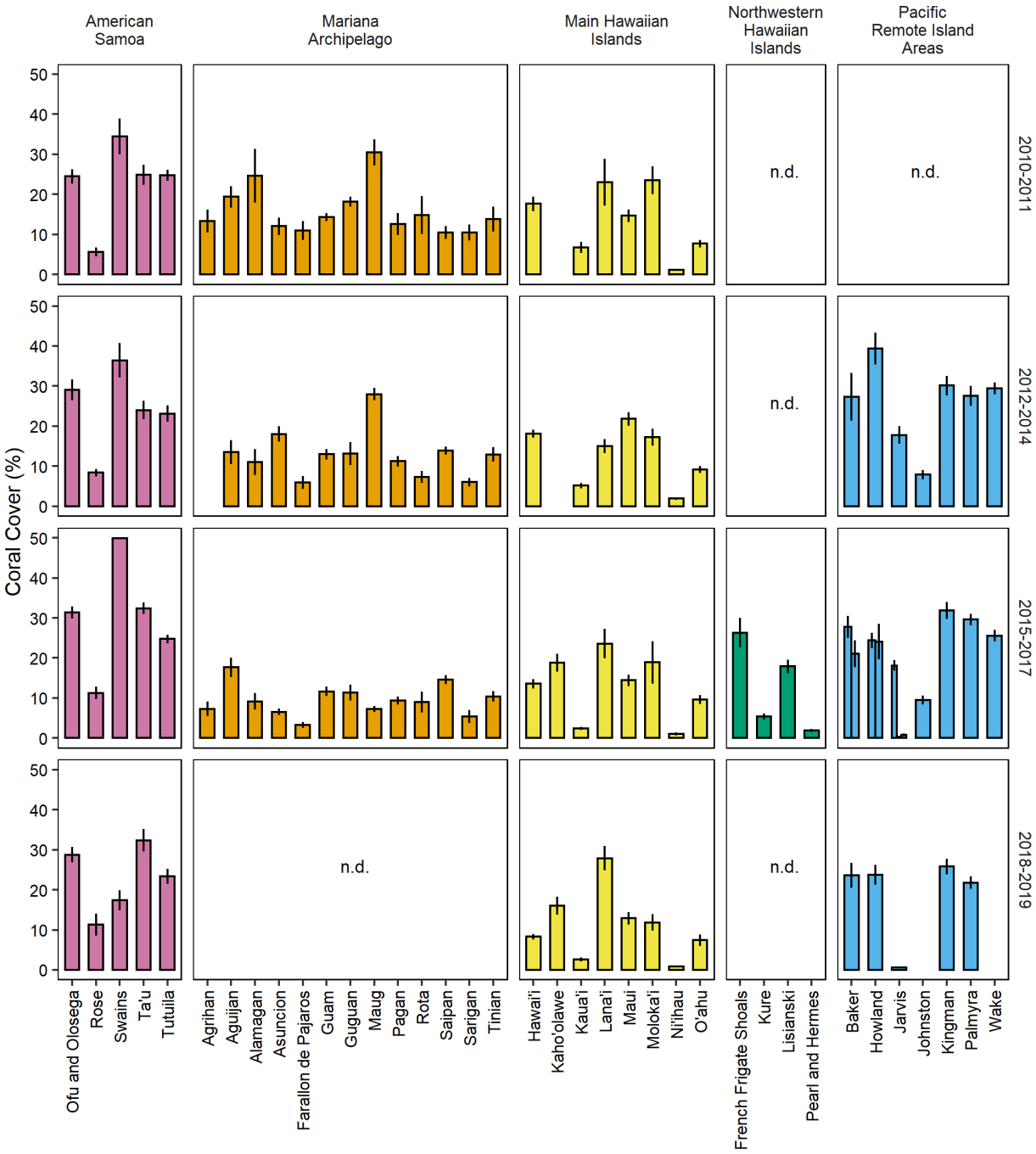
Supplementary Figure 4. Total Alkalinity (TA) data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). 2018–2019 data are not available for the Mariana Archipelago due to COVID-19 ("n.d." = no data), and islands missing data were not sampled during the specified sampling period. Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



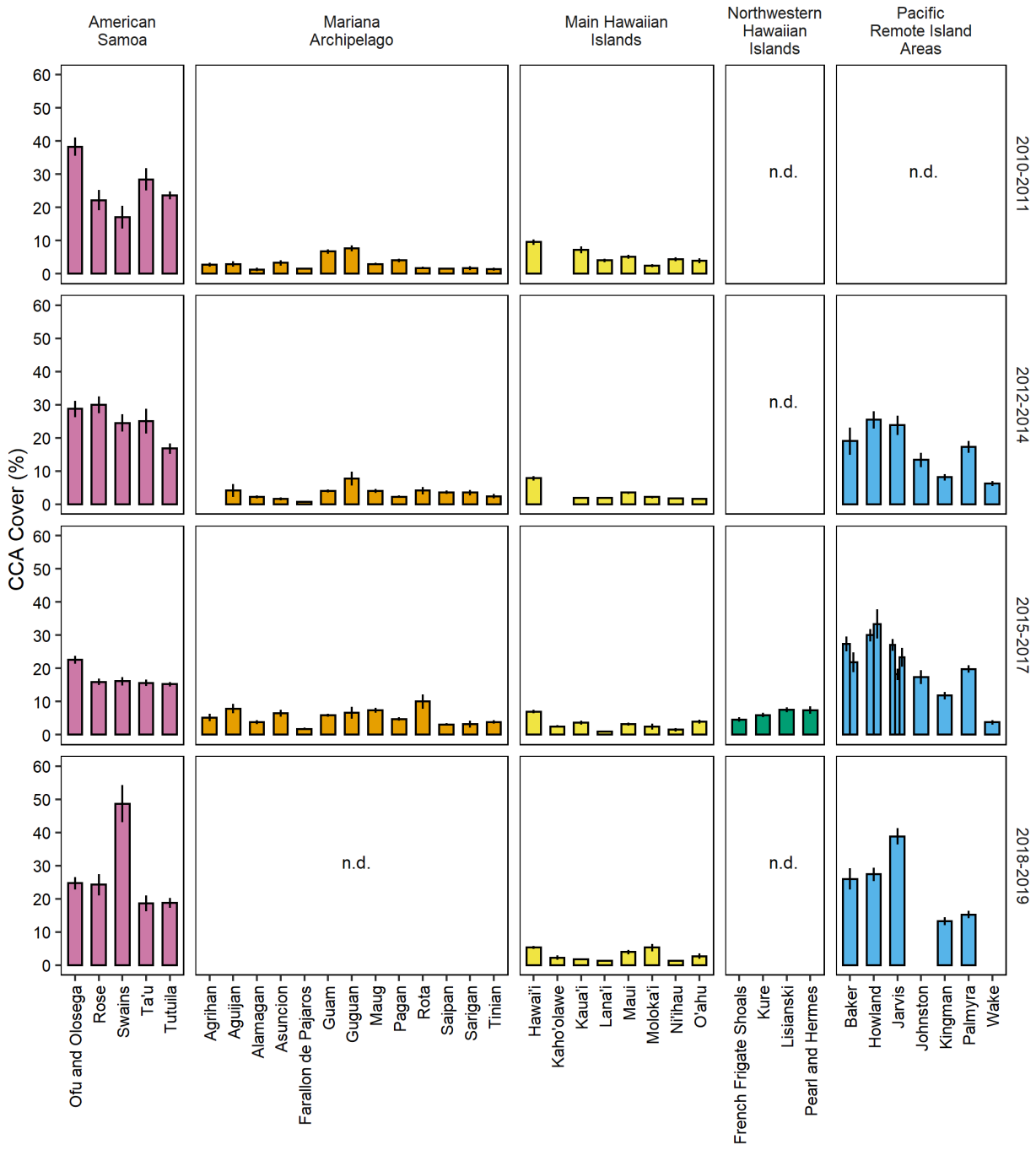
Supplementary Figure 5. Dissolved Inorganic Carbon (DIC) data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). 2018–2019 data are not available for the Mariana Archipelago due to COVID-19 ("n.d." = no data), and islands missing data were not sampled during the specified sampling period. Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



