Supplementary Data 1

Jaw mechanics and the evolutionary palaeoecology of the megaherbivorous dinosaurs from the
Dinosaur Park Formation (upper Campanian) of Alberta, Canada

Jordan C. Mallon and Jason S. Anderson

Journal of Vertebrate Palaeontology

TABLE S1. Raw data used in this study. **Taxonomic abbreviations:** **A**, Ankylosauria; **An**, Ankylosauridae; **C**, Ceratopsidae; **Ce**, Centrosaurinae; **Cen**, *Centrosaurus*; **Ch**, Chasmosaurinae; **Cha**, *Chasmosaurus*; **Cor**, *Corythosaurus*; **Euo**, *Euoplocephalus*; **Gry**, *Gryposaurus*; **H**, Hadrosauridae; **Ha**, Hadrosaurinae; **No**, Nodosauridae; **La**, Lambeosaurinae; **Lam**, *Lambeosaurus*; **pac**, ‘pachyrhinosaur’; **Pan**, *Panoplosaurus*; **Par**, *Parasaurolophus*; **Pro**, *Prosaurolophus*; **Sty**, *Styracosaurus*; **Vag**, *Vagaceratops*. **Institutional abbreviations:** **AMNH**, American Museum of Natural History, New York, New York; **ACM**, Beneski Museum of Natural History, Amherst, Massachusetts; **CMN**, Canadian Museum of Nature, Ottawa, Ontario; **FMNH**, Field Museum of Natural History, Chicago, Illinois; **MCSNM**, Museo Civico di Storia Naturale di Milano, Milan, Italy; **NHMUK**, Natural History Museum, London; **ROM**, Royal Ontario Museum, Toronto, Ontario; **TMM**, Texas Memorial Museum, Austin, Texas; **TMP**, Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta; **UALVP**, University of Alberta Laboratory of Vertebrate Palaeontology, Edmonton, Alberta; **USNM**, United States National Museum, Washington, D. C.; **YPM**, Yale Peabody Museum, New Haven, Connecticut. **Other abbreviations:** **?**, cannot estimate (missing data); **a + e'**, moment arm of the resistance force at the mesial tooth position; **a + e' + b**, moment arm of the resistance force at the predentary apex; **a - e''**, moment arm of the resistance force at the mesial tooth position; **d**, diagonal distance between jaw joint and point of insertion of adductor musculature at apex of coronoid process; **L**, left; **MAZ**, Megaherbivore Assemblage Zone; **R**, right; **RBF**, relative bite force; **θ**, angle made by adductor muscle resultant relative to tooth row; **δ**, angle between d and tooth row.

Suborder/ Family	Family/ Subfamily	Genus	Specimen	MAZ	Side	a + e' + b	a + e'	a - e''	d	θ	δ
A	An	Euo	AMNH 5337	?	L	?	201	81	50	47.76	29.75
A	An	Euo	AMNH 5405	?	R	259	204	87	45	34.93	54.15
A	An	Euo	TMP 1997.132.0001	?	L	?	205	68	69	38.57	31.11
A	An	Euo	UALVP 31	2	R	?	185	83	57	26.44	10.91
A	No	Pan	AMNH 5381	1	L	347	255	130	122	21.79	52.52
A	No	Pan	CMN 2759	1	L	285	184	84	91	44.25	40.94
A	No	Pan	ROM 1215	1	L	?	193	93	65	17.08	50.75
A	No	Pan	TMP 1998.098.0001	1	R	?	282	125	92	59.62	33.93
C	Ce	Cen	AMNH 5351	1	R	611	351	85	185	59.24	57.17
C	Ce	Cen	CMN 347	1	R	1	0.553	?	0.268	63.73	64.00
C	Ce	Cen	CMN 348	?	L	675	387	85	225	49.97	34.81
C	Ce	Cen	CMN 8795	1	L	644	365	74	168	30.32	64.84
C	Ce	Cen	ROM 767	1	R	612	345	61	182	53.81	47.93
C	Ce	Cen	TMP 1997.085.0001	1	R	?	367	60	154	32.33	50.91

