

TABLE DR1. ALL AVAILABLE RADIOMETRIC DATA FROM THE -150 M REEF OFF HAWAII

Location	Lat (°N)	Long (°W)	Sample number	Present depth (m)	Initial depth (m) [†]	Sample type	Radiocarbon ages (¹⁴ C ka) [‡]	2σ calibrated ages (cal ka) ^{‡‡}	2σ U/Th ages (ka) [¶]	2σ age range (ka)	Reference
Kawaihae	19.47	155.94	T276-R5 [±] (CAMS#81754)	-150	-121	Coralline algae (nodule)	10.63 \pm 0.04*	11.91, 11.82, 11.74 (11.82)	N.A.	12.79-11.27	This study
West Hualalai	19.47	156.10	P5-67-3	-175	-142	<i>Porites</i>	12.03 \pm 0.08**	13.48	N.A.	13.83-13.05	Moore et al. 1990
	19.47	156.10	P5-67-5A	-200	-169	Coralline algae (crust limestone)	11.01 \pm 0.04*	12.78, 12.75, 12.63 (12.72)	N.A.	12.90-11.76	Moore et al. 1990
Kealakekua Bay	19.47	155.94	T291-R4 [±]	-149	-111	<i>Porites</i>	N.A.	N.A.	15.24 \pm 0.10*	15.34-15.14	This study
	19.46	155.94	T291-R9 [±]	-153	-115	<i>Porites</i>	N.A.	N.A.	15.07 \pm 0.11*	15.18-14.96	This study
	19.48	155.96	T291-R16 [±]	-149	-112	<i>Porites</i>	N.A.	N.A.	14.74 \pm 0.09*	14.83-14.65	This study
	19.47	155.94	T291-R17A [±]	-150	-112	<i>Porites</i>	N.A.	N.A.	15.07 \pm 0.14*	15.21-14.93	This study
	19.47	155.94	T291-R7A [±]	-153	-115	<i>Porites</i>	N.A.	N.A.	15.25 \pm 0.14*	15.39-15.11	This study
	19.47	155.94	T291-R8A [±]	-153	-116	<i>Porites</i>	N.A.	N.A.	14.87 \pm 0.11*	14.98-14.76	This study
	19.47	155.94	T291-R8 [±] (CAMS#81755)	-153	-118	Coralline algae (crust limestone)	12.75 \pm 0.05*	14.29	N.A.	15.34-13.70	This study
	19.47	155.94	M-162-3	-204	-168	<i>Porites</i>	12.94 \pm 0.10**	15.04, 14.77, 14.37 (14.72)	N.A.	15.52-13.71	Moore and Fornari, 1984
	19.48	156.10	M-170-5A	-207	-168	<i>Porites</i>	N.A.	N.A.	15.80 \pm 0.50**	15.30-16.30	Moore et al. 1990
	19.48	156.10	M-170-5B	-207	-168	<i>Porites</i>	N.A.	N.A.	15.70 \pm 0.50**	15.20-16.20	Moore et al. 1990
	19.48	156.10	M-170-5C	-207	-168	<i>Porites</i>	13.61 \pm 0.05**	15.80	N.A.	16.26-15.36	Moore and Fornari, 1984
	19.47	155.94	M-169-1	-219	-184	<i>Porites</i>	12.82 \pm 0.16**	14.12	N.A.	15.35-13.66	Moore and Fornari, 1984
	19.47	155.94	T291-R12D [±] (CAMS#81756)	-152	-118	Coralline algae (crust limestone)	12.18 \pm 0.04*	13.80	N.A.	14.24-13.41	This study
Ka Lae (South Point)	18.86	155.94	P5-78-5	-160	-125	<i>Porites lobata?</i>	N.A.	N.A.	13.90 \pm 0.30**	13.60-14.20	Moore et al. 1990
	18.86	155.87	P5-78-4	-200	-165	<i>Porites</i>	12.50 \pm 0.04**	14.08	N.A.	15.12-13.45	Moore et al. 1990
	18.89	155.66	P5-77-7 [±]	-155	-128	Coralline algae (crust limestone)	10.46 \pm 0.06**	11.62, 11.48, 11.39 (11.50)	N.A.	12.26-10.85	Moore et al. 1990
	18.89	155.66	P5-77-6	-220	-195	Coralline algae (nodule limestone)	9.51 \pm 0.06**	10.287	N.A.	10.54-9.87	Moore et al. 1990
	18.88	155.67	P5-77-3	-305	-276	Coralline algae (nodule limestone)	10.73 \pm 0.07**	12.08, 12.02, 11.96 (12.02)	N.A.	12.38-11.49	Moore et al. 1990

⁺In situ samples collected from the top of the reef crest, the others were collected as loose talus on the upper and fore-reef slopes.

[†]Initial depth = present depth - (sample age \times subsidence rate); subsidence rate is 2.5mm/yr (Moore et al., 1996).

