

Supplementary Materials

Table S1. List of all previously published percussion and drill cores, core length, penetration depth from reef flat surface, compaction rate, co-ordinates.

Core site and number^	Date collected	Core length (m)	Penetration (m)	Compaction rate (%)	Easting*	Northing*	Reference
Bramston PC1	24/05/13	1.6	1.8	9.5	631241.3019	7781660.336	Ryan et al., 2016a
Bramston PC2	24/05/13	2.0	2.2	8.3	631241.3019	7781660.336	Ryan et al., 2016a
Bramston PC3	18/08/13	3.4	4.0	15.1	631480.5565	7781700.663	Ryan et al., 2016a
Bramston PC4	06/05/13	1.9	2.3	18.1	631689.1665	7781768.759	Ryan et al., 2016a
Bramston PC5	06/05/13	1.7	2.0	12.7	631780.0529	7781824.885	Ryan et al., 2016a
Bramston PC6	18/08/13	3.4	4.5	25.1	631807.8872	7781834.145	Ryan et al., 2016a
Bramston PC7	18/08/13	3.2	4.6	30.1	631933.6875	7781928.726	Ryan et al., 2016a
Bramston PC8	24/05/13	3.2	3.8	16.4	631939.4582	7781921.324	Ryan et al., 2016a
Stone Is South PC1	26/05/14	2.4	3.3	28.4	634424.1594	7783374.097	Ryan et al., 2016c
Stone Is South PC2	22/07/13	0.8	1.3	37.0	634391.4353	7783366.233	Ryan et al., 2016c
Stone Is South PC3	24/05/14	1.7	4.3	59.2	634375.8808	7783256.672	Ryan et al., 2016c
Stone Is South PC4	22/07/13	1.7	2.4	27.5	634386.5351	7783233.539	Ryan et al., 2016c
Stone Is South PC5	24/05/14	4.0	5.1	21.9	634369.7015	7783135.528	Ryan et al., 2016c
Stone Is South PC6	24/05/14	3.8	4.8	21.1	634361.849	7783073.48	Ryan et al., 2016c
Stone Is South PC7	22/07/13	1.4	1.7	18.7	634405.9811	7783076.795	Ryan et al., 2016c
Stone Is South PC8	22/07/13	1.9	2.6	24.2	634414.4468	7783021.778	Ryan et al., 2016c
Stone Is South PC9	24/05/14	2.6	4.7	45.4	634414.4468	7783021.778	Ryan et al., 2016c
Stone Is North PC1	25/05/14	2.0	2.5	20.0	634333.5001	7784622.068	Ryan et al., 2016c
Stone Is North PC2	25/05/14	3.0	4.0	24.0	634449.9508	7784642.573	Ryan et al., 2016c
Stone Is North PC3	25/05/14	3.3	4.2	22.6	634480.0843	7784681.575	Ryan et al., 2016c
Stone Is North PC4	25/05/14	1.0	1.2	21.0	634519.3453	7784733.542	Ryan et al., 2016c
Stone Is North PC5	25/05/14	2.9	5.0	41.2	634519.3453	7784733.542	Ryan et al., 2016c
Middle Is PC1	20/8/13	2.3	2.8	18.7	642521.6847	7789283.452	Ryan et al., 2016b
Middle Is PC2	17/8/13	1.7	2.2	22.8	642510.0477	7789234.718	Ryan et al., 2016b
Middle Is PC3	17/8/13	1.7	4.6	63.6	642507.7095	7789232.078	Ryan et al., 2016b

Middle Is PC4	20/8/13	1.6	2.0	21.6	642487.0533	7789179.21	Ryan et al., 2016b
Middle Is PC5	19/8/13	3.0	4.6	34.2	642492.5298	7789136.039	Ryan et al., 2016b
Middle Is PC6	19/8/13	1.1	1.4	19.3	642492.5298	7789136.039	Ryan et al., 2016b
Middle Is PC7	19/8/13	1.8	2.6	30.4	642461.6116	7789101.512	Ryan et al., 2016b
Middle Is PC8	19/8/13	2.3	3.4	32.0	642441.3308	7789065.884	Ryan et al., 2016b
Middle Is PC9	19/8/13	0.8	1.5	46.1	642441.3308	7789065.884	Ryan et al., 2016b
Middle Is PC10	20/8/13	1.2	1.7	29.1	642438.4358	7789026.018	Ryan et al., 2016b
Middle Is DC1	8/10/14	-	7.2	-	642462.7936	7789168.714	Ryan et al., 2016b
Holbourne Is PC1	25/06/13	1.4	1.6	13.6	642311.82	7817959.16	Ryan et al., 2018
Holbourne Is PC2	25/06/13	1.3	1.6	16.8	642282.24	7817904.05	Ryan et al., 2018
Holbourne Is PC3	25/06/13	1.5	1.8	13.4	642281.94	7817867.19	Ryan et al., 2018
Holbourne Is PC4	22/06/13	1.4	1.6	13.5	642313.9636	7817809.262	Ryan et al., 2018
Holbourne Is PC5	22/06/13	1.2	1.5	20.0	642247.9916	7817600.556	Ryan et al., 2018
Holbourne Is DC1	23/06/13	8.2	1.5	81.6	642291.5041	7817857.774	Ryan et al., 2018
Holbourne Is DC2	7/10/14	2.3	6.4	64.3	642393.9259	7817701.934	Ryan et al., 2018
Holbourne Is DC3	6/10/14	2.7	3.8	29.2	642343.1317	7817672.731	Ryan et al., 2018
Holbourne Is DC4	6/10/14	1.2	1.6	22.5	642268.8993	7817603.935	Ryan et al., 2018

^ PC = percussion core, DC = drill core * Co-ordinate system = Map Grid of Australia, Zone 55

Table S2. Multicollector inductively coupled plasma mass spectrometer uranium-thorium (U-Th) data of core samples from Bramston Reef, Stone Island, Middle Island and Holbourne Island, central Great Barrier Reef.

