























Species	Specimens	Side	dp3	dp4	m1	m2	m3	Source
<i>Homo erectus</i> (Asia)	PCG2	L		107.67				100
<i>Homo erectus</i> (Asia)	Sangiran 9	R				179.07	175.26	101 in <sup>97</sup>
<i>Homo erectus</i> (Asia)	Sangiran 1B	U			162.5	171.6	181.25	102
<i>Homo erectus</i> (Asia)	Sangiran FS67	R	66.24					103
<i>Homo erectus</i> (Asia)	Sangiran FS72	R		134				103
<i>Homo erectus</i> (Asia)	Zhoukoudian G1-6	L			165	158.75	147.6	104 in <sup>97</sup>
<i>Homo erectus</i> (Asia)	Zhoukoudian G1-7	R				162.54	159.96	104 in <sup>97</sup>
<i>Homo erectus</i> (Asia)	ZKD 100	L			165			104
<i>Homo erectus</i> (Asia)	ZKD 101	U			118.65			104
<i>Homo erectus</i> (Asia)	ZKD 102	L			163.8			104
<i>Homo erectus</i> (Asia)	ZKD 106	U				135.66		104
<i>Homo erectus</i> (Asia)	ZKD 110	U				158.75		104
<i>Homo erectus</i> (Asia)	ZKD 111	U				158.76		104
<i>Homo erectus</i> (Asia)	ZKD 114	U					100	104
<i>Homo erectus</i> (Asia)	ZKD 115	U					159.96	104
<i>Homo erectus</i> (Asia)	ZKD 116	U					147.6	104
<i>Homo erectus</i> (Asia)	ZKD 117	U					102	104
<i>Homo erectus</i> (Asia)	ZKD 123	U	50.82					104
<i>Homo erectus</i> (Asia)	ZKD 125, ZKD 128	R	68.6	98.28				104
<i>Homo erectus</i> (Asia)	ZKD 126	U		94.5				104
<i>Homo erectus</i> (Asia)	ZKD 127	R		123.22				104
<i>Homo erectus</i> (Asia)	ZKD 129	R		110.88				104
<i>Homo erectus</i> (Asia)	ZKD 131	U					137.16	104
<i>Homo erectus</i> (Asia)	ZKD 134	U					113.42	104
<i>Homo erectus</i> (Asia)	ZKD 136	U					117.72	104
<i>Homo erectus</i> (Asia)	ZKD 137	U			152.1			104
<i>Homo erectus</i> (Asia)	ZKD 138	U				129.95		104
<i>Homo erectus</i> (Asia)	ZKD 147	U			143.91			104
<i>Homo erectus</i> (Asia)	ZKD 34	U			132.98			104
<i>Homo erectus</i> (Asia)	ZKD 35	R			157.5			104
<i>Homo erectus</i> (Asia)	ZKD 36	L			180.48			104
<i>Homo erectus</i> (Asia)	ZKD 38	L			99.99			104
<i>Homo erectus</i> (Asia)	ZKD 43	U				142.08		104
<i>Homo erectus</i> (Asia)	ZKD 44	U				150.65		104
<i>Homo erectus</i> (Asia)	ZKD 45	U				145.2		104
<i>Homo erectus</i> (Asia)	ZKD 51	U					147.62	104
<i>Homo erectus</i> (Asia)	ZKD 52	U					139.08	104
<i>Homo erectus</i> (Asia)	ZKD 96	R			132.16			104
<i>Homo erectus</i> (Asia)	ZKD 97	R			132.09			104
<i>Homo erectus</i> (Asia)	ZKD 98	R			171.36			104
<i>Homo erectus</i> (Asia)	ZKD 99	R			163.48			104
<i>Homo erectus</i> (Africa)	KNM-ER 1507	L	53.04	102.83				89
<i>Homo erectus</i> (Africa)	KNM-ER 1808	R					163.2	105
<i>Homo erectus</i> (Africa)	KNM-ER 820	L	71.1	100.58	131.61			106
<i>Homo erectus</i> (Africa)	KNM-ER 820	R	70.07	103.4	131.76			106
<i>Homo erectus</i> (Africa)	KNM-ER 992	L			138.43	158.6	164.82	101 in <sup>97</sup>
<i>Homo erectus</i> (Africa)	KNM-WT 15000	L			132.98	140.3		107
<i>Homo erectus</i> (Africa)	KNM-WT 15000	R			132.09	141.36		107
<i>Homo erectus</i> (Africa)	OH 22	R			153.4	147.32		108
<i>Homo erectus</i> (Africa)	OH 51	L			172.62			108
<i>Homo erectus</i> (Africa)	Ternifine I	R			165	171.6	152.5	109 in <sup>110</sup>
<i>Homo erectus</i> (Africa)	Ternifine II	L			182	189	167.5	109 in <sup>110</sup>