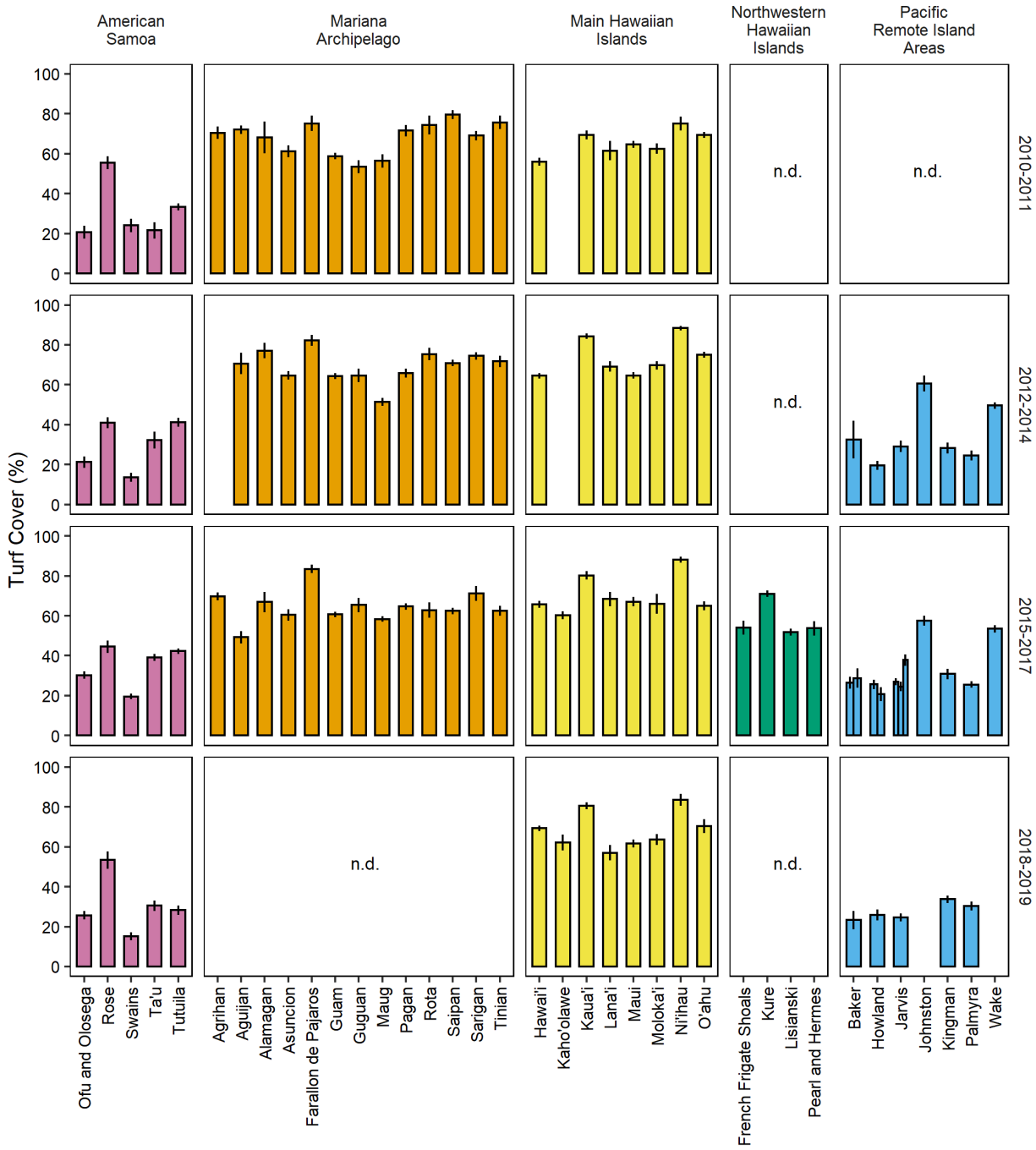
Supplementary Figure 6. pH (total scale) data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). 2018–2019 data are not available for the Mariana Archipelago due to COVID-19 ("n.d." = no data), and islands missing data were not sampled during the specified sampling period. Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



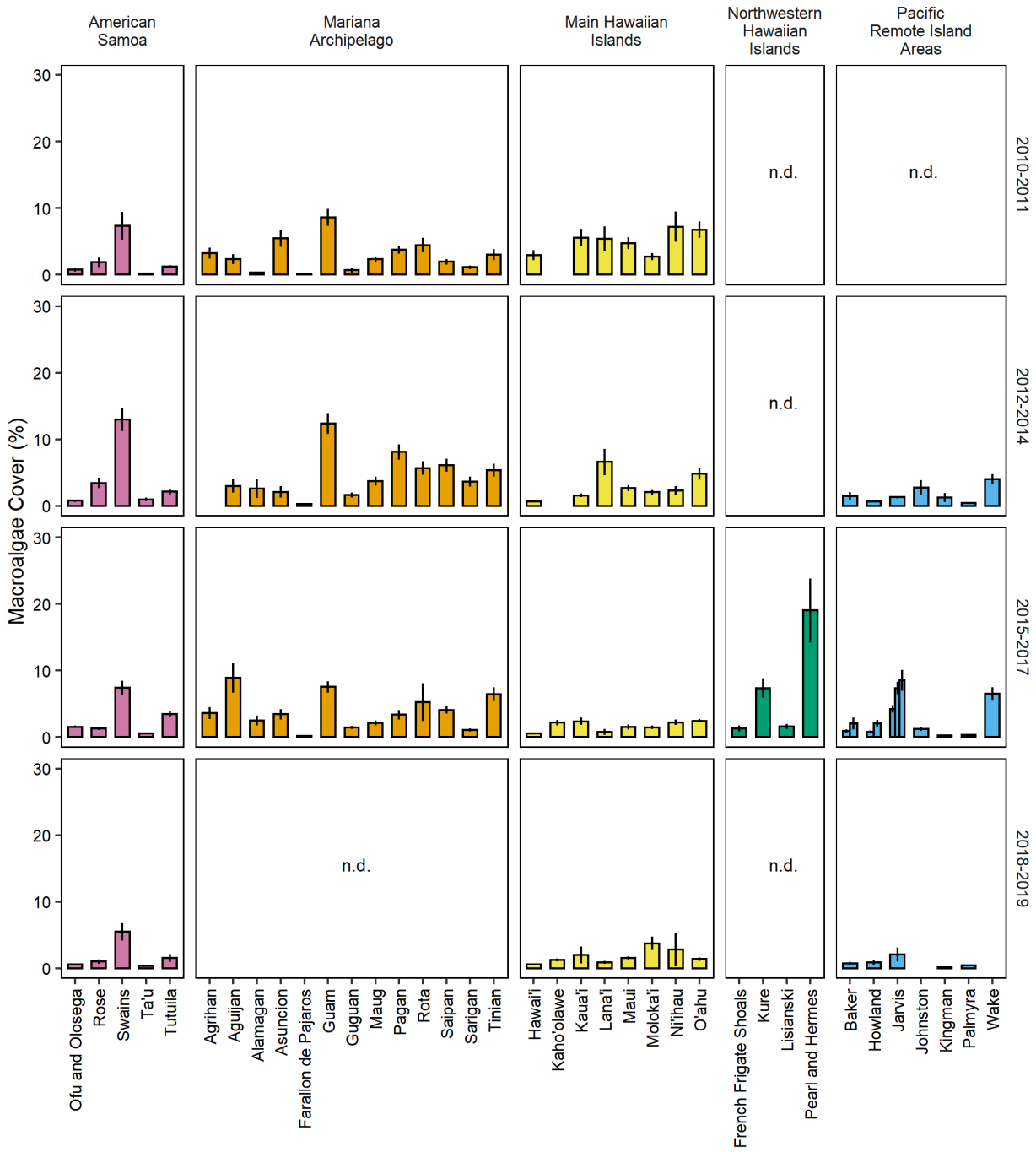
Supplementary Figure 7. Percent coral cover data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). Regions and islands missing data were not sampled during the specified sampling period ("n.d." = no data). Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



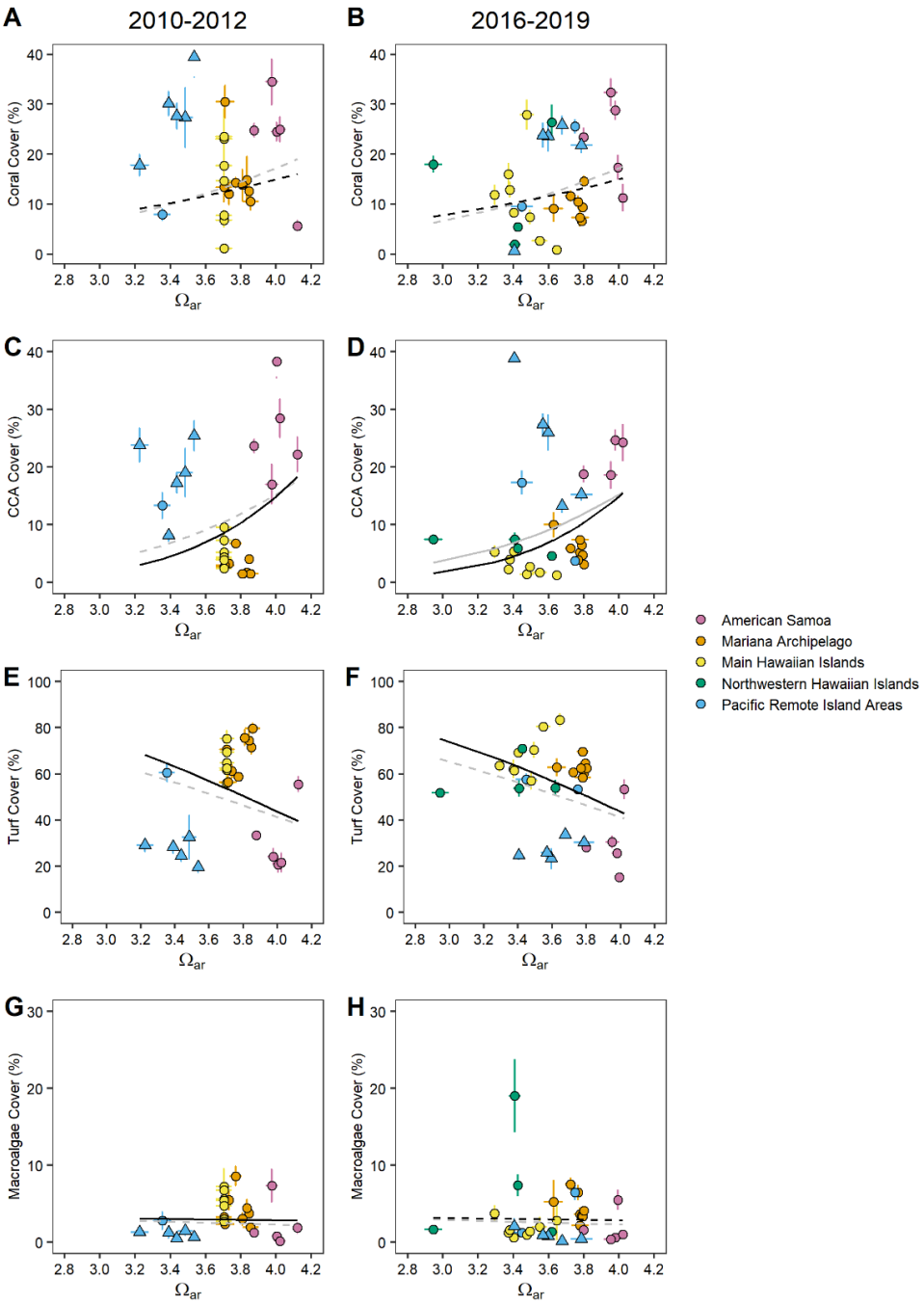
Supplementary Figure 8. Percent crustose coralline algae (CCA) cover data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). Regions and islands missing data were not sampled during the specified sampling period ("n.d." = no data). Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