[‡]Radiocarbon ages are calculated using a Libby half life of 5568 years; ^{*}Samples dated using ¹⁴C AMS methods at the Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory (This study); ^{**}Samples dated using conventional ¹⁴C methods at the USGS, Denver Colorado (Moore and Fornari, 1984; Moore et al., 1990).

^{††}All radiocarbon ages (¹⁴C ka) were converted to calibrated ages (cal ka) using the program CALIB 4.3 (Method A, data sets INTCAL.98 and MARINE.98) after Stuiver et al., 1998 and reported with 2σ errors. Calibration takes into account a correction for the average ocean reservoir (R) (400 yrs) as well a local deviation (ΔR) for Hawaii of -38 ± 3 (after Druffel et al., 2001).

[¶]Samples dated using the U/Th method (ka) at the University of Minnesota (This study)*. Chemical separations of U and Th were done at the University of Minnesota Duluth using methods given in Edwards et al., (1987); U and Th isotopic compositions were measured in the Minnesota Isotope Laboratory by ICP-MS on a Finnigan ELEMENT using methods outlined in Shen et al., (2002). See supplementary Table 2 for the details of the new U/Th data; ^{**}Samples dated at the USGS, Denver Colorado (Moore and Fornari, 1984; Moore et al., 1990).

References (not cited in the main text)

Druffel, E.R. M., Griffin, S., Guilderson, T. P., Kashgarian, M., Southon, J., Schrag, D.P., 2001, Changes of subtropical North Pacific radiocarbon and correlation with climate variability: Radiocarbon, v. 43, p. 15–25.

Edwards, R.L., Chen, H., and Wasserburg, G.J., 1987, U-238 U-234-Th-230-Th-232 Systematic and the precise measurement of time over the past 500,000 years: Earth and Planetary Science Letters, v. 81, p. 175–192.

Shen, C.C., Edwards, R.L., Cheng, H., Dorale, J.A., Thomas R.B., Moran, S.B., Weinstein, S.E., and Edmonds, H.N., 2002, Uranium and thorium isotopic concentration measurements by magnetic sector inductively coupled plasma mass spectrometry: Chemical Geology, v. 185, p. 165–178.

Stuiver M., Reimer, P.J., Bard, E., Beck, J.W., Burr, G.S., Hughen K.A., Kromer, B., McCormac, G., van der Plicht, J., and Spurk, M., 1998, INTCAL98 radiocarbon age calibration, 24000–0 cal BP: Radiocarbon, v. 40, p. 1041–1083.

TABLE DR2. U/TH DATA FROM THE -150 M DROWNED REEF OFF HAWAII

Sample number	Depth (m)	Coral species	^{238}U (ppb)	^{232}Th (ppt)	$\delta^{234}\text{U}$ measured [†]	$^{230}\text{Th}/^{238}\text{U}$ (activity) [‡]	^{230}Th age (ka) [‡]	$\delta^{234}\text{U}$ (initial) ^{‡‡}
T291-R4	-149	<i>Porites</i>	3092	1001	140.2 \pm 2.4	0.1489 \pm 0.0009	15.24 \pm 0.10	146.4 \pm 2.5
T291-R9	-153	<i>Porites</i>	2828	518	142.4 \pm 2.8	0.1477 \pm 0.001	15.07 \pm 0.11	148.6 \pm 2.8
T291-R16	-149	<i>Porites</i>	3477	44	139.4 \pm 2.8	0.1443 \pm 0.0008	14.74 \pm 0.09	145.3 \pm 2.8
T291-R17A	-150	<i>Porites</i>	3049	688	137.6 \pm 2.4	0.147 \pm 0.0013	15.07 \pm 0.14	143.5 \pm 2.5
T291-R7A	-153	<i>Porites</i>	2739	470	141.4 \pm 2.8	0.1492 \pm 0.0012	15.25 \pm 0.14	147.6 \pm 2.9
T291-R8A	-153	<i>Porites</i>	3209	439	140.9 \pm 3.0	0.1457 \pm 0.001	14.87 \pm 0.11	147.0 \pm 3.1

[†] $\delta^{234}\text{U} = [(^{234}\text{U}/^{238}\text{U})_{\text{activity}} - 1] \times 1000$, [‡]Activities and ages were calculated using $\lambda_{230} = 9.1577 \times 10^{-6} \text{ year}^{-1}$, $\lambda_{234} = 2.8263 \times 10^{-6} \text{ year}^{-1}$, $\lambda_{238} = 1.55125 \times 10^{-10} \text{ year}^{-1}$, $\lambda_{231} = 2.1158 \times 10^{-5} \text{ year}^{-1}$, and $\lambda_{235} = 9.8485 \times 10^{-10} \text{ year}^{-1}$ [age equations and references for λs are from Chen et al. (2000)], ^{‡‡} $\delta^{234}\text{U}_{\text{initial}}$ was calculated based on ^{230}Th age (T); i.e., $\delta^{234}\text{U}_{\text{initial}} = \delta^{234}\text{U}_{\text{measured}} \times e^{\lambda^{234} \times T}$. With exception of one sample (T291-R17A), all initial $\delta^{234}\text{U}$ values are within error of the modern seawater value of 149.3 \pm 1.5 (Edwards et al., 1993).