Species	Specimens	Side	dp3	dp4	m1	m2	m3	Source
<i>Homo erectus</i> (Africa)	Ternifine III	R			153.75	150.06	139.2	109 in 110
<i>Homo erectus</i> (Africa)	Thomas I	L			182	198	146.37	111 in 110
<i>Homo erectus</i> (Africa)	Rabat	U			143	141.25	127.2	102
<i>Homo floresiensis</i>	LB1	R			98.04	107	95	112
<i>Homo floresiensis</i>	LB6-1	U			82	84.39	70.31	112
<i>Homo habilis</i>	OH 13	L			150.8		180.56	113
<i>Homo habilis</i>	OH 13	R			149.64	168.19	179.58	113
<i>Homo habilis</i>	OH 16	R			187.96	246.13	228.8	113
<i>Homo habilis</i>	OH 27	R					201.96	113
<i>Homo habilis</i>	OH 37	L			141.24	199.5		113
<i>Homo habilis</i>	OH 4	R					201.5	113
<i>Homo habilis</i>	OH 7	L			180.56	210.6		113
<i>Homo habilis</i>	OH 7	R			183.52			113
<i>Homo heidelbergensis</i>	Arago 1	L		100.7				89
<i>Homo heidelbergensis</i>	Arago 1	R	82.82					89
<i>Homo heidelbergensis</i>	Arago 13	U			184.96	204.4	174.2	97
<i>Homo heidelbergensis</i>	Arago 2	U			119.9	129.71	101.85	110
<i>Homo heidelbergensis</i>	Arago 22	R	68.25					89
<i>Homo heidelbergensis</i>	Arago 5	L		100.44				89
<i>Homo heidelbergensis</i>	Arago 6	R	80					114 in 115
<i>Homo heidelbergensis</i>	Arago 8	R			179.4	230.74	165	110
<i>Homo heidelbergensis</i>	AT 1	L			125.4	117.42	96.6	110
<i>Homo heidelbergensis</i>	AT 1	R			131.08	123.12	107.91	110
<i>Homo heidelbergensis</i>	AT 100	L					109	110
<i>Homo heidelbergensis</i>	AT 101	R			111.24			110
<i>Homo heidelbergensis</i>	AT 11	L				107		110
<i>Homo heidelbergensis</i>	AT 13	L					143.51	110
<i>Homo heidelbergensis</i>	AT 2	R			124.02			110
<i>Homo heidelbergensis</i>	AT 21	L			136.8			110
<i>Homo heidelbergensis</i>	AT 22, AT 75	L			111.28	106.92	98.44	110
<i>Homo heidelbergensis</i>	AT 30	R					107.67	110
<i>Homo heidelbergensis</i>	Mauer	L					129.95	102
<i>Homo heidelbergensis</i>	Mauer	R			129.92	152.4	132.98	102
<i>Homo neanderthalensis</i>	Amud 1	L			117.72	113.4	127.44	116
<i>Homo neanderthalensis</i>	Amud 1	R			118.8	116.39	121.8	116
<i>Homo neanderthalensis</i>	Amud III	R		95.68				116
<i>Homo neanderthalensis</i>	Archi	L	66.6	95.68				117 in 115
<i>Homo neanderthalensis</i>	Archi	R	69.3	98.58				117 in 115
<i>Homo neanderthalensis</i>	Barakai	U		111.1				118 in 119
<i>Homo neanderthalensis</i>	Couvin	R		87				119
<i>Homo neanderthalensis</i>	Cova Negra	R		87.87				120
<i>Homo neanderthalensis</i>	Dederiyeh 1	L	66.3	102.6	120.75			121
<i>Homo neanderthalensis</i>	Dederiyeh 1	R	68.8					121
<i>Homo neanderthalensis</i>	Dederiyeh 2	L	64.38	94.94				122
<i>Homo neanderthalensis</i>	Engis 2	R	58.8	90.9				123 in 115
<i>Homo neanderthalensis</i>	Fate 12	L				126.44		124
<i>Homo neanderthalensis</i>	Fate 2	L			113			124
<i>Homo neanderthalensis</i>	Fate 3	R					139.7	124
<i>Homo neanderthalensis</i>	Fate 5	L		85.85				124
<i>Homo neanderthalensis</i>	Fate 6	R			138.75			124
<i>Homo neanderthalensis</i>	Gibraltar 2	L	72.54	108.78				125,126
<i>Homo neanderthalensis</i>	Gibraltar 2	R	76.56	105.06				125,127