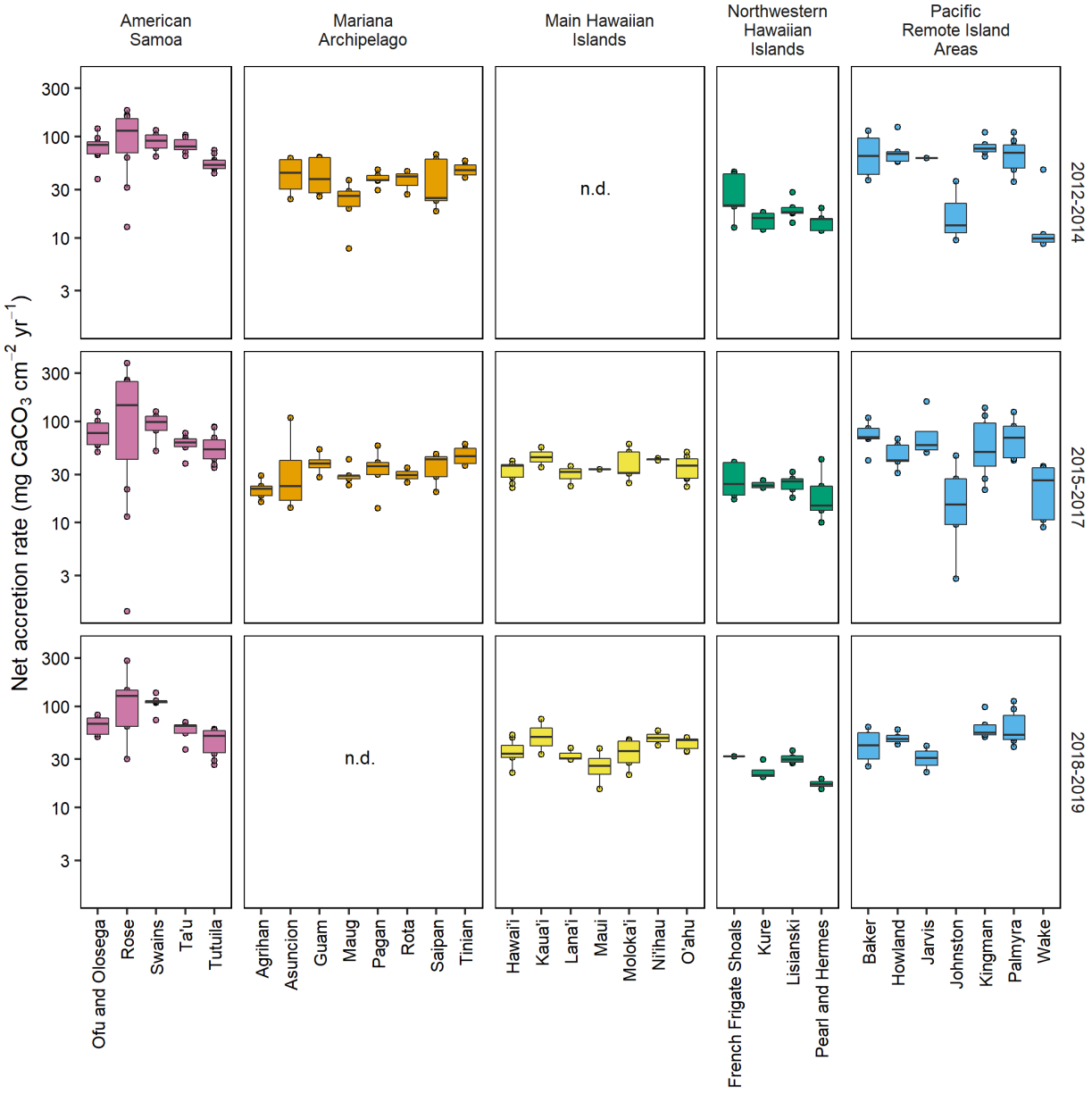
Supplementary Figure 9. Percent turf cover data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). Regions and islands missing data were not sampled during the specified sampling period ("n.d." = no data). Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



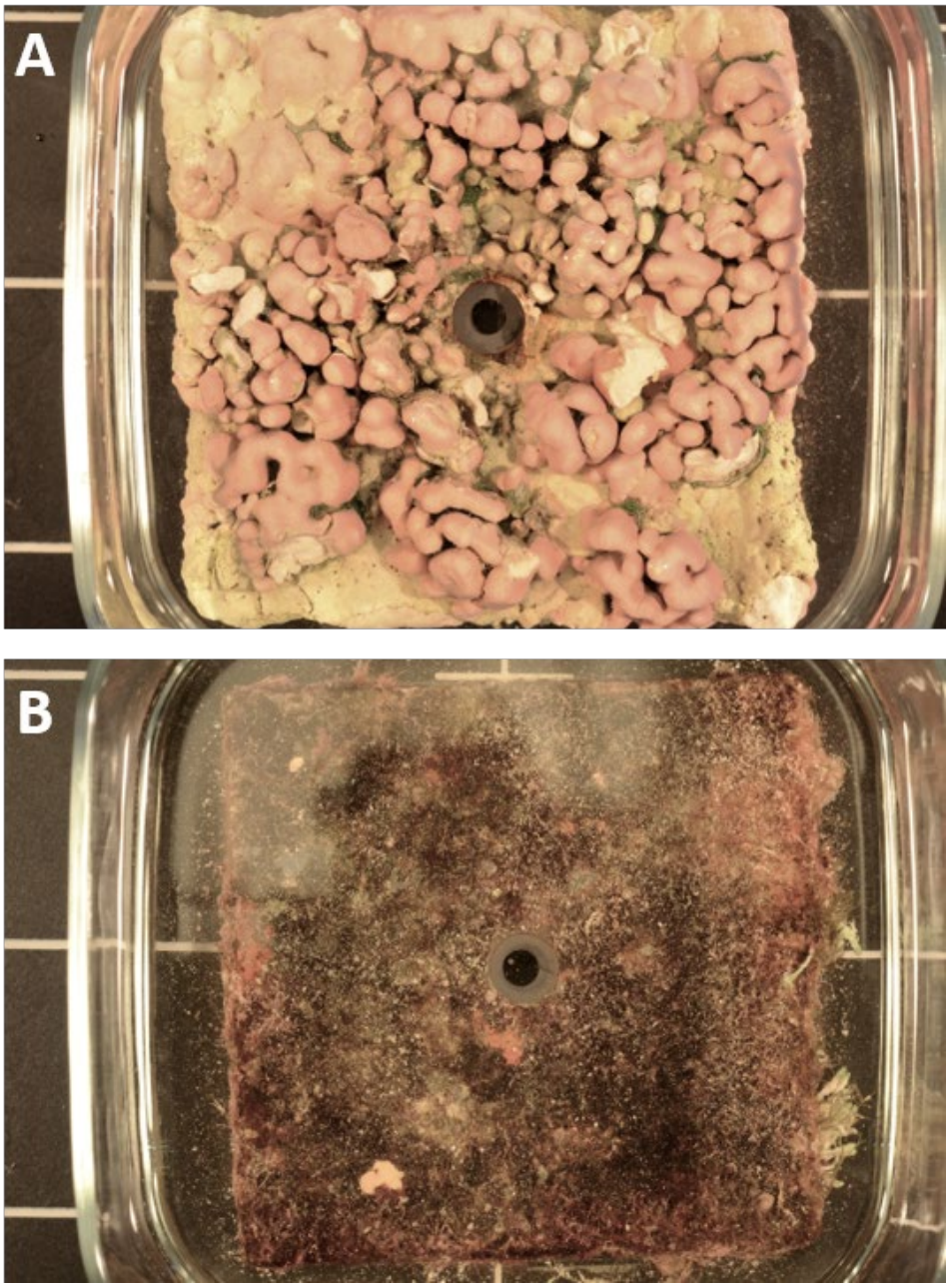
Supplementary Figure 10. Percent macroalgae cover data for 37 U.S. Pacific islands and atolls collected during four sampling periods (2010–2011, 2012–2014, 2015–2017, and 2018–2019). Regions and islands missing data were not sampled during the specified sampling period ("n.d." = no data). Islands that were surveyed more than once during the 2015–2017 sampling period (French Frigate Shoals and Lisianski: 2015 and 2016; Howland and Baker: 2015 and 2017; Jarvis: 2015, 2016, and 2017) are shown with individual boxplots for each year.