Sample Name*	Sample genus	Sample weight (g)	U (ppm)	²³² Th (ppb)	(²³⁰ Th/ ²³² Th)	(²³⁰ Th/ ²³⁸ U)	(²³⁴ U/ ²³⁸ U)	uncorr. ²³⁰ Th Age (ka)	corr. ²³⁰ Th Age (ka)†	corr. Initial (²³⁴ U/ ²³⁸ U)	Age (years BP=1950)
BR-P1-40 ^a	<i>Favites</i>	0.16692	2.6736 ± 0.0013	2.1952 ± 0.0138	81.78±0.62	0.022130±0.000094	1.1473±0.0009	2.123 ± 0.009	2.102 ± 0.010	1.1482 ± 0.0009	2038 ± 10
BR-P2-160 ^a	<i>Turbinaria</i>	0.04757	2.9613 ± 0.0014	8.6778 ± 0.3818	58.54±2.62	0.056537±0.000487	1.1440±0.0015	5.521 ± 0.049	5.461 ± 0.051	1.1463 ± 0.0015	5396 ± 51
BR-P3-200 ^a	<i>Acropora</i>	0.23003	3.5446 ± 0.0017	3.5610 ± 0.0067	133.03±0.41	0.044045±0.000109	1.1480±0.0008	4.263 ± 0.011	4.239 ± 0.012	1.1498 ± 0.0008	4175 ± 12
BR-P3-170 ^a	<i>Turbinaria</i>	0.18443	3.2207 ± 0.0018	3.1058 ± 0.0065	143.99±0.55	0.045763±0.000149	1.1499±0.0010	4.425 ± 0.015	4.402 ± 0.016	1.1518 ± 0.0011	4338 ± 16
BR-P4-143 ^a	<i>Fungia</i>	0.16724	2.8345 ± 0.0014	0.9970 ± 0.0023	421.50±1.45	0.048863±0.000129	1.1463 ± 0.0011	4.746 ± 0.014	4.734 ± 0.014	1.1483 ± 0.0011	4670 ± 14
BR-P6-340 ^a	<i>Favites</i>	0.16775	2.3071 ± 0.0007	4.0900 ± 0.0069	78.64±0.40	0.045947±0.000219	1.1480 ± 0.0009	4.450 ± 0.022	4.411 ± 0.023	1.1499 ± 0.0009	4346 ± 23
BR-P6-190 ^a	<i>Fungia</i>	0.17904	2.3559 ± 0.0010	0.5361 ± 0.0008	531.73±2.00	0.039881±0.000139	1.1459 ± 0.0011	3.860 ± 0.014	3.850 ± 0.014	1.1475 ± 0.0011	3786 ± 14
BR-P6-75 ^a	<i>Acropora</i>	0.1652	3.2633 ± 0.0016	0.4266 ± 0.0010	797.42±3.18	0.034360±0.000114	1.1468 ± 0.0010	3.315 ± 0.012	3.308 ± 0.012	1.1482 ± 0.0011	3244 ± 12
BR-P7-290 ^a	<i>Favites</i>	0.17795	2.7183 ± 0.0016	0.2332 ± 0.0007	904.36±3.87	0.025572±0.000082	1.1472 ± 0.0015	2.457 ± 0.009	2.450 ± 0.009	1.1482 ± 0.0015	2386 ± 9
BR-P7-210 ^a	<i>Calaustrea</i>	0.21947	2.5525 ± 0.0008	1.0453 ± 0.0016	180.72±0.66	0.024391±0.000081	1.1473 ± 0.0011	2.342 ± 0.008	2.329 ± 0.009	1.1483 ± 0.0011	2265 ± 9
BR-P7-180 ^a	<i>Montipora</i>	0.16637	3.2433 ± 0.0016	6.7739 ± 0.0108	31.42±0.14	0.021630±0.000093	1.1457 ± 0.0013	2.078 ± 0.009	2.033 ± 0.013	1.1466 ± 0.0014	1969 ± 13
BR-P8-75 ^a	<i>Fungia</i>	0.18084	2.3928 ± 0.0007	1.2241 ± 0.0022	86.13±0.48	0.014522±0.000077	1.1471 ± 0.0014	1.389 ± 0.008	1.373 ± 0.008	1.1477 ± 0.0014	1309 ± 8
BR-P8-170 ^a	<i>Platygyra</i>	0.19031	2.6415 ± 0.0013	0.2231 ± 0.0006	572.93±3.07	0.015947±0.000073	1.1462 ± 0.0016	1.527 ± 0.007	1.520 ± 0.008	1.1468 ± 0.0016	1456 ± 8
BR-FMA-1 ^a	<i>Porites</i>	0.1693	3.0083 ± 0.0014	1.5947 ± 0.0053	200.58 ± 1.19	0.035043 ± 0.000173	1.1483 ± 0.0011	3.377 ± 0.017	3.363 ± 0.017	1.1498 ± 0.0011	3298 ± 17
BR-FMA-2 ^a	<i>Porites</i>	0.16925	2.6599 ± 0.0008	11.7957 ± 0.0189	26.03 ± 0.11	0.038041 ± 0.000145	1.1454 ± 0.0013	3.681 ± 0.015	3.591 ± 0.023	1.1470 ± 0.0013	3526 ± 23
BR-FMA-3 ^a	<i>Porites</i>	0.17837	3.2648 ± 0.0014	0.4103 ± 0.0013	1076.71 ± 4.64	0.044599 ± 0.000136	1.1456 ± 0.0011	4.327 ± 0.014	4.320 ± 0.014	1.1474 ± 0.0012	4256 ± 14
BR-FMA-4	<i>Porites</i>	0.16773	2.7771 ± 0.0014	7.1218 ± 0.0138	46.42 ± 0.17	0.039231 ± 0.000127	1.1464 ± 0.0011	3.794 ± 0.013	3.740 ± 0.017	1.1480 ± 0.0011	3676 ± 17
BR-FMA-5	<i>Porites</i>	0.163	3.0144 ± 0.0017	17.3090 ± 0.0302	23.97 ± 0.07	0.045366 ± 0.000119	1.1455 ± 0.0013	4.403 ± 0.013	4.289 ± 0.026	1.1474 ± 0.0013	4224 ± 26
BR-FMA-6	<i>Porites</i>	0.16963	2.6651 ± 0.0014	14.4766 ± 0.0199	21.15 ± 0.08	0.037872 ± 0.000140	1.1453 ± 0.0009	3.664 ± 0.014	3.555 ± 0.026	1.1470 ± 0.0010	3491 ± 26
BR-FMA-7	<i>Porites</i>	0.17713	3.0085 ± 0.0019	23.7788 ± 0.0493	13.84 ± 0.05	0.036058 ± 0.000100	1.1454 ± 0.0013	3.486 ± 0.011	3.330 ± 0.033	1.1470 ± 0.0013	3266 ± 33
BR-FMA-8	<i>Porites</i>	0.17175	2.8827 ± 0.0014	3.6430 ± 0.0046	93.07 ± 0.29	0.038763 ± 0.000114	1.1439 ± 0.0012	3.757 ± 0.012	3.728 ± 0.013	1.1454 ± 0.0012	3664 ± 13
BR-FMA-9	<i>Porites</i>	0.19533	3.1318 ± 0.0011	1.7810 ± 0.0036	189.66 ± 0.65	0.035547 ± 0.000099	1.1475 ± 0.0010	3.429 ± 0.010	3.414 ± 0.011	1.1490 ± 0.0011	3350 ± 11
BR-FMA-11	<i>Porites</i>	0.15522	2.8553 ± 0.0013	25.8184 ± 0.1307	11.29 ± 0.08	0.033647 ± 0.000184	1.1469 ± 0.0013	3.245 ± 0.018	3.067 ± 0.040	1.1485 ± 0.0013	2686 ± 28
BR-FMA-11 ^a	<i>Porites</i>	0.15522	2.8553 ± 0.0013	25.8184 ± 0.1307	11.29 ± 0.08	0.033647 ± 0.000184	1.1469 ± 0.0013	3.245 ± 0.018	3.067 ± 0.040	1.1485 ± 0.0013	3003 ± 40