Species	Specimens	Side	dp3	dp4	m1	m2	m3	Source
<i>Homo neanderthalensis</i>	Grotte du Bison I Q5.1	R		81.7				128
<i>Homo neanderthalensis</i>	Grotte du Bison I S6	R		87				128
<i>Homo neanderthalensis</i>	Grotte du Renne 16	R				81.84		129
<i>Homo neanderthalensis</i>	Grotte du Renne 18	R	72.96					129
<i>Homo neanderthalensis</i>	Grotte du Renne 21	R				146.16		129
<i>Homo neanderthalensis</i>	Grotte du Renne 25	R	63					129
<i>Homo neanderthalensis</i>	Grotte du Renne 29	R		89				129
<i>Homo neanderthalensis</i>	Grotte du Renne 30	R			71.44			129
<i>Homo neanderthalensis</i>	Grotte du Renne 33	R	60.59					129
<i>Homo neanderthalensis</i>	Grotte du Renne 35	R			133.2			129
<i>Homo neanderthalensis</i>	Grotte du Renne 5	R				141.52		129
<i>Homo neanderthalensis</i>	Grotte du Renne 6	R					122.04	129
<i>Homo neanderthalensis</i>	Hortus 15	L		83.72				130 in 115
<i>Homo neanderthalensis</i>	Hortus 2	L		83.72				130 in 125
<i>Homo neanderthalensis</i>	KMH 1	L	65.52	92.92	84.15			131
<i>Homo neanderthalensis</i>	KMH 1	R	67.5	91.35				131
<i>Homo neanderthalensis</i>	KMH 14	L				140		131
<i>Homo neanderthalensis</i>	KMH 2	L				117.72	118.77	131
<i>Homo neanderthalensis</i>	KMH 2	R				120.99	123.17	131
<i>Homo neanderthalensis</i>	KMH 32	U				127.6		131
<i>Homo neanderthalensis</i>	Krapina 1, Krapina 7, Krapina 79	R			174.795	172.36	122.5	132
<i>Homo neanderthalensis</i>	Krapina 10, Krapina 77, Krapina 108	R			154.24	154.945	140.065	132
<i>Homo neanderthalensis</i>	Krapina 104	R			112.32			132
<i>Homo neanderthalensis</i>	Krapina 105	R			170			132
<i>Homo neanderthalensis</i>	Krapina 107	L				170.8		132
<i>Homo neanderthalensis</i>	Krapina 2, Krapina 84	R			125.97	141.45		132
<i>Homo neanderthalensis</i>	Krapina 3, Krapina 5, Krapina 82	L			154.2	142.945	140.79	132
<i>Homo neanderthalensis</i>	Krapina 4	L					128.26	132
<i>Homo neanderthalensis</i>	Krapina 51	L	77.9					132
<i>Homo neanderthalensis</i>	Krapina 52, Krapina 62	L		85.2025	116.28			132
<i>Homo neanderthalensis</i>	Krapina 53	R		109.545	151.875	160.475		132
<i>Homo neanderthalensis</i>	Krapina 54, Krapina 83	L			123.585	112.7		132
<i>Homo neanderthalensis</i>	Krapina 55, Krapina 106	L			157.3	150.93	136.53	132
<i>Homo neanderthalensis</i>	Krapina 57	R			143.125	143.22	129.34	132
<i>Homo neanderthalensis</i>	Krapina 58	L			127.53	135.09	128.4	132
<i>Homo neanderthalensis</i>	Krapina 58	R			129.6	136.23	132.37	132
<i>Homo neanderthalensis</i>	Krapina 59	L			130.98	140.3		132
<i>Homo neanderthalensis</i>	Krapina 59	R					133.34	132
<i>Homo neanderthalensis</i>	Krapina 6	L				135.85		132
<i>Homo neanderthalensis</i>	Krapina 63	L		115.575				132
<i>Homo neanderthalensis</i>	Krapina 64	L	77.42	91.91	130.68			132
<i>Homo neanderthalensis</i>	Krapina 65	L			102.46			132
<i>Homo neanderthalensis</i>	Krapina 66	L			106.5			132
<i>Homo neanderthalensis</i>	Krapina 68	R		112.86				132
<i>Homo neanderthalensis</i>	Krapina 78	L					116.48	132