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	RBF at prementary apex	RBF at mesial tooth	RBF at distal tooth
A	An	Euo	AMNH 5337	?	0.2429	0.6027
A	An	Euo	AMNH 5405	0.1737	0.2206	0.5172
A	An	Euo	TMP 1997.132.0001	?	0.3156	0.9516
A	An	Euo	UALVP 31	?	0.1869	0.4166
A	No	Pan	AMNH 5381	0.3385	0.4606	0.9035
A	No	Pan	CMN 2759	0.3182	0.4928	1.0795
A	No	Pan	ROM 1215	?	0.3119	0.6473
A	No	Pan	TMP 1998.098.0001	?	0.3256	0.7346
C	Ce	Cen	AMNH 5351	0.2712	0.4721	1.9493
C	Ce	Cen	CMN 347	0.2120	0.3833	?
C	Ce	Cen	CMN 348	0.3320	0.5790	2.6361
C	Ce	Cen	CMN 8795	0.2598	0.4584	2.2611
C	Ce	Cen	ROM 767	0.2912	0.5165	2.9212
C	Ce	Cen	TMP 1997.085.0001	?	0.4167	2.5488

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	MAZ	Side	a + e' + b	a + e'	a - e''	d	ø	δ
C	Ce	Cen	UALVP 16248	1	?	515	296	?	140	61.93	55.37
C	Ce	Cen	USNM 8897	1	L	615	336	90	205	47.01	48.46
C	Ce	Cen	YPM 2015	1	L	613	369	85	207	58.51	43.71
C	Ce	pac	TMP 2002.076.0001	2	L	689	401	80	196	39.01	47.09
C	Ce	Sty	CMN 344	2	L	660	381	89	206	46.74	53.45
C	Ce	Sty	TMP 1986.126.0001	2	L	548	323	80	173	37.07	45.57
C	Ch	Cha	CMN 2245	2	R	595	374	50	195	48.99	49.67
C	Ch	Cha	CMN 2280	1	L	626	360	70	170	63.09	54.90
C	Ch	Cha	ROM 839	2	R	665	409	87	218	64.92	46.42
C	Ch	Cha	ROM 843	2	L	?	444	83	200	58.84	50.03
C	Ch	Vag	CMN 41357	?	R	655	371	83	196	66.97	36.04
H	Ha	Gry	CMN 2278	1	L	745	525	140	289	53.21	39.15
H	Ha	Gry	MCSNM 345	1	L	690	390	86	251	61.36	49.49
H	Ha	Gry	ROM 764	1	R	?	?	125	245	55.56	41.16
H	Ha	Gry	ROM 873	1	R	733	521	140	284	55.81	47.17
H	Ha	Gry	TMP 1980.022.0001	1	L	545	381	105	220	57.48	40.45
H	Ha	Gry	TMP 1991.081.0001	?	L	530	367	55	217	68.66	50.55
H	Ha	Pro	ACM 578	2	R	?	574	123	282	50.91	39.45
H	Ha	Pro	AMNH 5386	?	L	?	?	66	225	53.25	46.95
H	Ha	Pro	CMN 2277	2	R	750	506	117	254	58.98	39.17
H	Ha	Pro	CMN 2870	?	L	774	532	132	260	50.45	33.42
H	Ha	Pro	ROM 1928	2	L	655	420	93	247	46.39	43.93
H	Ha	Pro	ROM 787	2	R	726	503	124	271	54.51	40.69
H	Ha	Pro	TMM 41262	2	R	?	421	114	223	56.72	40.09
H	Ha	Pro	TMP 1984.001.0001	2	R	?	535	140	294	45.89	42.02
H	Ha	Pro	USNM V 12712	2	L	922	579	150	272	56.47	41.96