BR-FMA-12	<i>Porites</i>	0.17108	3.1487 ± 0.0013	8.4324 ± 0.0150	40.30 ± 0.16	0.035567 ± 0.000129	1.1468 ± 0.0010	3.433 ± 0.013	3.378 ± 0.017	1.1483 ± 0.0010	3314 ± 17
SI-S-P1-58 ^c	<i>Montipora</i>	0.21575	3.1467±0.0026	19.4274±0.0199	34.34±0.07	0.0699±0.0001	1.1431±0.0008	6.869±0.015	6.746±0.029	1.1460±0.0008	6681±29
SI-S-P1-160 ^c	<i>Echinophyllia?</i>	0.16562	2.9049±0.0015	6.4259±0.0063	99.32±0.22	0.0724±0.0001	1.1438±0.0008	7.122±0.016	7.075±0.018	1.1468±0.0008	7010±18
SI-S-P1-205 ^c	<i>Acropora</i>	0.21053	3.0082±0.0016	4.9554±0.0056	137.20±0.27	0.0745±0.0001	1.1454±0.0009	7.323±0.014	7.287±0.016	1.1485±0.0009	7222±16
SI-S-P3-140 ^c	<i>Montipora</i>	0.19953	3.1606±0.0016	12.2095±0.0172	57.45±0.13	0.0731±0.0001	1.1446±0.0009	7.191±0.015	7.113±0.022	1.1477±0.0010	7048±22
SI-S-P5-230 ^c	<i>Acropora?</i>	0.20736	3.9607±0.0027	24.8726±0.0302	34.51±0.10	0.0714±0.0002	1.1457±0.0009	7.010±0.020	6.886±0.032	1.1487±0.0009	6821±32
SI-S-P5-270 ^c	<i>Acropora?</i>	0.17518	3.1187±0.0018	13.6891±0.0091	49.90±0.11	0.0722±0.0002	1.1460±0.0008	7.085±0.017	6.996±0.024	1.1491±0.0008	6931±24
SI-S-P5-305 ^c	<i>Galaxea</i>	0.16176	3.3103±0.0018	3.7376±0.0051	192.51±0.52	0.0716±0.0002	1.1475±0.0011	7.020±0.018	6.994±0.019	1.1505±0.0011	6929±19
SI-S-P5-340 ^c	<i>Astreopora</i>	0.16991	2.8840±0.0018	10.6622±0.0171	60.40±0.18	0.0736±0.0002	1.1466±0.0013	7.224±0.021	7.148±0.026	1.1497±0.0013	7083±26
SI-S-P6-243 ^c	<i>Fungia</i>	0.24719	3.1007±0.0018	4.1694±0.0042	141.86±0.35	0.0629±0.0001	1.1460±0.0009	6.146±0.016	6.116±0.017	1.1485±0.0009	6051±17
SI-S-P6-320 ^c	<i>Acropora</i>	0.15603	3.4518±0.0032	16.5770±0.0158	41.45±0.07	0.0656±0.0001	1.1442±0.0010	6.431±0.013	6.335±0.023	1.1470±0.0010	6270±23
SI-S-P6-348 ^c	<i>Acropora</i>	0.19332	3.8507±0.0019	14.2128±0.0393	55.14±0.19	0.0671±0.0001	1.1467±0.0009	6.564±0.015	6.490±0.021	1.1495±0.0009	6425±21
SI-S-P6-370 ^c	<i>Goniastrea?</i>	0.16593	2.7815±0.0017	10.3483±0.0111	61.31±0.14	0.0752±0.0002	1.1460±0.0010	7.388±0.017	7.312±0.023	1.1491±0.0010	7247±23
SI-S-P9-90 ^c	<i>Acropora</i>	0.18877	3.4118±0.0013	16.3489±0.0135	29.25±0.06	0.0462±0.0001	1.1456±0.0011	4.485±0.010	4.389±0.022	1.1476±0.0011	4324±22
SI-S-P9-170 ^c	<i>Porites?</i>	0.21903	2.8464±0.0018	1.1778±0.0014	336.86±0.79	0.0459±0.0001	1.1447±0.0011	4.463±0.011	4.450±0.011	1.1466±0.0012	4385±11