Species	Specimens	Side	dp3	dp4	m1	m2	m3	Source
<i>Homo neanderthalensis</i>	Krapina 8	R					155.68	132
<i>Homo neanderthalensis</i>	Krapina 80	R			146.05			132
<i>Homo neanderthalensis</i>	Krapina 85	L					126.42	132
<i>Homo neanderthalensis</i>	Krapina 86	L				145.41		132
<i>Homo neanderthalensis</i>	Krapina 9	L					125.19	132
<i>Homo neanderthalensis</i>	La Ferrassie 4 bis	L		76.8				133 in 115
<i>Homo neanderthalensis</i>	La Ferrassie 8	L	62.16	101.37				133 in 115
<i>Homo neanderthalensis</i>	La Ferrassie 8	R	62.25					133 in 115
<i>Homo neanderthalensis</i>	La Quina 761	R		99.75				134 in 119
<i>Homo neanderthalensis</i>	Molare	L		118.65				115
<i>Homo neanderthalensis</i>	Molare	R	79.2	110.74				115
<i>Homo neanderthalensis</i>	Pech de l'Aze	R	65.25	92.92				125
<i>Homo neanderthalensis</i>	Roc de Marsal infant	L	66	96.46				135
<i>Homo neanderthalensis</i>	Roc de Marsal infant	R	65.7	99.64				135
<i>Homo neanderthalensis</i>	Salemas	L		110				136 in 135
<i>Homo neanderthalensis</i>	Scladina 4A-13	R		89.3				119
<i>Homo neanderthalensis</i>	Shanidar 1	L			105	117.72	124.2	137
<i>Homo neanderthalensis</i>	Shanidar 1	R			109.2	121	126.44	137
<i>Homo neanderthalensis</i>	Shanidar 2	L			126.44	135.6	131.04	137
<i>Homo neanderthalensis</i>	Shanidar 2	R			124.32	129.92	120.96	137
<i>Homo neanderthalensis</i>	Shanidar 6	R				148.68	156.16	137
<i>Homo neanderthalensis</i>	Shanidar 7	L	67.64	91				138
<i>Homo neanderthalensis</i>	Shanidar 7	R	61.92					138
<i>Homo neanderthalensis</i>	Tabun series IV	L		105.28				139:209 in 119
<i>Homo neanderthalensis</i>	Teshik-Tash	L	78.3	96.9				140 in 125
<i>Homo neanderthalensis</i>	Teshik-Tash	R	76.5	105.6				140 in 125
<i>Paranthropus boisei</i>	KNM-ER 1477	L	97.9	168.51				141
<i>Paranthropus boisei</i>	KNM-ER 1477	R	101.2	161.46				141
<i>Paranthropus boisei</i>	KNM-ER 3230	L			262.4	372.13	332.1	105
<i>Paranthropus boisei</i>	KNM-ER 3230	R			246.33	377.88	358.28	105
<i>Paranthropus boisei</i>	KNM-ER 729	R			248	351	418	142
<i>Paranthropus boisei</i>	OH 26	R					290.5	113
<i>Paranthropus boisei</i>	OH 30	L			252			113
<i>Paranthropus boisei</i>	OH 38	R				316.8		113
<i>Paranthropus robustus</i>	DNH 10	R					230.79	143
<i>Paranthropus robustus</i>	DNH 18	R					270.04	143
<i>Paranthropus robustus</i>	DNH 19	L				252.32		143
<i>Paranthropus robustus</i>	DNH 2	L		117.16				143
<i>Paranthropus robustus</i>	DNH 21	L				212.67	195.91	143
<i>Paranthropus robustus</i>	DNH 44	R	94.16					143
<i>Paranthropus robustus</i>	DNH 46	R			198.45			143
<i>Paranthropus robustus</i>	DNH 51	R				233.52	236.3	143
<i>Paranthropus robustus</i>	DNH 56	L		113.85				143
<i>Paranthropus robustus</i>	DNH 56	R		116				143
<i>Paranthropus robustus</i>	DNH 60	R	72.38	123.22	161.84	188.5		143
<i>Paranthropus robustus</i>	DNH 67	R			178.12			143
<i>Paranthropus robustus</i>	DNH 7	L			168.84	180.9	206.72	144
<i>Paranthropus robustus</i>	DNH 7	R				191.7	206.36	144
<i>Paranthropus robustus</i>	DNH 75	R					231.82	143
<i>Paranthropus robustus</i>	DNH 8	L			227.65	238.5	309.42	144