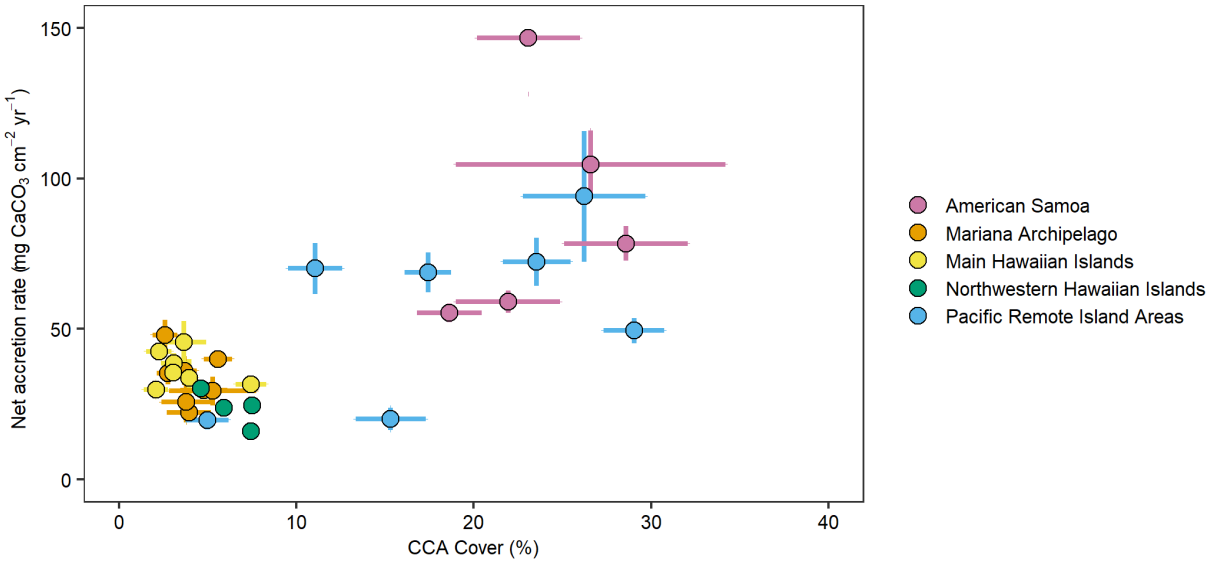
Supplementary Figure 11. Benthic community responses observed across a Pacific-wide gradient in Ω_{ar} during the first (2010–2012; **A,C,E,G**), and last (2016–2019; **B,D,F,H**) sampling period for each island. Mean (± standard error) percent cover of (**A**,**B**) hard coral; (**C,D**) crustose coralline algae (CCA); (**E,F**) turf; and (**G,H**) macroalgae plotted against the mean (± standard error) Ω_{ar}. Gray lines show significant (solid; $p \leq 0.05$) and non-significant (dashed; $p > 0.05$) beta regression model fit for all data, and black lines show significant (solid; $p \leq 0.05$) and non-significant (dashed; $p > 0.05$) beta regression model fit with equatorial and near-equatorial Pacific Remote Island Areas (triangles) removed. Data from the Northwestern Hawaiian Islands are not available for 2010–2012 (**A,C,E,G**).



Supplementary Figure 12. Carbonate net accretion rates (shown on log-scale) measured from Calcification Accretion Units (CAUs) recovered from 31 Pacific islands and atolls during three sampling periods (2012–2014, 2015–2017, and 2018–2019, n = 1446). CAUs were deployed on the reef for 2–3 years prior to recovery. Accretion rates are estimated by determining the total weight of carbonate material accreted to the plates during the deployment period. Mean data for each site within an island and sampling period are shown (1–5 CAUs per site, 1–16 sites per island/year). CAUs were not recovered for islands missing data during a sampling period ("n.d." = no data).



Supplementary Figure 13. Images of CAU plates collected from (A) a higher accretion rate site (Swains, American Samoa) and (B) a lower accretion rate site (Lisianski, Northwestern Hawaiian Islands).



Supplementary Figure 14. 2010–2019 island-mean (± standard error) crustose coralline algae (CCA) percent cover plotted against net calcium carbonate accretion rates measured from Calcification Accretion Units (CAUs).

Supplementary Table 1. Summary of sample years, mean (standard deviation) temperature, salinity, total alkalinity (TA), dissolved inorganic carbon (DIC), pH, Ω_{ar}, and number of samples collected for the islands of American Samoa.

Island	Year	Temp (ºC)	Salinity (psu)	TA (µmol kg^{-1})	DIC (µmol kg^{-1})	pH (total scale)	Ω_{ar}	n
Ofu and Olosega	2010	29.45 (0.22)	35.58 (0.08)	2330.51 (12.50)	1980.24 (16.69)	8.05 (0.01)	4.00 (0.11)	18
	2012	29.56 (0.15)	35.37 (0.03)	2315.29 (7.10)	1950.93 (12.95)	8.07 (0.01)	4.15 (0.10)	21
	2015	30.09 (0.16)	34.57 (0.12)	2267.59 (6.88)	1932.32 (7.96)	8.04 (0.02)	3.87 (0.13)	17
	2018	28.25 (0.11)	35.20 (0.11)	2308.86 (9.15)	1958.61 (14.69)	8.07 (0.02)	3.98 (0.13)	17
Rose	2010	29.86 (0.32)	35.80 (0.07)	2349.36 (6.88)	1988.95 (9.20)	8.05 (0.01)	4.12 (0.09)	20
	2012	29.50 (0.15)	35.45 (0.02)	2326.61 (6.25)	1968.67 (13.04)	8.06 (0.01)	4.09 (0.09)	20
	2015	30.04 (0.14)	34.53 (0.03)	2268.26 (7.11)	1929.05 (9.87)	8.05 (0.01)	3.91 (0.09)	14
	2018	27.84 (0.08)	35.48 (0.06)	2338.08 (5.08)	1983.22 (1.75)	8.08 (0.01)	4.02 (0.05)	12
Swains	2010	29.42 (0.25)	35.38 (0.03)	2320.63 (3.55)	1973.21 (9.61)	8.05 (0.01)	3.98 (0.12)	12
	2012	29.18 (0.11)	35.46 (0.02)	2335.37 (3.14)	1972.48 (4.30)	8.07 (0.01)	4.14 (0.05)	10
	2015	30.09 (0.16)	34.45 (0.13)	2265.44 (3.45)	1921.67 (4.95)	8.05 (0.01)	3.96 (0.06)	12
	2018	29.47 (0.21)	35.01 (0.07)	2300.70 (5.74)	1952.55 (6.85)	8.06 (0.01)	3.99 (0.05)	11
Ta‘ū	2010	29.46 (0.13)	35.54 (0.17)	2336.12 (11.20)	1984.62 (14.26)	8.05 (0.02)	4.02 (0.12)	16
	2012	29.51 (0.18)	35.32 (0.03)	2317.95 (5.12)	1961.21 (10.94)	8.06 (0.01)	4.08 (0.07)	14
	2015	30.02 (0.06)	34.53 (0.12)	2269.98 (4.76)	1935.78 (18.04)	8.04 (0.03)	3.86 (0.16)	14
	2018	28.17 (0.19)	35.28 (0.07)	2320.85 (7.72)	1973.40 (15.29)	8.07 (0.02)	3.95 (0.11)	8
Tutuila	2010	29.10 (0.24)	35.33 (0.22)	2312.39 (14.41)	1973.48 (16.50)	8.04 (0.02)	3.88 (0.12)	24
	2012	29.12 (0.35)	35.39 (0.09)	2316.20 (15.33)	1967.29 (19.64)	8.06 (0.02)	3.98 (0.15)	26
	2015	29.83 (0.28)	34.75 (0.13)	2277.58 (9.38)	1942.37 (9.50)	8.04 (0.01)	3.86 (0.09)	40
	2018	28.25 (0.40)	34.95 (0.22)	2292.53 (13.45)	1959.73 (10.30)	8.05 (0.01)	3.80 (0.12)	30

Supplementary Table 2. Summary of sample years, mean (standard deviation) temperature, salinity, total alkalinity (TA), dissolved inorganic carbon (DIC), pH, Ω_{ar}, and number of samples collected for the islands of the Mariana Archipelago.

Island	Year	Temp (ºC)	Salinity (psu)	TA (µmol kg^{-1})	DIC (µmol kg^{-1})	pH (total scale)	Ω_{ar}	n
Agrihan	2011	27.44 (0.16)	34.63 (0.21)	2271.77 (15.99)	1945.92 (15.85)	8.06 (0.02)	3.70 (0.15)	12
	2017	29.16 (0.09)	34.66 (0.06)	2278.90 (4.06)	1950.10 (8.14)	8.04 (0.01)	3.78 (0.08)	6
Aguijan	2014	28.10	34.67	2274.00	1945.40	8.05	3.74	1
	2017	29.06 (0.02)	34.46 (0.00)	2263.35 (0.49)	1932.55 (2.76)	8.05 (0.01)	3.80 (0.03)	2
Alamagan	2014	27.99	34.96	2293.00	1955.00	8.06	3.84	1
Asuncion	2011	26.11 (0.27)	34.93 (0.02)	2288.22 (2.04)	1956.28 (4.76)	8.08 (0.01)	3.73 (0.05)	6
	2014	25.72 (0.22)	35.13 (0.02)	2302.29 (3.02)	1978.73 (2.29)	8.07 (0.01)	3.63 (0.04)	7
	2017	30.18 (0.26)	34.71 (0.04)	2282.20 (2.23)	1955.10 (4.39)	8.02 (0.00)	3.79 (0.03)	5
Farallón de Pájaros	2014	26.18	35.10	2298.10	1976.00	8.06	3.63	1
Guam	2011	29.23 (0.08)	34.45 (0.04)	2252.87 (8.83)	1924.64 (8.49)	8.04 (0.01)	3.77 (0.11)	10
	2014	28.03 (0.15)	34.64 (0.10)	2269.18 (8.73)	1941.97 (11.27)	8.05 (0.02)	3.73 (0.10)	24
	2017	29.20 (0.10)	34.21 (0.11)	2237.29 (14.56)	1913.41 (23.97)	8.04 (0.02)	3.72 (0.12)	16
Guguan	2014	28.77	34.65	2263.00	1943.10	8.03	3.67	1
	2017	29.07 (0.03)	34.63 (0.00)	2277.60 (0.28)	1945.40 (0.85)	8.05 (0.00)	3.81 (0.01)	2
Maug	2011	27.14 (0.18)	34.86 (0.08)	2284.01 (7.54)	1956.67 (22.29)	8.06 (0.03)	3.71 (0.18)	12
	2014	25.54 (0.64)	35.01 (0.36)	2301.38 (4.38)	1981.23 (10.95)	8.07 (0.02)	3.60 (0.11)	17
	2017	30.32 (0.45)	34.59 (0.31)	2278.24 (2.28)	1952.84 (18.69)	8.02 (0.03)	3.78 (0.18)	14
Pagan	2011	27.12 (0.21)	34.75 (0.03)	2276.71 (5.62)	1936.22 (9.98)	8.09 (0.01)	3.85 (0.06)	10
	2014	28.48 (0.33)	34.73 (0.12)	2279.09 (7.88)	1947.01 (7.99)	8.05 (0.01)	3.79 (0.06)	21
	2017	29.61 (0.32)	34.64 (0.12)	2277.17 (4.21)	1948.32 (4.80)	8.03 (0.01)	3.79 (0.07)	11
Rota	2011	29.13 (0.15)	34.50 (0.05)	2263.19 (4.08)	1928.96 (7.21)	8.05 (0.01)	3.84 (0.06)	8
	2014	28.06 (0.18)	34.72 (0.14)	2279.03 (7.37)	1948.95 (11.00)	8.06 (0.01)	3.76 (0.08)	6
	2017	28.97 (0.09)	34.24 (0.09)	2241.44 (12.37)	1926.19 (11.09)	8.03 (0.02)	3.63 (0.16)	9
Saipan	2011	28.28 (0.27)	34.82 (0.05)	2278.30 (8.41)	1939.52 (17.90)	8.07 (0.02)	3.86 (0.14)	10
	2014	28.30 (0.13)	34.49 (0.18)	2259.45 (11.16)	1936.44 (11.97)	8.05 (0.02)	3.69 (0.16)	16
	2017	29.27 (0.55)	34.41 (0.13)	2255.48 (9.79)	1924.70 (9.92)	8.05 (0.01)	3.80 (0.05)	12
Sarigan	2014	28.51 (0.07)	34.49 (0.02)	2261.65 (1.91)	1934.85 (6.86)	8.05 (0.01)	3.74 (0.05)	2
Tinian	2011	28.72 (0.47)	34.59 (0.18)	2262.18 (12.15)	1929.07 (13.07)	8.06 (0.01)	3.81 (0.09)	10
	2014	28.35 (0.12)	34.35 (0.15)	2246.90 (5.43)	1922.18 (9.24)	8.05 (0.01)	3.71 (0.07)	6
	2017	28.87 (0.18)	34.47 (0.09)	2265.80 (4.25)	1937.39 (1.90)	8.05 (0.01)	3.77 (0.05)	8