SI-N-P1-120 ^c	<i>Turbinaria</i>	0.1513	3.7116±0.0023	9.5592±0.0091	77.19±0.18	0.0655±0.0001	1.1449±0.0011	6.419±0.016	6.366±0.019	1.1476±0.0011	6301±19
SI-N-P1-137 ^c	<i>Acropora</i>	0.15099	3.3960±0.0019	4.7758±0.0053	115.53±0.28	0.0535±0.0001	1.1459±0.0010	5.213±0.013	5.182±0.014	1.1481±0.0010	5117±14
SI-N-P2-255 ^c	<i>Dipsastraea?</i>	0.15749	2.4786±0.0015	13.9761±0.0158	37.78±0.08	0.0702±0.0001	1.1442±0.0010	6.896±0.014	6.783±0.026	1.1472±0.0010	6718±26
SI-N-P2-290 ^c	<i>Cyphastrea</i>	0.21055	2.6844±0.0008	4.2976±0.0041	133.36±0.27	0.0704±0.0001	1.1441±0.0010	6.913±0.014	6.877±0.016	1.1470±0.0011	6812±16
SI-N-P3-153 ^c	<i>Turbinaria</i>	0.1553	3.3376±0.0023	4.9700±0.0055	115.97±0.29	0.0569±0.0001	1.1456±0.0008	5.551±0.014	5.519±0.016	1.1479±0.0009	5454±16
SI-N-P3-243 ^c	<i>Acropora</i>	0.18981	3.3703±0.0014	15.7033±0.0346	46.18±0.14	0.0709±0.0002	1.1439±0.0006	6.970±0.017	6.877±0.025	1.1469±0.0006	6812±25
SI-N-P4-87 ^c	<i>Hydnophora</i>	0.17439	2.9422±0.0015	11.3488±0.0113	39.43±0.10	0.0501±0.0001	1.1472±0.0009	4.867±0.012	4.788±0.020	1.1493±0.0010	4723±20
SI-N-P5-55 ^c	<i>Montastrea?</i>	0.16615	2.7145±0.0015	8.4770±0.0080	44.72±0.12	0.0460±0.0001	1.1443±0.0010	4.473±0.013	4.408±0.018	1.1462±0.0010	4343±18
SI-N-P5-155 ^c	<i>Acropora</i>	0.19371	3.2528±0.0018	4.9628±0.0099	114.54±0.39	0.0576±0.0002	1.1455±0.0008	5.620±0.017	5.586±0.018	1.1479±0.0008	5521±18
SI-N-P5-280 ^c	<i>Galaxea</i>	0.15815	3.0829±0.0019	5.3853±0.0052	126.84±0.27	0.0730±0.0001	1.1465±0.0006	7.167±0.015	7.129±0.017	1.1496±0.0006	7064±17
SI-N-P5-220 ^c	<i>Montipora</i>	0.16677	3.3881±0.0015	18.5639±0.0239	35.78±0.09	0.0646±0.0001	1.1436±0.0011	6.333±0.015	6.224±0.026	1.1463±0.0011	6159±26
SI-S-FMA-1 ^c	<i>Porites</i>	0.1556	3.0897±0.0017	4.1796±0.0035	104.75±0.27	0.0467±0.0001	1.1475±0.0009	4.527±0.012	4.497±0.014	1.1494±0.0009	4432±14
SI-S-FMA-2 ^c	<i>Porites</i>	0.2076	2.7754±0.0015	2.2285±0.0026	151.06±0.44	0.0400±0.0001	1.1450±0.0008	3.872±0.011	3.852±0.012	1.1466±0.0008	3787±12
SI-S-FMA-3 ^c	<i>Porites</i>	0.17588	2.8840±0.0009	6.1024±0.0110	96.77±0.26	0.0675±0.0001	1.1431±0.0014	6.628±0.016	6.582±0.019	1.1458±0.0014	6518±19
SI-S-FMA-4 ^c	<i>Porites</i>	0.16906	3.0751±0.0018	5.2987±0.0071	122.11±0.39	0.0693±0.0002	1.1427±0.0010	6.818±0.021	6.780±0.023	1.1455±0.0010	6716±23
SI-S-FMA-5 ^c	<i>Porites</i>	0.17473	3.4858±0.0013	0.3191±0.0006	2058±5.2	0.0621±0.0001	1.1422±0.0012	6.090±0.013	6.084±0.013	1.1447±0.0013	6020±13