Species	Specimens	Side	dp3	dp4	m1	m2	m3	Source
<i>Paranthropus robustus</i>	DNH 8	R			223.44	229.4	291.4	144
<i>Paranthropus robustus</i>	KB 5223	L	74.26	128.75	179.8			88
<i>Paranthropus robustus</i>	KB 5223	R		128.75	178.75			88
<i>Paranthropus robustus</i>	SK 1	U				260.1		90
<i>Paranthropus robustus</i>	SK 104	U			205.5			90
<i>Paranthropus robustus</i>	SK 12	U					246.24	90
<i>Paranthropus robustus</i>	SK 1586	L				207		145
<i>Paranthropus robustus</i>	SK 1586	R				223.5	250.5	145
<i>Paranthropus robustus</i>	SK 1587	L			189.63			145
<i>Paranthropus robustus</i>	SK 1587	R				196.08		145
<i>Paranthropus robustus</i>	SK 1588	L			172.2			145
<i>Paranthropus robustus</i>	SK 1648	R					227.65	145
<i>Paranthropus robustus</i>	SK 23	L			217.56	224.96	208	90
<i>Paranthropus robustus</i>	SK 23	R			214.62	222	249.12	90
<i>Paranthropus robustus</i>	SK 25	L			205.72			90
<i>Paranthropus robustus</i>	SK 25	R			203	250.5		90
<i>Paranthropus robustus</i>	SK 34	U			208.8	270.54	297	90
<i>Paranthropus robustus</i>	SK 37	U				246.5		90
<i>Paranthropus robustus</i>	SK 3974	R			199.66			145
<i>Paranthropus robustus</i>	SK 3976	L			276.8			145
<i>Paranthropus robustus</i>	SK 3978	L	79.56	136.5				145
<i>Paranthropus robustus</i>	SK 3978	R	81.18	138.03				145
<i>Paranthropus robustus</i>	SK 438	L			141.7			89
<i>Paranthropus robustus</i>	SK 5	U				213		90
<i>Paranthropus robustus</i>	SK 55b	L			138.99	195.91		90
<i>Paranthropus robustus</i>	SK 55b	R			197.28	224.51	212.35	90
<i>Paranthropus robustus</i>	SK 6	L			243.2	275.31	292.3	90
<i>Paranthropus robustus</i>	SK 6	R			235.06	281.88	289.6	90
<i>Paranthropus robustus</i>	SK 61	L	100.7	158.27				90
<i>Paranthropus robustus</i>	SK 61	R	105.45	160.8	224.84			90
<i>Paranthropus robustus</i>	SK 62	L	85.05	143.88				90
<i>Paranthropus robustus</i>	SK 62	R			160.8			90
<i>Paranthropus robustus</i>	SK 63	L	72.54	127.2	199.8			90
<i>Paranthropus robustus</i>	SK 63	R	84.6	127.2	201.15			90
<i>Paranthropus robustus</i>	SK 64	R	92.22	134.62				90
<i>Paranthropus robustus</i>	SK 81	U					251.37	90
<i>Paranthropus robustus</i>	SK 828	U			223.08			90
<i>Paranthropus robustus</i>	SK 838	U			182			90
<i>Paranthropus robustus</i>	SK 839, SK 852	R	81					89
<i>Paranthropus robustus</i>	SK 840	U					206.4	90
<i>Paranthropus robustus</i>	SK 841	U			116.4		210.98	90
<i>Paranthropus robustus</i>	SK 842	U			125.24			90
<i>Paranthropus robustus</i>	SK 843	U			197.1	219.62		90
<i>Paranthropus robustus</i>	SK 844	U					215.28	90
<i>Paranthropus robustus</i>	SK 845	R			217.5	233.6		90
<i>Paranthropus robustus</i>	SK 846	U			200.1			90
<i>Paranthropus robustus</i>	SKW 4767	U			233.28			146
<i>Paranthropus robustus</i>	SKW 5	L				231.84		147
<i>Paranthropus robustus</i>	SKW 5	R			179.52	233.28	233.8	147
<i>Paranthropus robustus</i>	SKX 4446	U			221.65	270.18		148
<i>Paranthropus robustus</i>	SKX 4446	U			221.65	270.18		146
<i>Paranthropus robustus</i>	SKX 5002	L					247.42	149