Supplementary Table 3. Summary of sample years, mean (standard deviation) temperature, salinity, total alkalinity (TA), dissolved inorganic carbon (DIC), pH, Ω_{ar}, and number of samples collected for the main Hawaiian Islands.

Island	Year	Temp (ºC)	Salinity (psu)	TA (µmol kg^{-1})	DIC (µmol kg^{-1})	pH (total scale)	Ω_{ar}	n
Hawai‘i	2010	25.99 (0.47)	35.06 (0.12)	2292.09 (10.83)	1986.35 (11.15)	8.04 (0.01)	3.46 (0.08)	26
	2013	25.92 (0.75)	34.94 (0.19)	2295.68 (19.91)	1990.37 (17.71)	8.04 (0.02)	3.46 (0.17)	31
	2016	27.45 (0.40)	34.54 (0.39)	2277.97 (10.70)	1966.26 (9.24)	8.04 (0.01)	3.57 (0.09)	25
	2019	27.75 (0.92)	34.01 (0.68)	2249.93 (29.94)	1955.53 (28.10)	8.02 (0.03)	3.40 (0.15)	59
Kaho‘olawe	2016	27.14 (0.21)	34.74 (0.02)	2280.45 (11.33)	1976.73 (7.82)	8.03 (0.03)	3.47 (0.20)	6
	2019	25.41 (0.23)	34.39 (0.09)	2261.26 (7.66)	1963.70 (7.84)	8.05 (0.01)	3.37 (0.06)	14
Kaua‘i	2010	25.82 (0.19)	35.19 (0.06)	2298.86 (3.79)	1993.81 (11.31)	8.04 (0.02)	3.45 (0.12)	10
	2013	26.74 (0.39)	35.29 (0.27)	2318.51 (7.71)	2010.72 (6.68)	8.03 (0.02)	3.50 (0.15)	10
	2016	26.51 (0.41)	34.91 (0.07)	2296.94 (3.51)	1987.83 (7.00)	8.04 (0.02)	3.51 (0.07)	12
	2019	27.73 (0.47)	34.60 (0.14)	2277.54 (10.22)	1968.17 (13.63)	8.03 (0.02)	3.55 (0.14)	12
Lāna‘i	2010	26.32 (0.45)	35.18 (0.03)	2295.51 (7.10)	1992.24 (5.76)	8.03 (0.01)	3.44 (0.10)	8
	2013	26.59 (0.43)	35.15 (0.09)	2302.60 (6.65)	1993.94 (6.78)	8.03 (0.01)	3.50 (0.09)	8
	2016	26.77 (0.71)	34.87 (0.06)	2293.90 (6.00)	1984.36 (6.61)	8.04 (0.01)	3.52 (0.11)	9
	2019	27.46 (0.84)	34.60 (0.08)	2268.00 (9.72)	1964.46 (12.56)	8.02 (0.02)	3.48 (0.18)	21
Maui	2010	25.72 (0.44)	35.14 (0.06)	2297.28 (8.21)	2000.10 (11.35)	8.03 (0.02)	3.36 (0.15)	18
	2013	26.08 (0.68)	35.23 (0.06)	2310.97 (5.03)	2003.17 (5.65)	8.04 (0.01)	3.48 (0.06)	7
	2016	26.77 (0.61)	34.70 (0.21)	2275.29 (27.47)	1972.24 (26.30)	8.03 (0.01)	3.45 (0.07)	8
	2019	26.37 (1.78)	34.49 (0.14)	2268.96 (10.25)	1973.04 (13.81)	8.03 (0.03)	3.38 (0.15)	40
Moloka‘i	2010	25.78 (0.38)	35.16 (0.05)	2298.66 (7.20)	1995.53 (5.48)	8.04 (0.02)	3.43 (0.12)	12
	2013	26.21 (0.60)	35.26 (0.04)	2304.81 (26.91)	2002.92 (17.05)	8.03 (0.02)	3.42 (0.13)	13
	2016	26.23 (0.35)	34.86 (0.07)	2290.03 (5.74)	1984.13 (6.13)	8.04 (0.01)	3.47 (0.09)	12
	2019	24.99 (0.47)	34.52 (0.11)	2267.29 (11.50)	1976.43 (8.47)	8.04 (0.01)	3.29 (0.07)	28
Ni‘ihau	2010	26.25 (0.04)	35.26 (0.02)	2307.12 (5.18)	1995.62 (4.77)	8.04 (0.01)	3.52 (0.06)	6
	2013	27.29 (0.15)	35.28 (0.15)	2312.09 (5.83)	1998.04 (5.91)	8.03 (0.01)	3.57 (0.07)	8
	2016	26.92 (0.27)	34.93 (0.02)	2298.93 (1.91)	1985.58 (3.49)	8.04 (0.01)	3.57 (0.02)	6
	2019	27.54 (0.10)	34.72 (0.01)	2286.95 (2.59)	1967.86 (6.39)	8.05 (0.01)	3.65 (0.05)	12
O‘ahu	2010	26.11 (0.21)	35.26 (0.05)	2313.31 (2.40)	2000.85 (2.93)	8.04 (0.01)	3.53 (0.02)	8
	2013	26.79 (0.42)	35.22 (0.11)	2304.80 (25.81)	1991.82 (14.39)	8.04 (0.03)	3.55 (0.20)	28
	2016	27.26 (0.28)	34.79 (0.14)	2290.55 (11.16)	1982.20 (6.31)	8.03 (0.01)	3.52 (0.10)	25
	2019	27.38 (0.67)	34.62 (0.09)	2274.81 (17.76)	1969.77 (21.55)	8.03 (0.01)	3.49 (0.13)	37

Supplementary Table 4. Summary of sample years, mean (standard deviation) temperature, salinity, total alkalinity (TA), dissolved inorganic carbon (DIC), pH, Ω_{ar}, and number of samples collected for the Northwestern Hawaiian Islands.

Island	Year	Temp (ºC)	Salinity (psu)	TA (µmol kg^{-1})	DIC (µmol kg^{-1})	pH (total scale)	Ω_{ar}	n
French Frigate Shoals	2010	26.30 (0.31)	35.71 (0.06)	2321.79 (18.90)	2012.66 (5.01)	8.03 (0.03)	3.49 (0.16)	10
	2013	27.84 (0.47)	35.47 (0.07)	2311.23 (15.91)	1997.02 (8.12)	8.02 (0.02)	3.58 (0.12)	18
	2015	27.34 (0.15)	34.77 (0.74)	2305.95 (1.77)	2007.85 (7.14)	8.01 (0.02)	3.43 (0.13)	2
	2016	28.00 (0.22)	35.04 (0.20)	2297.81 (9.24)	1981.36 (6.74)	8.03 (0.02)	3.62 (0.13)	19
	2019	28.37 (0.27)	35.04 (0.08)	2300.02 (8.86)	1982.48 (11.06)	8.02 (0.01)	3.64 (0.08)	19
Kure	2010	27.62 (0.28)	35.57 (0.02)	2324.16 (4.02)	2007.24 (6.16)	8.02 (0.01)	3.61 (0.10)	12
	2013	25.98 (0.94)	35.26 (0.19)	2319.12 (5.43)	2013.66 (6.76)	8.03 (0.01)	3.46 (0.13)	13
	2016	26.95 (0.51)	34.80 (0.71)	2306.04 (4.36)	2007.44 (5.80)	8.02 (0.01)	3.43 (0.09)	17
	2019	29.20 (0.35)	35.52 (0.03)	2319.57 (61.80)	2003.55 (14.18)	7.99 (0.13)	3.66 (0.63)	19
Lisianski	2010	27.78 (0.23)	35.90 (0.11)	2179.44 (32.59)	1958.41 (24.32)	7.86 (0.03)	2.55 (0.16)	10
	2013	28.47 (0.36)	35.52 (0.25)	2249.09 (40.24)	1986.00 (11.97)	7.93 (0.05)	3.04 (0.32)	15
	2015	28.13 (0.33)	35.50 (0.24)	2261.07 (22.84)	1993.70 (19.21)	7.94 (0.03)	3.08 (0.20)	10
	2016	27.91 (0.15)	35.21 (0.19)	2220.75 (42.45)	1964.92 (25.67)	7.93 (0.03)	2.95 (0.21)	17
	2019	28.87 (0.49)	35.52 (0.11)	2242.81 (42.19)	1978.85 (31.05)	7.93 (0.03)	3.05 (0.17)	22
Pearl and Hermes	2010	27.60 (0.24)	35.73 (0.03)	2315.42 (28.54)	2013.58 (8.90)	8.00 (0.04)	3.44 (0.28)	10
	2013	27.49 (0.34)	35.46 (0.11)	2323.90 (11.52)	2004.36 (4.21)	8.03 (0.02)	3.64 (0.12)	16
	2015	27.41 (0.66)	35.59 (0.09)	2325.20 (21.42)	2023.02 (19.22)	8.00 (0.06)	3.45 (0.37)	6
	2016	26.82 (0.55)	35.08 (0.47)	2301.04 (14.80)	2002.59 (8.24)	8.01 (0.02)	3.41 (0.15)	21
	2019	29.29 (0.45)	35.45 (0.05)	2313.30 (20.72)	2001.03 (15.51)	7.99 (0.02)	3.60 (0.13)	12