SI-S-FMA-6 ^c	<i>Porites</i>	0.16148	2.8541±0.0017	8.1953±0.0144	73.18±0.22	0.0693±0.0002	1.1431±0.0013	6.807±0.020	6.747±0.23	1.1459±0.0014	6683±23
SI-S-FMA-7 ^c	<i>Porites</i>	0.16971	2.9055±0.0012	5.9842±0.0184	90.33±0.39	0.0613±0.0002	1.1437±0.0010	6.002±0.020	5.958±0.022	1.1462±0.0011	5894±22
SI-S-FMA-8 ^c	<i>Porites</i>	0.24771	2.9610±0.0014	6.9935±0.0089	87.92±0.24	0.0684±0.0002	1.1449±0.0010	6.713±0.018	6.663±0.021	1.1478±0.0011	6599±21
SI-S-FMA-9 ^c	<i>Porites</i>	0.16688	3.0193±0.0013	26.6601±0.0332	25.52±0.07	0.0743±0.0002	1.1394±0.0011	7.341±0.021	7.167±0.040	1.1425±0.0011	7103±40
SI-S-FMA-10 ^c	<i>Porites</i>	0.21337	2.8451±0.0021	2.0915±0.0043	288.51±0.94	0.0699±0.0002	1.1448±0.0009	6.861±0.019	6.842±0.020	1.1477±0.0009	6777±20
SI-S-FMA-11 ^c	<i>Porites</i>	0.16964	2.6623±0.0019	4.3082±0.0044	132.76±0.26	0.0708±0.0001	1.1446±0.0009	6.954±0.014	6.918±0.016	1.1476±0.0010	6853±16
SI-S-FMA-12 ^c	<i>Porites</i>	0.23411	2.7961±0.0012	8.8096±0.0080	64.68±0.15	0.0672±0.0002	1.1456±0.0007	6.581±0.016	6.516±0.020	1.1484±0.0007	6451±20
SI-S-FMA-13 ^c	<i>Porites</i>	0.16273	2.8711±0.0021	11.6698±0.0128	51.79±0.13	0.0694±0.0002	1.1438±0.0010	6.815±0.017	6.732±0.024	1.1466±0.0010	6667±24
SI-N-FMA-14 ^c	<i>Porites</i>	0.1689	2.7336±0.0016	29.7643±0.0356	13.63±0.04	0.0489±0.0001	1.1453±0.0010	4.754±0.013	4.540±0.045	1.1475±0.0010	4475±45
SI-N-FMA-15 ^c	<i>Porites</i>	0.18224	2.7080±0.0015	1.8490±0.0022	100.60±0.37	0.0226±0.0001	1.1462±0.0009	2.174±0.008	2.156±0.009	1.1472±0.0009	2091±9
SI-N-FMA-16 ^c	<i>Porites</i>	0.1687	2.6780±0.0014	10.8745±0.0106	16.87±0.08	0.0226±0.0001	1.1478±0.0011	2.165±0.010	2.083±0.019	1.1488±0.0011	2018±19
MI-P1-200 ^b	<i>Acropora</i>	0.15535	3.2997 ± 0.0020	26.8893±0.0234	28.53 ± 0.05	0.0766 ± 0.0001	1.1446 ± 0.0011	7.545 ± 0.016	7.385 ± 0.035	1.1479 ± 0.0011	7320 ± 35
MI-P1-150 ^b	<i>Isopora?</i>	0.1534	3.0438 ± 0.0017	14.4597±0.0144	47.39 ± 0.11	0.0742 ± 0.0002	1.1437 ± 0.0010	7.305 ± 0.017	7.210 ± 0.026	1.1468 ± 0.0010	7145 ± 26
MI-P2-55 ^b	<i>Pavona</i>	0.17066	3.7599 ± 0.0015	19.9783±0.0202	41.05 ± 0.10	0.0719 ± 0.0002	1.1458 ± 0.0012	7.057 ± 0.017	6.952 ± 0.027	1.1488 ± 0.0012	6887 ± 27
MI-P2-110 ^b	<i>Dipsastraea</i>	0.17661	2.6802 ± 0.0012	25.4699±0.0267	23.76 ± 0.06	0.0744 ± 0.0002	1.1442 ± 0.0011	7.324 ± 0.018	7.137 ± 0.041	1.1475 ± 0.0011	7072 ± 41
MI-P2-160 ^b	?	0.15531	3.9771 ± 0.0031	24.9074±0.0270	36.22 ± 0.07	0.0748 ± 0.0001	1.1434 ± 0.0013	7.364 ± 0.016	7.240 ± 0.029	1.1466 ± 0.0013	7175 ± 29