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	RBF at prementary apex	RBF at mesial tooth	RBF at distal tooth
C	Ce	Cen	UALVP 16248	0.2416	0.4203	?
C	Ce	Cen	USNM 8897	0.3318	0.6073	2.2674
C	Ce	Cen	YPM 2015	0.3300	0.5483	2.3801
C	Ce	pac	TMP 2002.076.0001	0.2838	0.4876	2.4443
C	Ce	Sty	CMN 344	0.3072	0.5322	2.2781
C	Ce	Sty	TMP 1986.126.0001	0.3131	0.5312	2.1447
C	Ch	Cha	CMN 2245	0.3240	0.5154	3.8555
C	Ch	Cha	CMN 2280	0.2398	0.4170	2.1445
C	Ch	Cha	ROM 839	0.3053	0.4965	2.3339
C	Ch	Cha	ROM 843	?	0.4262	2.2801
C	Ch	Vag	CMN 41357	0.2916	0.5147	2.3008
H	Ha	Gry	CMN 2278	0.3876	0.5500	2.0625
H	Ha	Gry	MCSNM 345	0.3400	0.6015	2.7276
H	Ha	Gry	ROM 764	?	?	1.9465
H	Ha	Gry	ROM 873	0.3775	0.5312	1.9767
H	Ha	Gry	TMP 1980.022.0001	0.3998	0.5719	2.0752
H	Ha	Gry	TMP 1991.081.0001	0.3574	0.5161	3.4436
H	Ha	Pro	ACM 578	?	0.4913	2.2926
H	Ha	Pro	AMNH 5386	?	?	3.3552
H	Ha	Pro	CMN 2277	0.3352	0.4969	2.1490
H	Ha	Pro	CMN 2870	0.3340	0.4859	1.9584
H	Ha	Pro	ROM 1928	0.3771	0.5881	2.6559
H	Ha	Pro	ROM 787	0.3717	0.5366	2.1765
H	Ha	Pro	TMM 41262	?	0.5260	1.9423
H	Ha	Pro	TMP 1984.001.0001	?	0.5492	2.0986
H	Ha	Pro	USNM V 12712	0.2918	0.4647	1.7937

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	MAZ	Side	a + e' + b	a + e'	a - e''	d	ø	δ
H	La	Cor	AMNH 5240	1	R	682	410	113	215	41.31	44.13
H	La	Cor	AMNH 5338	1	R	576	384	94	217	46.87	49.13
H	La	Cor	CMN 8676	1	L	501	320	90	179	50.15	57.27
H	La	Cor	CMN 8704	1	L	?	362	92	215	40.94	49.22
H	La	Cor	ROM 1933	1	L	?	372	85	224	36.70	49.51
H	La	Cor	ROM 1947	1	L	?	245	43	104	46.90	54.60
H	La	Cor	ROM 776	1	R	?	417	122	271	25.94	53.86
H	La	Cor	ROM 845	1	L	623	399	110	250	37.30	47.93
H	La	Cor	ROM 870	1	R	?	339	112	195	45.61	45.66
H	La	Cor	ROM 871	1	L	?	396	117	225	58.96	47.21
H	La	Cor	TMP 1980.023.0004	1	L	?	441	92	260	41.10	43.38
H	La	Cor	TMP 1982.037.0001	1	R	?	344	88	214	37.12	51.79
H	La	Cor	TMP 1984.121.0001	?	L	610	405	102	240	43.57	44.08
H	La	Cor	CMN 34825	1	R	365	285	78	178	42.45	46.05
H	La	Cor	ROM 868	1	L	?	415	127	226	36.69	55.11
H	La	Cor	TMP 1980.040.0001	1	L	555	355	114	230	37.43	44.80
H	La	Lam	AMNH 5340	?	L	308	220	53	129	48.90	46.70
H	La	Lam	AMNH 5353	?	L	?	380	66	225	37.26	52.57
H	La	Lam	AMNH 5373	?	L	515	334	91	201	38.45	50.09
H	La	Lam	AMNH 5382	?	L	?	?	117	257	42.82	38.83
H	La	Lam	CMN 2869	?	R	?	310	104	191	55.86	36.37
H	La	Lam	CMN 351	?	L	?	396	105	235	48.62	50.54
H	La	Lam	CMN 8503	2	R	445	302	62	185	44.10	50.80
H	La	Lam	CMN 8633	1	R	?	287	72	176	54.70	45.05
H	La	Lam	CMN 8703	1	R	?	406	95	214	47.34	42.76
H	La	Lam	CMN 8705	2	L	671	405	115	256	39.72	39.02