Supplementary Table 5. Summary of sample years, mean (standard deviation) temperature, salinity, total alkalinity (TA), dissolved inorganic carbon (DIC), pH, Ω_{ar}, and number of samples collected for the Pacific Remote Island Areas.

Island	Year	Temp (ºC)	Salinity (psu)	TA (µmol kg^{-1})	DIC (µmol kg^{-1})	pH (total scale)	Ω_{ar}	n
Baker	2010	29.85 (0.08)	34.26 (0.08)	2245.54 (6.14)	1907.16 (5.10)	8.05 (0.01)	3.90 (0.05)	8
	2012	27.36 (0.30)	35.25 (0.03)	2309.34 (16.65)	2004.24 (27.70)	8.01 (0.02)	3.48 (0.13)	10
	2015	28.75 (0.20)	35.36 (0.02)	2316.20 (8.85)	2010.90 (9.14)	7.99 (0.01)	3.52 (0.09)	10
	2017	27.86 (0.19)	35.04 (0.05)	2285.77 (24.83)	2016.88 (15.17)	7.95 (0.05)	3.12 (0.31)	6
	2018	29.06 (0.04)	35.35 (0.07)	2290.70 (24.41)	1977.35 (29.67)	8.00 (0.01)	3.60 (0.05)	4
Howland	2010	29.85 (0.12)	34.26 (0.03)	2250.37 (3.12)	1911.39 (6.73)	8.05 (0.01)	3.91 (0.06)	10
	2012	27.42 (0.22)	35.20 (0.02)	2312.41 (3.46)	2002.80 (8.90)	8.02 (0.01)	3.54 (0.06)	10
	2015	28.76 (0.26)	35.33 (0.04)	2320.88 (4.29)	2015.18 (6.20)	7.99 (0.01)	3.53 (0.11)	9
	2017	27.87 (0.12)	35.06 (0.00)	2302.95 (3.40)	2018.25 (8.43)	7.98 (0.01)	3.29 (0.09)	6
	2018	28.52 (0.08)	35.05 (0.46)	2315.62 (4.28)	2006.54 (9.02)	8.01 (0.01)	3.57 (0.07)	5
Jarvis	2010	28.55 (0.25)	35.46 (0.02)	2322.94 (6.66)	2015.27 (12.19)	8.00 (0.02)	3.54 (0.13)	12
	2012	26.38 (0.54)	35.41 (0.05)	2324.45 (5.98)	2042.77 (24.59)	7.98 (0.03)	3.23 (0.23)	20
	2015	28.26 (0.36)	35.27 (0.14)	2318.97 (5.63)	2036.11 (40.01)	7.96 (0.07)	3.29 (0.36)	16
	2016	27.02 (1.71)	34.70 (1.30)	2320.66 (3.79)	2036.32 (24.70)	7.99 (0.03)	3.30 (0.30)	14
	2017	26.73 (0.16)	35.02 (0.20)	2304.87 (9.78)	2032.64 (13.73)	7.97 (0.02)	3.14 (0.13)	10
	2018	28.00 (0.10)	35.25 (0.10)	2312.22 (8.71)	2016.65 (12.51)	7.99 (0.01)	3.41 (0.08)	21
Johnston	2010	26.03 (0.20)	35.09 (0.06)	2291.84 (20.73)	1981.64 (12.46)	8.05 (0.02)	3.50 (0.12)	8
	2012	25.86 (0.30)	34.86 (0.04)	2258.15 (19.30)	1961.07 (19.95)	8.04 (0.02)	3.35 (0.15)	10
	2015	25.72 (0.16)	35.02 (0.10)	2294.78 (14.40)	1989.49 (7.19)	8.04 (0.03)	3.45 (0.20)	10
Kingman	2010	28.05 (0.07)	34.82 (0.01)	2272.03 (9.12)	1962.29 (8.65)	8.02 (0.02)	3.54 (0.12)	20
	2012	27.29 (0.13)	34.99 (0.01)	2285.61 (12.84)	1989.22 (6.99)	8.01 (0.01)	3.39 (0.11)	16
	2015	28.92 (0.09)	34.48 (0.15)	2271.90 (26.50)	1942.47 (4.53)	8.05 (0.04)	3.79 (0.31)	17
	2018	29.42 (0.14)	34.15 (0.09)	2238.91 (6.78)	1920.74 (4.89)	8.03 (0.01)	3.68 (0.05)	12
Palmyra	2010	28.17 (0.13)	34.91 (0.06)	2280.26 (14.30)	1972.97 (17.12)	8.01 (0.02)	3.52 (0.14)	20
	2012	27.29 (0.06)	34.98 (0.01)	2292.70 (12.04)	1992.20 (5.68)	8.01 (0.01)	3.44 (0.10)	16
	2015	29.04 (0.15)	34.75 (0.10)	2280.78 (9.63)	1960.73 (6.89)	8.02 (0.02)	3.68 (0.14)	19
	2018	29.38 (0.19)	34.22 (0.12)	2239.74 (21.93)	1910.78 (41.80)	8.05 (0.04)	3.79 (0.26)	18
Wake	2011	26.38 (0.29)	35.22 (0.04)	2309.89 (4.82)	1972.52 (7.27)	8.08 (0.01)	3.80 (0.10)	10
	2014	25.97 (0.11)	35.30 (0.05)	2313.44 (8.68)	1981.12 (4.74)	8.08 (0.01)	3.73 (0.08)	19
	2017	27.48 (0.28)	34.93 (0.13)	2295.30 (10.58)	1965.20 (13.26)	8.06 (0.01)	3.75 (0.09)	13

Supplementary Table 6. Summary of mean (standard error) percent cover of coral, crustose coralline algae (CCA), turf, and macroalgae and number of benthic surveys conducted in American Samoa. Sampling years shown as ranges were pooled across the specified years to increase sample size.

Island	Year(s)	Coral	CCA	Turf	Macroalgae	n
Ofu and Olosega	2010	24.5 (1.8)	38.3 (2.7)	20.7 (3.3)	0.8 (0.3)	30
	2012	29.1 (2.6)	28.7 (2.5)	21.3 (2.8)	0.8 (0.2)	30
	2015-16	31.4 (1.5)	22.6 (1.2)	30.3 (1.9)	1.5 (0.2)	93
	2018	28.7 (1.9)	24.7 (1.8)	25.7 (2.1)	0.6 (0.1)	38
Rose	2010	5.6 (1.1)	22.2 (3.0)	55.5 (3.2)	1.9 (0.7)	33
	2012	8.4 (1.0)	30.0 (2.5)	41.0 (2.8)	3.5 (0.8)	48
	2015-16	11.3 (1.5)	15.9 (0.9)	44.5 (3.1)	1.3 (0.2)	136
	2018	11.3 (2.7)	24.3 (3.2)	53.3 (4.3)	1.0 (0.3)	33
Swains	2010	34.5 (4.5)	17.0 (3.4)	24.1 (3.4)	7.3 (2.1)	24
	2012	36.4 (4.3)	24.5 (2.6)	13.6 (2.2)	12.9 (1.7)	38
	2015-16	49.9 (2.4)	16.1 (1.3)	19.6 (1.4)	7.4 (1.1)	50
	2018	17.4 (2.5)	48.7 (5.6)	15.1 (2.0)	5.5 (1.3)	22
Ta‘ū	2010	25.0 (2.5)	28.5 (3.4)	21.6 (4.1)	0.2 (0.1)	24
	2012	24.0 (2.3)	25.1 (3.8)	32.2 (4.2)	1.0 (0.3)	22
	2015-16	32.4 (1.4)	15.6 (1.0)	39.1 (1.7)	0.6 (0.1)	117
	2018	32.4 (2.8)	18.6 (2.4)	30.5 (2.7)	0.4 (0.1)	38
Tutuila	2010	24.8 (1.3)	23.7 (1.2)	33.4 (1.8)	1.2 (0.2)	124
	2012	23.1 (2.1)	16.8 (1.6)	41.1 (2.2)	2.2 (0.4)	79
	2015-16	24.7 (1.1)	15.2 (0.7)	42.3 (1.4)	3.5 (0.4)	321
	2018	23.4 (1.9)	18.8 (1.5)	28.2 (2.3)	1.6 (0.6)	101

Supplementary Table 7. Summary of mean (standard error) percent cover of coral, crustose coralline algae (CCA), turf, and macroalgae and number of benthic surveys conducted in the Mariana Archipelago.