MI-P4-145 ^b	<i>Porites</i>	0.15008	3.2282 ± 0.0018	7.8353±0.0110	95.04 ± 0.27	0.0760 ± 0.0002	1.1455 ± 0.0010	7.478 ± 0.021	7.427 ± 0.023	1.1487 ± 0.0010	7362 ± 23
MI-P6-100 ^b	<i>Hydnophora?</i>	0.19221	2.9347 ± 0.0014	8.7262±0.0081	72.72 ± 0.15	0.0713 ± 0.0001	1.1444 ± 0.0010	7.003 ± 0.015	6.941 ± 0.019	1.1473 ± 0.0010	6876 ± 19
MI-P5-250 ^b	<i>Acropora</i>	0.15785	3.4156 ± 0.0020	81.3308±0.0610	10.69 ± 0.02	0.0839 ± 0.0002	1.1424 ± 0.0008	8.305 ± 0.017	7.844 ± 0.093	1.1463 ± 0.0008	7779 ± 93
MI-P7-95 ^b	<i>Acropora</i>	0.1592	3.2160 ± 0.0019	8.5709 ± 0.0100	20.63 ± 0.09	0.0181 ± 0.0001	1.1465 ± 0.0008	1.737 ± 0.008	1.681 ± 0.014	1.1473 ± 0.0008	1616 ± 14
MI-P8-70 ^b	<i>Acropora</i>	0.16275	3.1938 ± 0.0018	5.1999 ± 0.0046	33.38 ± 0.14	0.0179 ± 0.0001	1.1461 ± 0.0008	1.717 ± 0.007	1.682 ± 0.010	1.1468 ± 0.0008	1617 ± 10
MI-P8-200 ^b	<i>Acropora?</i>	0.1551	3.7846 ± 0.0024	5.5028 ± 0.0041	139.32 ± 0.36	0.0668 ± 0.0002	1.1463 ± 0.0011	6.536 ± 0.018	6.504 ± 0.019	1.1490 ± 0.0011	6439 ± 19
MI-D1-36 ^b	<i>Porites</i>	0.17184	2.8051 ± 0.0011	10.3322±0.0108	11.67 ± 0.05	0.0142 ± 0.0001	1.1468 ± 0.0008	1.355 ± 0.006	1.280 ± 0.016	1.1474 ± 0.0009	1215 ± 16
MI-D1-450 ^b	<i>Dipsastraea?</i>	0.17332	3.2377 ± 0.0018	2.6943 ± 0.0025	293.75 ± 0.55	0.0806 ± 0.0001	1.1431 ± 0.0010	7.958 ± 0.016	7.938 ± 0.017	1.1464 ± 0.0011	7873 ± 17
MI-D1-710 ^b	?	0.18929	4.2148 ± 0.0038	34.5816±0.0564	29.18 ± 0.07	0.0789 ± 0.0002	1.1423 ± 0.0014	7.794 ± 0.020	7.634 ± 0.037	1.1456 ± 0.0014	7569 ± 37
MI-D1-100 ^b	?	0.15401	2.5297 ± 0.0019	4.2254 ± 0.0071	24.97 ± 0.16	0.0137 ± 0.0001	1.1457 ± 0.0011	1.316 ± 0.008	1.278 ± 0.011	1.1463 ± 0.0011	1213 ± 11
MI-FMA-1 ^b	<i>Porites</i>	0.17665	3.1819 ± 0.0012	1.5715 ± 0.0173	435.91 ± 4.19	0.070956 ± 0.000168	1.1440 ± 0.0012	6.973 ± 0.019	6.959 ± 0.019	1.1469 ± 0.0012	6895 ± 19
MI-FMA-2 ^b	<i>Porites</i>	0.17096	2.8067 ± 0.0014	4.7207 ± 0.0073	3.41 ± 0.04	0.001890 ± 0.000020	1.1472 ± 0.0012	0.180 ± 0.002	0.143 ± 0.008	1.1473 ± 0.0012	78 ± 8
MI-FMA-3 ^b	<i>Porites</i>	0.17204	3.0201 ± 0.0013	1.7019 ± 0.0036	18.06 ± 0.16	0.003354 ± 0.000029	1.1452 ± 0.0013	0.320 ± 0.003	0.304 ± 0.004	1.1453 ± 0.0013	240 ± 4
MI-FMA-4 ^b	<i>Porites</i>	0.16562	2.8905 ± 0.0016	0.5016 ± 0.0011	30.73 ± 0.52	0.001758 ± 0.000029	1.1468 ± 0.0009	0.167 ± 0.003	0.159 ± 0.003	1.1469 ± 0.0009	95 ± 3
MI-FMA-5 ^b	<i>Porites</i>	0.17453	2.8086 ± 0.0010	2.5323 ± 0.0051	5.90 ± 0.07	0.001754 ± 0.000021	1.1443 ± 0.0008	0.167 ± 0.002	0.145 ± 0.005	1.1444 ± 0.0008	81 ± 5