Species	Specimens	Side	dp3	dp4	m1	m2	m3	Source
<i>Paranthropus robustus</i>	SKX 5013	U			163.2			148
<i>Paranthropus robustus</i>	SKX 5013	U			163.2			146
<i>Paranthropus robustus</i>	SKX 5014	U					258	148
<i>Paranthropus robustus</i>	SKX 5023	U			180.48			148
<i>Paranthropus robustus</i>	SKX 5023	U			180.48			146
<i>Paranthropus robustus</i>	TM 1536	L	79.38					89
<i>Paranthropus robustus</i>	TM 1536	R	76.8	116.62	149.86			88,89
<i>Paranthropus robustus</i>	TM 1601	R	85					89

**Supplementary Table 4 | Hominin mean rectangular area (mesiodistal length × buccolingual width, mm<sup>2</sup>) of lower deciduous premolars and molars, and number of individuals sampled at each tooth position for fossil hominin species in parentheses.**

Species	dp3	dp4	m1	m2	m3
<i>Homo sapiens</i>	55.96	90.11	122.46	114.45	109.95
<i>Ardipithecus ramidus</i>	35.77 (1)	(0)	110.37 (7)	148.01 (5)	144.56 (3)
<i>Australopithecus afarensis</i>	72.88 (4)	121.88 (2)	165.11 (17)	186.28 (18)	199.28 (13)
<i>Australopithecus africanus</i>	66.93 (3)	120.80 (7)	186.97 (6)	215.66 (5)	213.31 (6)
<i>Australopithecus anamensis</i>	(0)	(0)	148.82 (7)	207.84 (7)	186.58 (7)
<i>Australopithecus deyiremeda</i>	(0)	(0)	158.76 (1)	204.24 (1)	211.72 (1)
<i>Australopithecus sediba</i>	(0)	(0)	137.99 (2)	178.89 (2)	191.96 (2)
<i>Homo erectus</i> (Asia)	61.89 (3)	111.43 (6)	150.69 (19)	160.07 (18)	141.49 (16)
<i>Homo erectus</i> (Africa)	61.81 (2)	102.41 (2)	155.44 (10)	162.08 (8)	151.54 (7)
<i>Homo floresiensis</i>	(0)	(0)	90.02 (2)	95.70 (2)	82.66 (2)
<i>Homo habilis</i>	(0)	(0)	165.37 (4)	206.11 (4)	203.08 (4)
<i>Homo heidelbergensis</i>	77.02 (3)	100.57 (2)	136.20 (9)	150.21 (7)	125.93 (9)
<i>Homo neanderthalensis</i>	68.61 (17)	96.52 (34)	130.50 (24)	137.74 (24)	131.57 (19)
<i>Paranthropus boisei</i>	99.55 (1)	164.99 (1)	251.46 (3)	347.60 (3)	351.23 (3)
<i>Paranthropus robustus</i>	84.02 (11)	131.00 (14)	199.79 (29)	232.09 (20)	240.40 (21)

**Supplementary Table 5 | Mean, maximum and standard deviation of prediction error rates (%) for *Homo* and australopith fossil individuals.** The observed size of the tooth in the ‘Predicted using’ column was used to predict the sizes of each other tooth in the fossil. The average prediction errors for all tooth positions and specimens were 10.3% and 7.9% for *Homo* and australopith specimens respectively. \* indicates values that include *Homo neanderthalensis* KMH 1 where m1 is incompletely developed and so does not fit predictions.