Island	Year	Coral	CCA	Turf	Macroalgae	n
Agrihan	2011	13.3 (2.8)	2.7 (0.6)	70.5 (3.1)	3.2 (0.8)	20
	2017	7.3 (1.8)	5.2 (1.1)	69.6 (2.0)	3.6 (0.9)	26
Aguijan	2011	19.4 (2.7)	3.0 (0.8)	72.1 (2.2)	2.3 (0.7)	13
	2014	13.5 (3.0)	4.2 (1.9)	70.6 (5.4)	3.0 (1.0)	16
	2017	17.6 (2.4)	7.9 (1.4)	49.2 (3.2)	8.9 (2.2)	27
Alamagan	2011	24.7 (6.7)	1.3 (0.5)	68.2 (8.0)	0.4 (0.1)	5
	2014	11.1 (3.2)	2.2 (0.5)	77.1 (3.9)	2.6 (1.4)	17
	2017	9.2 (2.1)	3.8 (0.6)	66.8 (5.0)	2.5 (0.8)	13
Asuncion	2011	12.1 (2.2)	3.3 (0.8)	61.2 (3.0)	5.5 (1.3)	20
	2014	18.0 (1.9)	1.7 (0.4)	64.7 (2.2)	2.1 (0.9)	33
	2017	6.6 (0.8)	6.5 (1.1)	60.4 (2.9)	3.4 (0.8)	31
Farallón de Pájaros	2011	11.0 (2.4)	1.6 (0.2)	75.2 (3.8)	0.1 (0.0)	12
	2014	5.9 (1.6)	0.7 (0.2)	82.3 (2.7)	0.3 (0.1)	18
	2017	3.3 (0.7)	1.8 (0.4)	83.4 (2.1)	0.2 (0.1)	27
Guam	2011	14.3 (1.0)	6.8 (0.7)	58.8 (1.6)	8.6 (1.3)	132
	2014	13.0 (1.3)	4.1 (0.4)	64.3 (1.6)	12.4 (1.6)	106
	2017	11.6 (1.2)	5.9 (0.5)	60.6 (1.5)	7.5 (0.9)	97
Guguan	2011	18.2 (1.3)	7.6 (0.9)	53.5 (3.2)	0.7 (0.3)	10
	2014	13.2 (2.8)	7.7 (2.1)	64.7 (3.4)	1.6 (0.4)	16
	2017	11.3 (1.9)	6.6 (1.7)	65.4 (3.6)	1.4 (0.2)	12
Maug	2011	30.5 (3.2)	3.0 (0.4)	56.4 (3.3)	2.3 (0.4)	30
	2014	28.0 (1.5)	4.0 (0.6)	51.5 (2.0)	3.7 (0.7)	59
	2017	7.3 (0.8)	7.4 (0.7)	58.3 (1.4)	2.1 (0.4)	64
Pagan	2011	12.6 (2.8)	4.0 (0.6)	71.5 (2.8)	3.7 (0.6)	28
	2014	11.3 (1.3)	2.3 (0.3)	65.9 (2.3)	8.1 (1.1)	61
	2017	9.4 (1.0)	4.7 (0.5)	64.7 (1.7)	3.4 (0.7)	59
Rota	2011	14.9 (4.7)	1.7 (0.4)	74.4 (4.8)	4.4 (1.1)	24
	2014	7.3 (1.5)	4.1 (1.1)	75.3 (3.1)	5.7 (1.0)	37
	2017	9.1 (2.6)	10.0 (2.2)	62.8 (3.9)	5.3 (2.8)	41
Saipan	2011	10.5 (1.6)	1.5 (0.3)	79.7 (2.3)	2.0 (0.4)	29
	2014	13.9 (1.0)	3.6 (0.5)	70.9 (1.7)	6.1 (0.9)	69
	2017	14.6 (1.2)	3.1 (0.4)	62.4 (1.6)	4.1 (0.5)	58
Sarigan	2011	10.5 (2.0)	1.7 (0.6)	69.2 (2.4)	1.1 (0.3)	9
	2014	6.0 (1.0)	3.5 (0.8)	74.5 (1.8)	3.7 (0.7)	16
	2017	5.4 (1.6)	3.2 (1.0)	71.2 (3.7)	1.1 (0.2)	14
Tinian	2011	13.8 (3.1)	1.5 (0.4)	75.7 (3.4)	3.0 (0.8)	19
	2014	12.9 (1.8)	2.5 (0.7)	71.8 (2.9)	5.4 (1.0)	26
	2017	10.4 (1.3)	3.9 (0.5)	62.5 (2.6)	6.4 (1.0)	38

Supplementary Table 8. Summary of mean (standard error) percent cover of coral, crustose coralline algae (CCA), turf, and macroalgae and number of benthic surveys conducted in the main Hawaiian Islands. Sampling years shown as ranges were pooled across the specified years to increase sample size.

Island	Year(s)	Coral	CCA	Turf	Macroalgae	n
Hawai‘i	2010-12	17.7 (1.8)	9.5 (0.8)	56.0 (2.0)	3.0 (0.7)	42
	2013-15	18.1 (1.0)	7.8 (0.7)	64.5 (1.3)	0.7 (0.1)	179
	2016	13.6 (1.2)	7.0 (0.5)	65.7 (1.7)	0.6 (0.1)	90
	2019	8.3 (0.7)	5.4 (0.4)	69.3 (1.4)	0.6 (0.1)	120
Kaho‘olawe	2016	18.9 (2.2)	2.5 (0.4)	60.3 (2.0)	2.2 (0.4)	35
	2019	16.0 (2.2)	2.3 (0.7)	62.1 (4.0)	1.2 (0.2)	30
Kaua‘i	2010-12	6.8 (1.4)	7.3 (1.0)	69.4 (2.3)	5.6 (1.3)	24
	2013-15	5.2 (0.6)	2.0 (0.3)	84.2 (1.4)	1.6 (0.3)	70
	2016	2.4 (0.4)	3.6 (0.6)	80.2 (2.1)	2.4 (0.5)	47
	2019	2.6 (0.5)	1.7 (0.3)	80.4 (1.7)	2.0 (1.3)	37
Lāna‘i	2010-12	23.1 (5.9)	4.0 (0.5)	61.6 (4.8)	5.4 (1.9)	43
	2013-15	15.0 (1.7)	2.0 (0.3)	69.1 (2.6)	6.6 (2.0)	58
	2016	23.6 (3.7)	1.0 (0.2)	68.4 (3.6)	0.8 (0.4)	41
	2019	27.9 (3.0)	1.4 (0.3)	57.0 (3.9)	0.9 (0.2)	45
Maui	2010-12	14.7 (1.5)	5.2 (0.6)	64.7 (1.8)	4.7 (0.9)	77
	2013-15	21.8 (1.7)	3.5 (0.4)	64.7 (1.6)	2.7 (0.4)	69
	2016	14.4 (1.4)	3.2 (0.5)	67.1 (2.4)	1.5 (0.4)	43
	2019	12.9 (1.6)	4.0 (0.6)	61.6 (2.0)	1.6 (0.2)	70
Moloka‘i	2010-12	23.5 (3.5)	2.4 (0.4)	62.5 (2.6)	2.7 (0.5)	60
	2013-15	17.3 (2.1)	2.2 (0.4)	69.8 (2.2)	2.1 (0.3)	107
	2016	18.9 (5.3)	2.4 (0.9)	66.0 (4.9)	1.5 (0.2)	33
	2019	11.8 (2.0)	5.3 (1.1)	63.6 (2.7)	3.8 (1.0)	60
Ni‘ihau	2010-12	1.1 (0.3)	4.4 (0.5)	75.2 (3.5)	7.2 (2.3)	15
	2013-15	1.9 (0.3)	1.8 (0.3)	88.4 (1.1)	2.3 (0.7)	91
	2016	1.0 (0.4)	1.5 (0.6)	88.2 (1.4)	2.2 (0.4)	17
	2019	0.8 (0.3)	1.3 (0.3)	83.5 (2.9)	2.8 (2.5)	24
O‘ahu	2010-12	7.7 (0.9)	3.9 (0.7)	69.5 (1.6)	6.8 (1.2)	73
	2013-15	9.2 (0.9)	1.6 (0.2)	75.0 (1.4)	4.8 (0.9)	128
	2016	9.6 (1.2)	4.0 (0.6)	65.0 (2.3)	2.4 (0.3)	86
	2019	7.4 (1.4)	2.7 (0.8)	70.3 (3.5)	1.4 (0.3)	93

Supplementary Table 9. Summary of mean (standard error) percent cover of coral, crustose coralline algae (CCA), turf, and macroalgae and number of benthic surveys conducted in the Northwestern Hawaiian Islands.

Island	Year	Coral	CCA	Turf	Macroalgae	n
French Frigate Shoals	2016	26.3 (3.6)	4.6 (0.7)	54.0 (3.5)	1.3 (0.5)	73
Kure	2016	5.4 (0.7)	5.9 (0.6)	71.0 (1.6)	7.4 (1.4)	58
Lisianski	2016	17.9 (1.7)	7.5 (0.8)	51.7 (1.7)	1.6 (0.4)	56
Pearl & Hermes	2016	1.9 (0.4)	7.5 (1.2)	53.7 (3.6)	19.0 (4.8)	75

Supplementary Table 10. Summary of mean (standard error) percent cover of coral, crustose coralline algae (CCA), turf, and macroalgae and number of benthic surveys conducted in the Pacific Remote Island Areas.