MI-FMA-6 ^b	<i>Porites</i>	0.21671	2.6435 ± 0.0011	0.7088 ± 0.0016	20.00 ± 0.30	0.001768 ± 0.000027	1.1450 ± 0.0009	0.168 ± 0.003	0.158 ± 0.003	1.1451 ± 0.0009	94 ± 3
MI-FMA-7 ^b	<i>Porites</i>	0.15135	2.9265 ± 0.0013	1.8049 ± 0.0027	8.54 ± 0.13	0.001736 ± 0.000027	1.1466 ± 0.0013	0.165 ± 0.003	0.149 ± 0.004	1.1467 ± 0.0013	84 ± 4
MI-FMA-8 ^b	<i>Porites</i>	0.19911	3.0088 ± 0.0017	2.4795 ± 0.0049	12.56 ± 0.10	0.003411 ± 0.000027	1.1444 ± 0.0010	0.325 ± 0.003	0.305 ± 0.005	1.1446 ± 0.0010	241 ± 5
MI-FMA-9 ^b	<i>Porites</i>	0.17186	3.0207 ± 0.0013	1.9607 ± 0.0159	14.09 ± 0.17	0.003015 ± 0.000028	1.1441 ± 0.0010	0.288 ± 0.003	0.271 ± 0.004	1.1443 ± 0.0010	206 ± 4
MI-FMA-10 ^b	<i>Porites</i>	0.17564	2.8426 ± 0.0015	1.6544 ± 0.0024	13.95 ± 0.16	0.002677 ± 0.000031	1.1457 ± 0.0013	0.255 ± 0.003	0.239 ± 0.004	1.1458 ± 0.0013	175 ± 4
HI-P1-10 ^d	<i>Porites</i>	0.15454	2.8663 ± 0.0012	35.0528±0.0372	2.13 ± 0.02	0.0086 ± 0.0001	1.1462 ± 0.0008	0.821 ± 0.007	0.582 ± 0.048	1.1468 ± 0.0008	517 ± 48
HI-P1-110 ^d	<i>Favites?</i>	0.16045	2.7212 ± 0.0015	2.0712±0.0022	291.30±0.78	0.0731 ± 0.0002	1.1446±0.0009	7.184 ± 0.019	7.165± 0.020	1.1476 ± 0.0010	7100±20
HI-P3-35 ^d	<i>Dipsastraea</i>	0.15431	3.1142 ± 0.0020	9.3400 ± 0.0097	67.33 ± 0.16	0.0665 ± 0.0001	1.1448±0.0009	6.523 ± 0.016	6.461 ± 0.020	1.1476 ± 0.0009	6396 ± 20
HI-P3-145 ^d	<i>Porites?</i>	0.15847	3.4105 ± 0.0020	6.0905 ± 0.0083	125.81 ± 0.33	0.0740 ± 0.0002	1.1449 ± 0.0009	7.281 ± 0.019	7.243 ± 0.020	1.1480 ± 0.0009	7178 ± 20
HI-P4-60 ^d	<i>Dipsastraea</i>	0.15511	3.4990 ± 0.0020	7.1010 ± 0.0078	96.88 ± 0.24	0.0648 ± 0.0001	1.1449 ± 0.0009	6.346 ± 0.016	6.303 ± 0.018	1.1475 ± 0.0009	6238 ± 18
HI-P4-105 ^d	<i>Acropora</i>	0.16358	3.5527 ± 0.0023	5.7588 ± 0.0057	124.31 ± 0.33	0.0664 ± 0.0002	1.1454 ± 0.0009	6.505 ± 0.018	6.470 ± 0.019	1.1481 ± 0.0009	6406 ± 19
HI-P5-20 ^d	?	0.15672	4.3009 ± 0.0018	15.6908±0.0186	12.72 ± 0.04	0.0153 ± 0.0001	1.1469 ± 0.0009	1.464 ± 0.005	1.391 ± 0.015	1.1476 ± 0.0009	1326 ± 15
HI-D1-60 ^d	<i>Porites</i>	0.16189	2.7820 ± 0.0022	0.8230 ± 0.0011	39.61 ± 0.31	0.0039 ± 0.0000	1.1460 ± 0.0011	0.368 ± 0.003	0.357 ± 0.004	1.1461 ± 0.0012	292 ± 4
HI-D1-640 ^d	<i>Platygyra?</i>	0.16035	2.6411 ± 0.0017	0.3855 ± 0.0004	1604.12±3.94	0.0772 ± 0.0002	1.1456 ± 0.0013	7.593 ± 0.020	7.585 ± 0.020	1.1487 ± 0.0014	7520 ± 20
HI-D1-800 ^d	?	0.17577	3.0853 ± 0.0024	2.5875 ± 0.0029	250.50 ± 0.68	0.0692 ± 0.0002	1.1467 ± 0.0009	6.783 ± 0.019	6.762 ± 0.019	1.1496 ± 0.0009	6697 ± 19
HI-D4-110 ^d	?	0.15665	2.3437 ± 0.0016	0.2959 ± 0.0005	687.76 ± 2.6	0.0286 ± 0.0001	1.1461 ± 0.0011	2.756 ± 0.010	2.748 ± 0.010	1.1472 ± 0.0011	2683 ± 10
HI-D3-37 ^d	<i>Porites</i>	0.16156	2.6681 ± 0.0018	0.2676 ± 0.0005	104.00 ± 0.83	0.0034 ± 0.0000	1.1456 ± 0.0011	0.328 ± 0.003	0.321 ± 0.003	1.1457 ± 0.0011	256 ± 3
HI-D3-330 ^d	<i>Favites</i>	0.15349	2.9891 ± 0.0016	0.8949 ± 0.0011	761.91 ± 1.61	0.0752 ± 0.0001	1.1433 ± 0.0013	7.407 ± 0.016	7.396 ± 0.016	1.1463 ± 0.0013	7331 ± 16
HI-D3-350 ^d	<i>Acropora</i>	0.16783	3.6183 ± 0.0020	3.8074 ± 0.0035	220.67 ± 0.42	0.0765 ± 0.0001	1.1451 ± 0.0012	7.532 ± 0.016	7.508 ± 0.017	1.1483 ± 0.0012	7443 ± 17
HI-D2-10 ^d	<i>Porites</i>	0.15721	2.9391 ± 0.0018	4.2492 ± 0.0043	7.35 ± 0.05	0.0035 ± 0.0000	1.1455 ± 0.0013	0.334 ± 0.002	0.301 ± 0.007	1.1457 ± 0.0013	236 ± 7
HI-D2-620 ^d	?	0.05713	1.4915 ± 0.0009	83.7686±0.1063	44.04 ± 0.09	0.8152 ± 0.0015	1.1121 ± 0.0011	138.91 ± 0.59	137.84 ± 0.61	1.1673 ± 0.0016	137778 ± 608
HI-FMA-1 ^d	<i>Porites</i>	0.22481	2.9284 ± 0.0013	4.4440 ± 0.0109	9.57 ± 0.06	0.004787 ± 0.000030	1.1456 ± 0.0012	0.457 ± 0.003	0.423 ± 0.007	1.1458 ± 0.0012	359 ± 7
HI-FMA-2 ^d	<i>Porites</i>	0.20076	2.8052 ± 0.0011	5.7741 ± 0.0218	10.79 ± 0.07	0.007317 ± 0.000041	1.1468 ± 0.0012	0.698 ± 0.004	0.654 ± 0.010	1.1472 ± 0.0012	589 ± 10
HI-FMA-3 ^d	<i>Porites</i>	0.18129	2.7744 ± 0.0018	2.0148 ± 0.0021	13.16 ± 0.11	0.0031 ± 0.0000	1.1466 ± 0.0008	0.300 ± 0.003	0.281 ± 0.005	1.1468 ± 0.0008	216 ± 5
HI-FMA-4 ^d	<i>Porites</i>	0.16514	2.9699 ± 0.0020	1.5833 ± 0.0021	16.84 ± 0.12	0.0030 ± 0.0000	1.1476 ± 0.0009	0.281 ± 0.002	0.266 ± 0.004	1.1478 ± 0.0009	202 ± 4
HI-FMA-5 ^d	<i>Porites</i>	0.20117	2.9353 ± 0.0019	2.0755 ± 0.0027	8.17 ± 0.10	0.0019 ± 0.0000	1.1470 ± 0.0008	0.181 ± 0.002	0.163 ± 0.004	1.1471 ± 0.0008	98 ± 4