### Mean Prediction Error

Taxon	Predicted using	Predicted tooth				
		dp3	dp4	m1	m2	m3
<i>Homo</i>	dp3		12.0	30.1*		
	dp4	8.6		12.7*	1.8	
	m1	17.1*	9.4*		10.2	15.5
	m2		1.2	7.0		8.7
	m3			10.1	8.5	
Australopiths	dp3		7.8	10.0	20.0	
	dp4	7.1		6.6	14.5	9.6
	m1	9.2	7.0		8.1	7.9
	m2	16.3	12.3	7.5		7.4
	m3		7.9	7.5	7.8	

### Maximum Prediction Error

Taxon	Predicted using	Predicted tooth				
		dp3	dp4	m1	m2	m3
<i>Homo</i>	dp3		36.7	62.2*		
	dp4	26.7		46.0*	1.8	
	m1	32.8*	30.1*		34.8	54.5
	m2		1.2	21.1		29.2
	m3			26.9	22.5	
Australopiths	dp3		19.1	29.1	20	
	dp4	16.1		16.1	17.4	19.2
	m1	22.6	19.2		22.8	23.5
	m2	16.3	14.5	18.0		21.4
	m3		15.7	29.2	27.2	

### SD of the Prediction Error

Taxon	Predicted using	Predicted tooth				
		dp3	dp4	m1	m2	m3
<i>Homo</i>	dp3		10.9	22.8*		
	dp4	7.4		16.9*		
	m1	11.1*	10.7*		7.2	12.2
	m2			4.7		7.6
	m3			6.4	6.7	
Australopiths	dp3		6.0	8.5		
	dp4	5.1		4.7	4.1	13.5
	m1	6.7	5.3		5.9	7.0
	m2		3.1	4.9		5.0
	m3		11.0	6.7	5.8	

**Supplementary Table 6 | Great ape mean rectangular area (mesiodistal length × buccolingual width, mm<sup>2</sup>) of lower deciduous premolars and molars.** Number of individuals is in parentheses. Sex: F, female; M, male.

Species	Sex	dp3	dp4	m1	m2	m3	Source
<i>Gorilla gorilla</i>	F	80.24 (20)	128.55 (16)	198.74 (35)	245.75 (28)	226.61 (17)	<sup>150</sup>
<i>Gorilla gorilla</i>	M	89.53 (16)	144.83 (13)	222.63 (30)	280.18 (23)	260.68 (17)	<sup>150</sup>
<i>Pan paniscus</i>	F	36.00 (2)	55.08 (2)	86.24 (40)	92.82 (25)	78.26 (13)	<sup>30</sup>
<i>Pan paniscus</i>	M	36.00 (3)	55.89 (4)	87.22 (33)	90.16 (17)	75.60 (12)	<sup>30</sup>
<i>Pan troglodytes</i>	F	41.09 (17)	63.8 (16)	103.79 (48)	113.35 (36)	103.44 (32)	<sup>150</sup>
<i>Pan troglodytes</i>	M	40.53 (19)	66.1 (18)	106.37 (30)	113.76 (17)	102.43 (10)	<sup>150</sup>
<i>Pongo pygmaeus</i>	F	56.32 (5)	94.28 (5)	150.56 (5)	166.06 (3)	159.29 (3)	<sup>151</sup>
<i>Pongo pygmaeus</i>	M	67.6 (9)	104.49 (9)	161.17 (12)	179.54 (6)	183.37 (3)	<sup>151</sup>

**Supplementary Table 7 | 2D and 3D measures of tooth size for six fossil hominin specimens.** Rectangular area (mesiodistal length × maximum buccolingual width, MDBLArea), 3D area of the enamel-dentine junction (EDJ3DArea), cross-sectional area of the tooth at the cervix (CervixArea) and outline area of the outer enamel surface (OES2DArea) for each tooth position.

Species	Specimen	Tooth	Cervix Area	EDJ3D Area	MDBL Area	OES2D Area
<i>Australopithecus anamensis</i>	KNM-KP 29286	m1	115.3	226.7	148.9	129.3
<i>Australopithecus anamensis</i>	KNM-KP 29286	m2	160.6	279.6	198.8	168.7
<i>Australopithecus anamensis</i>	KNM-KP 29286	m3	148.5	255.9	193.7	159.3
<i>Homo erectus</i>	Sangiran 1B	m1	114.5	265.4	169.0	141.6
<i>Homo erectus</i>	Sangiran 1B	m2	128.3	277.7	180.8	153.9
<i>Homo erectus</i>	Sangiran 1B	m3	120.7	253.7	180.0	147.2
<i>Homo neanderthalensis</i>	Scladina 4A I	m1	73.9	216.1	124.0	102.4
<i>Homo neanderthalensis</i>	Scladina 4A I	m2	84.0	211.1	128.3	106.3
<i>Homo neanderthalensis</i>	Scladina 4A I	m3	80.5	189.2	126.5	102.3
<i>Paranthropus boisei</i>	KNM-ER 15930	m1	125.6	281.8	181.9	154.0
<i>Paranthropus boisei</i>	KNM-ER 15930	m2	164.6	320.2	244.2	201.8
<i>Paranthropus boisei</i>	KNM-ER 15930	m3	176.7	342.3	277.5	220.0
<i>Paranthropus robustus</i>	DNH 8	m1	125.8	316.0	215.9	185.5
<i>Paranthropus robustus</i>	DNH 8	m2	150.9	317.4	242.8	203.0
<i>Paranthropus robustus</i>	DNH 8	m3	163.1	370.0	304.3	243.7
<i>Paranthropus robustus</i>	SK 6	m1	162.0	352.7	246.2	207.3
<i>Paranthropus robustus</i>	SK 6	m2	190.7	373.6	286.9	234.2
<i>Paranthropus robustus</i>	SK 6	m3	200.4	374.5	301.3	245.3