Island	Year	Coral	CCA	Turf	Macroalgae	n
Baker	2012	27.3 (5.9)	19.0 (4.2)	32.5 (9.4)	1.5 (0.6)	23
	2015	27.7 (2.7)	27.3 (2.2)	26.5 (2.9)	0.9 (0.2)	51
	2017	21.1 (3.3)	21.9 (3.0)	28.8 (4.8)	2.0 (0.9)	22
	2018	23.6 (3.1)	26.0 (3.2)	23.3 (4.5)	0.8 (0.2)	23
Howland	2012	39.4 (4.0)	25.4 (2.6)	19.6 (2.3)	0.7 (0.2)	36
	2015	24.4 (1.9)	30.0 (1.9)	25.6 (2.4)	0.8 (0.2)	55
	2017	24.1 (4.4)	33.4 (4.4)	20.7 (3.5)	2.0 (0.6)	20
	2018	23.8 (2.5)	27.4 (2.0)	25.8 (2.7)	0.9 (0.4)	21
Jarvis	2012	17.8 (2.2)	23.8 (2.9)	29.1 (2.9)	1.3 (0.2)	42
	2015	18.1 (1.3)	27.0 (1.8)	27.0 (1.7)	4.2 (0.6)	101
	2016	0.3 (0.1)	18.2 (1.7)	24.6 (2.4)	7.4 (0.9)	60
	2017	0.8 (0.3)	23.3 (2.8)	37.8 (2.9)	8.5 (1.6)	60
	2018	0.6 (0.2)	38.8 (2.5)	24.7 (2.0)	2.1 (1.0)	67
Johnston	2012	7.9 (1.1)	13.3 (2.2)	60.6 (3.9)	2.8 (1.1)	34
	2015	9.5 (1.1)	17.3 (2.1)	57.6 (2.5)	1.2 (0.3)	46
Kingman	2012	30.1 (2.4)	8.1 (1.0)	28.4 (2.8)	1.2 (0.7)	49
	2015	31.8 (2.1)	11.8 (1.1)	30.9 (2.6)	0.3 (0.1)	73
	2018	25.8 (1.9)	13.2 (1.2)	33.7 (1.9)	0.1 (0.0)	68
Palmyra	2012	27.6 (2.5)	17.3 (1.8)	24.6 (2.4)	0.5 (0.1)	41
	2015	29.6 (1.4)	19.8 (1.1)	25.6 (1.7)	0.3 (0.0)	112
	2018	21.8 (1.6)	15.2 (1.1)	30.3 (2.1)	0.4 (0.1)	86
Wake	2014	29.5 (1.5)	6.2 (0.7)	49.6 (1.7)	4.1 (0.7)	65
	2017	25.6 (1.4)	3.8 (0.7)	53.4 (1.8)	6.5 (1.0)	81

Supplementary Table 11. Summary of regions, islands, and years of CAU recovery, with mean (standard deviation) calcification rate and number of units for each island and year. CAUs are recovered after a 2–3 year deployment on the reef.

Region	Island	Recovery Year	Calcification Rate (mg cm^{-2} yr^{-1})	n
American Samoa	Ofu and Olosega	2012	82.79 (30.87)	34
		2015	78.37 (29.61)	27
		2018	65.46 (18.60)	24
	Rose	2012	103.67 (60.44)	45
		2015	146.61 (119.55)	41
		2018	107.74 (69.11)	19
	Swains	2012	89.58 (38.28)	26
		2015	104.64 (42.16)	14
		2018	107.96 (41.49)	24
	Ta‘ū	2012	83.15 (22.40)	27
		2015	59.00 (15.86)	18
		2018	57.18 (19.65)	22
	Tutuila	2012	55.34 (19.50)	67
		2015	55.33 (21.35)	49
		2018	47.21 (19.11)	42
Mariana Archipelago	Agrihan	2017	22.21 (7.94)	19
	Asuncion	2014	44.74 (22.06)	19
		2017	25.64 (25.09)	14
	Guam	2014	43.00 (17.91)	18
		2017	40.00 (11.75)	18
	Maug	2014	21.79 (11.27)	28
		2017	29.67 (12.47)	24
	Pagan	2014	38.04 (10.45)	23
		2017	36.10 (21.84)	21
	Rota	2014	37.73 (10.61)	15
		2017	29.33 (14.40)	9
	Saipan	2014	39.38 (24.98)	24
		2017	35.26 (15.91)	19
	Tinian	2014	47.21 (16.44)	19
		2017	48.00 (19.05)	15
Main Hawaiian Islands	Hawai‘i	2016	31.63 (10.04)	38
		2019	35.00 (13.37)	30
	Kaua‘i	2016	45.60 (22.29)	10
		2019	59.00 (28.44)	8
	Lāna‘i	2016	29.86 (9.59)	14
		2019	32.50 (5.64)	14
	Maui	2016	33.75 (12.53)	4
		2019	27.00 (13.28)	13
	Moloka‘i	2016	38.57 (16.21)	23
		2019	37.47 (15.31)	19
	Ni‘ihau	2016	42.50 (3.85)	8

		2019	50.00 (25.93)	9
	O‘ahu	2016	35.44 (15.75)	34
		2019	41.32 (10.24)	19
Northwestern Hawaiian Islands	French Frigate Shoals	2013	26.21 (14.76)	29
		2016	30.22 (11.65)	18
		2019	32.00	1
	Kure	2013	15.20 (3.68)	20
		2016	23.78 (6.61)	9
		2019	22.88 (7.82)	16
	Lisianski	2013	19.65 (9.03)	26
		2016	24.64 (9.18)	25
		2019	30.35 (9.51)	17
	Pearl and Hermes	2013	14.62 (6.66)	24
		2016	15.94 (10.49)	17
		2019	17.30 (8.14)	10
Pacific Remote Island Areas	Baker	2012	73.63 (39.04)	19
		2015	72.30 (25.41)	10
		2018	43.14 (20.33)	14
	Howland	2012	72.67 (30.73)	24
		2015	49.41 (17.34)	17
		2018	49.23 (12.73)	13
	Jarvis	2012	61.00 (19.04)	5
		2015	94.00 (61.34)	8
		2018	32.00 (12.16)	14
	Johnston	2012	17.62 (12.39)	16
		2015	20.04 (18.63)	25
	Kingman	2012	79.07 (29.10)	27
		2015	70.07 (43.86)	27
		2018	64.62 (31.24)	24
	Palmyra	2012	74.96 (31.98)	27
		2015	68.78 (31.73)	23
		2018	65.59 (30.30)	29
	Wake	2014	16.13 (16.64)	23
		2017	19.72 (13.16)	18

Supplementary Table 12. Variance component analysis results for total variance in Ω_{ar} attributed to region, island nested within region, sampling period, sample depth, solar hour (time of day), and the interaction of sampling period of region and island. df = degrees of freedom, SS = sum of squares, MS = mean squares, SD = standard deviation, CV = coefficient of variation. Negative variance was set to 0 for sampling period.

	df	SS	MS	% Total	SD	CV (%)
Sampling Period	3	4.19	1.40	0.00	0.00	0.00
Depth	67	9.14	0.14	1.23	0.03	0.96
Solar Hour	19	3.55	0.19	0.39	0.02	0.54
Region	4	65.62	16.41	51.09	0.22	6.16
Island (within Region)	27	27.33	1.01	18.55	0.13	3.71
Sampling Period x Region	11	5.19	0.47	4.56	0.07	1.84
Sampling Period x Island (within Region)	69	7.62	0.11	7.37	0.08	2.34
Error	1551	25.19	0.02	16.80	0.13	3.53
Total	15.74			100.00	0.31	8.61

Supplementary Table 13. Beta regression model results for the relationship between Ω_{ar} and the cover of coral, crustose coralline algae (CCA), turf, and macroalgae. Models were constructed using island-mean Ω_{ar} and square-root transformed benthic cover proportion data for 1) all years (2010–2019), 2) the first sampling period for each island (2010–2012), and 3) the last sampling period for each island (2016–2019). In addition, each model was run with and without the equatorial and near-equatorial Pacific Remote Island Areas (eq. PRIA: Baker, Howland, Jarvis, Kingman, and Palmyra) excluded. Bolded p-values show results that are significant at the $p \leq 0.05$ level. See Figure 3 and Supplementary Figure 7.

Model Name	Year Range	Islands Excluded	Response Variable	Estimate	SE	z-value	p-value
All years, all islands	2010–2019	None	Coral	0.565	0.397	1.423	0.155
			CCA	0.631	0.446	1.416	0.157
			Turf	-0.519	0.467	-1.112	0.266
			Macroalgae	0.055	0.379	0.146	0.884
All years, no eq. PRIA	2010–2019	Baker Howland Jarvis Kingman Palmyra	Coral	0.637	0.384	1.659	0.097
			CCA	1.351	0.409	3.305	**0.001**
			Turf	-1.268	0.419	-3.027	**0.002**
			Macroalgae	0.022	0.377	0.058	0.954
First sampling period, all islands	2010–2012	French Frigate Shoals* Kaho‘olawe* Kure* Lisianski* Pearl and Hermes*	Coral	-0.295	0.475	-0.620	0.535
			CCA	-0.099	0.601	-0.165	0.869
			Turf	0.583	0.616	0.946	0.344
			Macroalgae	0.142	0.457	0.311	0.756
First sampling period, no eq. PRIA	2010–2012	Baker French Frigate Shoals* Howland Jarvis Kaho‘olawe* Kure* Kingman Lisianski* Palmyra Pearl and Hermes*	Coral	0.810	0.672	1.205	0.228
			CCA	2.535	0.825	3.071	**0.002**
			Turf	-2.222	0.783	-2.837	**0.005**
			Macroalgae	-1.150	0.567	-2.030	**0.042**
Last sampling period, all islands	2016–2019	None	Coral	0.714	0.441	1.618	0.106
			CCA	0.988	0.484	2.042	**0.041**
			Turf	-0.856	0.459	-1.867	0.062
			Macroalgae	-0.140	0.421	-0.332	0.740
Last sampling period, no eq. PRIA	2016–2019	Baker Howland Jarvis Kingman Palmyra	Coral	0.490	0.418	1.172	0.241
			CCA	1.417	0.446	3.174	**0.002**
			Turf	-1.149	0.416	-2.764	**0.006**
			Macroalgae	-0.062	0.400	-0.155	0.877

*Islands excluded because no data were collected during the specified time range