Ratios in parentheses are activity ratios calculated from atomic ratios using decay constants of Cheng et al. (2000). All values have been corrected for laboratory procedural blanks. All errors reported as 2σ. Uncorrected ²³⁰Th age was calculated using Isoplot/EX 3.0 program (Ludwig, 2003), where *ka* denotes thousand years.

*For the sample nomenclature, BR-P1-40 refers to Bramston Reef (SI-S = Stone Island South; SI-N = Stone Island North; MI = Middle Island; HI = Holbourne Island), percussion core (D = drill core), core one, 40 cm downcore where the coral sample was dated. Samples followed by ^{a,b,c,d} were previously published in

^aRyan *et al.*, 2016a, ^bRyan *et al.*, 2016b, ^cRyan *et al.*, 2016c, ^dRyan *et al.*, 2018. All other sample ages are first published in this manuscript.

†²³⁰Th ages corrected using a model two-component correction value based on the equation from Clark *et al.* (2014):

$$\left(\frac{{}^{230}\text{Th}}{{}^{232}\text{Th}} \right)_{\text{mix}} = \left(\left(\frac{{}^{232}\text{Th}_{\text{live}}}{{}^{232}\text{Th}_{\text{dead}}} \right) \times \left(\frac{{}^{230}\text{Th}}{{}^{232}\text{Th}} \right)_{\text{live}} \right) + \left(\left(\frac{{}^{232}\text{Th}_{\text{dead}} - {}^{232}\text{Th}_{\text{live}}}{{}^{232}\text{Th}_{\text{dead}}} \right) \times \left(\frac{{}^{230}\text{Th}}{{}^{232}\text{Th}} \right)_{\text{sed}} \right)$$

where ${}^{232}\text{Th}_{\text{dead}}$ is the measured ${}^{232}\text{Th}$ value (ppb) in the non-living coral sample. ${}^{232}\text{Th}_{\text{live}}$ is the mean measured ${}^{232}\text{Th}$ value (ppb) determined to be 0.95 ppb and ${}^{230}\text{Th}/{}^{232}\text{Th}_{\text{live}}$ represents or approximates the isotopic composition of the hydrogenous component in the dead coral skeleton with an atomic value of $5.85 \times 10^{-6} \pm 20\%$ (which corresponds to an activity value of $1.08 \pm 20\%$) based on live *Porites* corals collected from the Palm Islands region (Clark *et al.*, 2014) which is of a similar setting to the reefs in this study. ${}^{230}\text{Th}/{}^{232}\text{Th}_{\text{sed}}$ is the detrital component represented by a mean atomic value of $3.53 \times 10^{-6} \pm 20\%$ (which corresponds to an activity value of $0.61 \pm 20\%$) from isochron derived initial ${}^{230}\text{Th}/{}^{232}\text{Th}$ values obtained from dead *Porites* coral skeletons collected from the Palm Islands region (Clark *et al.*, 2014).

References

- Cheng, H.; Edwards, R.L.; Hoff, J.; Gallup, C.D.; Richards, D.A.; Asmerom, Y. The half-lives of uranium-234 and thorium-230. *Chemical Geology*, **2000**, 169, 17–33.
- Clark, T. R.; Zhao, J. X.; Roff, G.; Feng, Y. X.; Done, T. J.; Nothdurft, L. D.; Pandolfi, J. M. Discerning the timing and cause of historical mortality events in modern *Porites* from the Great Barrier Reef. *Geochim. Cosmochim. Acta* **2014**, 138, 57–80, doi:10.1016/j.gca.2014.04.022.
- Ludwig, K.R. *Users Manual for Isoplot/Ex version 3.0: A Geochronological Toolkit for Microsoft Excel*, Berkeley Geochronology Centre Special Publication No.3, **2003**, Berkeley.
- Ryan, E. J.; Smithers, S. G.; Lewis, S. E.; Clark, T. R.; Zhao, J. X. Chronostratigraphy of Bramston Reef reveals a long-term record of fringing reef growth under muddy conditions in the central Great Barrier Reef. *Palaeogeogr. Palaeoclimatol. Palaeoecol.* **2016a**, 441, 734–747, doi:10.1016/j.palaeo.2015.10.016.
- Ryan, E. J.; Smithers, S. G.; Lewis, S. E.; Clark, T. R.; Zhao, J. X. The influence of sea level and cyclones on Holocene reef flat development: Middle Island, central Great Barrier Reef. *Coral Reefs* **2016b**, 35, 805–818, doi:10.1007/s00338-016-1453-9.
- Ryan, E. J.; Lewis, S. E.; Smithers, S. G.; Clark, T. R.; Zhao, J. X. Multi-scale records of reef development and condition provide context for contemporary changes on inshore reefs. *Glob. Planet. Change* **2016c**, 146, 162–178, doi:10.1016/j.gloplacha.2016.10.007.
- Ryan, E. J.; Smithers, S. G.; Lewis, S. E.; Clark, T. R.; Zhao, J. X.; Hua, Q. Fringing reef growth over a shallow last interglacial reef foundation at a mid-shelf high island: Holbourne Island, central Great Barrier Reef. *Mar. Geol.* **2018**, 398, 137–150, doi:10.1016/j.margeo.2017.12.007.