**Supplementary Table 8 | Results for multiple linear regression of proportion of maximum in tooth row (PropRowMaxP) vs tooth position (ToothNoP) and area of m1 (AreaM1) for *Homo* species.**

**Plane A**

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	0.4405763	0.0940624	4.684	0.000352	***
ToothNoP	0.2377533	0.0134270	17.707	5.56e-11	***
AreaM1	-0.0016578	0.0006297	-2.633	0.019684	*

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.04591 on 14 degrees of freedom

(14 observations deleted due to missingness)

Multiple R-squared: 0.9593, Adjusted R-squared: 0.9535

F-statistic: 165 on 2 and 14 DF, p-value: 1.848e-10

**Plane B**

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	1.2257523	0.1115384	10.990	2.86e-07	***
ToothNoP	-0.0821669	0.0207012	-3.969	0.0022	**
AreaM1	0.0006890	0.0004452	1.548	0.1500	

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.03873 on 11 degrees of freedom

(10 observations deleted due to missingness)

Multiple R-squared: 0.6226, Adjusted R-squared: 0.554

F-statistic: 9.075 on 2 and 11 DF, p-value: 0.004701

## Supplementary Table 9 | Results for multiple linear regression of proportion of maximum in tooth row (PropRowMaxP) vs tooth position (ToothNoP) and area of m1 (AreaM1) for australopithecines.

### Plane A

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	8.096e-02	7.664e-02	1.056	0.309
ToothNoP	2.304e-01	1.652e-02	13.950	1.32e-09 ***
AreaM1	2.379e-06	3.358e-04	0.007	0.994

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.0576 on 14 degrees of freedom

(17 observations deleted due to missingness)

Multiple R-squared: 0.9345, Adjusted R-squared: 0.9251

F-statistic: 99.8 on 2 and 14 DF, p-value: 5.197e-09

### Plane B

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	0.9062316	0.0813763	11.136	5.09e-08 ***
ToothNoP	0.0096313	0.0162932	0.591	0.565
AreaM1	0.0001680	0.0002022	0.831	0.421

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.03259 on 13 degrees of freedom

(10 observations deleted due to missingness)

Multiple R-squared: 0.07408, Adjusted R-squared: -0.06837

F-statistic: 0.5201 on 2 and 13 DF, p-value: 0.6064

**Supplementary Table 10 | Results for multiple linear regression of proportion of maximum in tooth row (PropRowMaxP) vs tooth position (ToothNoP) and area of m1 (AreaM1) for great apes.**

**Plane A**

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	0.1729463	0.0432668	3.997	0.00312	**
ToothNoP	0.2677833	0.0135136	19.816	9.85e-09	***
AreaM1	-0.0007271	0.0002288	-3.178	0.01121	*

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.03822 on 9 degrees of freedom

(10 observations deleted due to missingness)

Multiple R-squared: 0.9781, Adjusted R-squared: 0.9733

F-statistic: 201.4 on 2 and 9 DF, p-value: 3.374e-08

**Plane B**

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	1.2875205	0.1459685	8.821	0.000311	***
ToothNoP	-0.0836563	0.0307087	-2.724	0.041567	*
AreaM1	0.0003374	0.0003184	1.060	0.337646	

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.04343 on 5 degrees of freedom

(10 observations deleted due to missingness)

Multiple R-squared: 0.6309, Adjusted R-squared: 0.4832

F-statistic: 4.272 on 2 and 5 DF, p-value: 0.08279

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