References (not cited in the main text)

- Cheng, H., Edwards, R.L., Hoff, J., Gallup, C.D., Richards, D.A., and Asmerom, Y., 2000, The half-lives of uranium-234 and thorium-230: Chemical Geology, v. 169, p. 17–33.

Data Repository Item

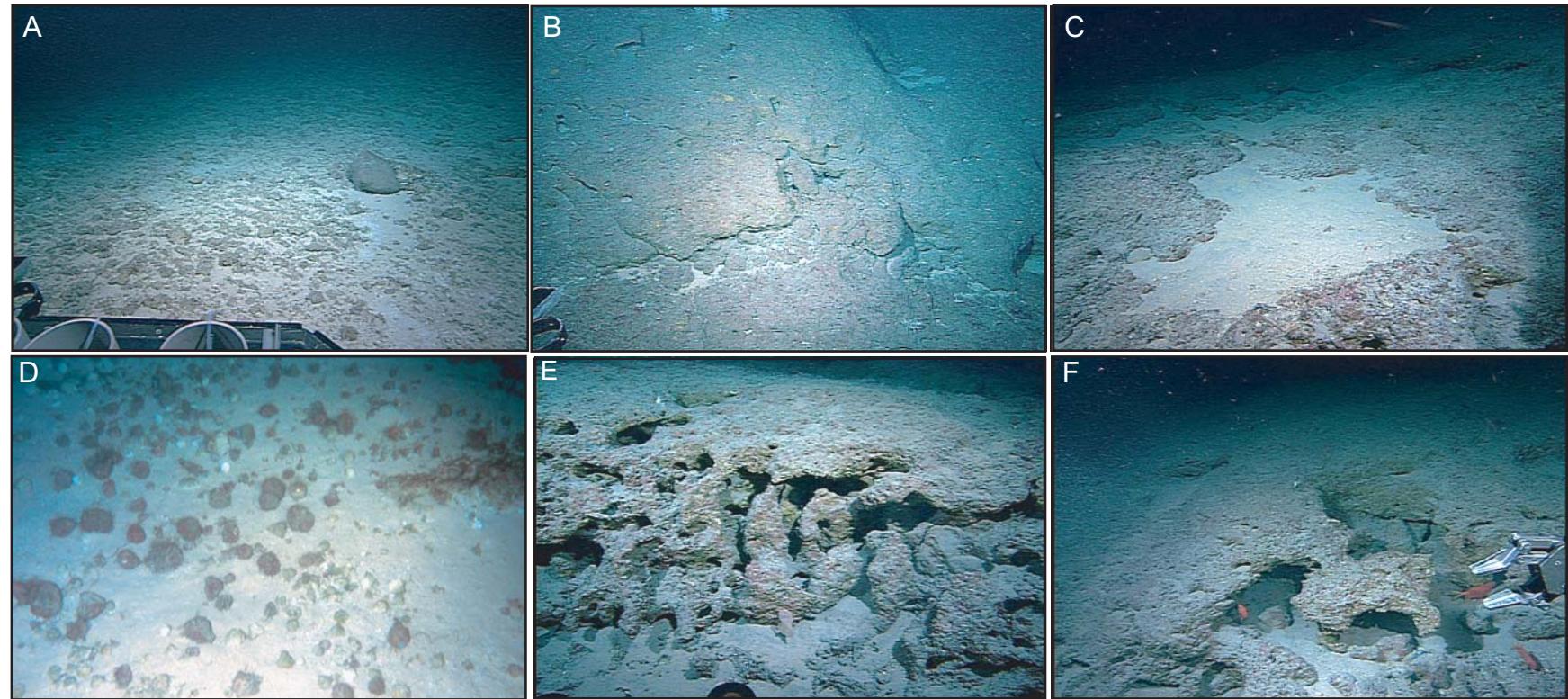


Figure DR1

Webster et al., 2003

Figure DR1. Outcrop photographs from *Pisces* and *Tiberon* dives. A: T276, -200m, fore-reef slope showing carbonate rubble and fine sediments. B. T276, -180 m, massive, steep reef wall. C: T291, -150 m, reef crest showing patchy, crust or pavement covered in places by fine carbonate sediments. D: P5-67, -170 m, upper reef slope covered with coralline algae-dominated nodules. E: T291, -150 m, reef crest showing 20–30 cm coralline algal-dominated crust or pavement. F: T291, -152m, reef crest showing a similar coralline algal-dominate crust or pavement.