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	RBF at predeantary apex	RBF at mesial tooth	RBF at distal tooth
H	La	Cor	AMNH 5240	0.3143	0.5227	1.8966
H	La	Cor	AMNH 5338	0.3747	0.5620	2.2959
H	La	Cor	CMN 8676	0.3409	0.5337	1.8977
H	La	Cor	CMN 8704	?	0.5939	2.3369
H	La	Cor	ROM 1933	?	0.6008	2.6295
H	La	Cor	ROM 1947	?	0.4160	2.3701
H	La	Cor	ROM 776	?	0.6396	2.1861
H	La	Cor	ROM 845	0.3999	0.6244	2.2649
H	La	Cor	ROM 870	?	0.5751	1.7406
H	La	Cor	ROM 871	?	0.5457	1.8470
H	La	Cor	TMP 1980.023.0004	?	0.5868	2.8130
H	La	Cor	TMP 1982.037.0001	?	0.6220	2.4314
H	La	Cor	TMP 1984.121.0001	0.3931	0.5921	2.3510
H	La	Cor	CMN 34825	0.4875	0.6243	2.2813
H	La	Cor	ROM 868	?	0.5443	1.7787
H	La	Cor	TMP 1980.040.0001	0.4106	0.6419	1.9990
H	La	Lam	AMNH 5340	0.4168	0.5836	2.4224
H	La	Lam	AMNH 5353	?	0.5921	3.4091
H	La	Lam	AMNH 5373	0.3902	0.6016	2.2081
H	La	Lam	AMNH 5382	?	?	2.1733
H	La	Lam	CMN 2869	?	0.6157	1.8351
H	La	Lam	CMN 351	?	0.5859	2.2096
H	La	Lam	CMN 8503	0.4142	0.6103	2.9729
H	La	Lam	CMN 8633	?	0.6044	2.4092
H	La	Lam	CMN 8703	?	0.5271	2.2526
H	La	Lam	CMN 8705	0.3742	0.6199	2.1833

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	MAZ	Side	a + e' + b	a + e'	a - e''	d	ø	∂
H	La	Lam	FMNH 1479	1	L	?	378	98	212	56.22	42.82
H	La	Lam	NHMUK R9527	?	R	?	378	105	245	41.33	41.28
H	La	Lam	ROM 1218	2	L	?	401	95	245	47.66	47.63
H	La	Lam	ROM 758	2	R	306	207	57	125	48.74	51.34
H	La	Lam	ROM 794	2	R	655	392	84	250	41.77	59.96
H	La	Lam	ROM 869	1	L	494	340	95	212	17.66	48.49
H	La	Lam	TMP 1966.004.0001	?	R	604	381	85	225	39.38	45.61
H	La	Lam	TMP 1981.037.0001	1	R	620	398	76	229	40.08	45.77
H	La	Lam	TMP 1982.038.0001	1	L	460	340	76	238	56.17	46.33
H	La	Lam	TMP 1997.012.0128	2	L	595	352	87	207	40.80	44.49
H	La	Par	ROM 768	1	L	588	398	113	235	41.23	38.60

TABLE S1. (Continued)

Suborder/ Family	Family/ Subfamily	Genus	Specimen	RBF at prementary apex	RBF at mesial tooth	RBF at distal tooth
H	La	Lam	FMNH 1479	?	0.5539	2.1364
H	La	Lam	NHMUK R9527	?	0.6428	2.3140
H	La	Lam	ROM 1218	?	0.6084	2.5680
H	La	Lam	ROM 758	0.4022	0.5945	2.1591
H	La	Lam	ROM 794	0.3737	0.6244	2.9141
H	La	Lam	ROM 869	0.3925	0.5703	2.0411
H	La	Lam	TMP 1966.004.0001	0.3711	0.5883	2.6370
H	La	Lam	TMP 1981.037.0001	0.3684	0.5739	3.0053
H	La	Lam	TMP 1982.038.0001	0.5051	0.6834	3.0573
H	La	Lam	TMP 1997.012.0128	0.3467	0.5861	2.3713
H	La	Par	ROM 768	0.3934	0.5812	2.0470

FIGURE S1: ACM 578, *Prosaurolophus maximus*

FIGURE S2: AMNH 5240, *Corythosaurus casuarius*

FIGURE S3: AMNH 5337, *Euoplocephalus tutus*

FIGURE S4: AMNH 5338, *Corythosaurus casuarius*

FIGURE S5: AMNH 5340, *Lambeosaurus* sp.

FIGURE S6: AMNH 5351, *Centrosaurus apertus*

FIGURE S7: AMNH 5353, *Lambeosaurus lambei*

FIGURE S8: AMNH 5373, *Lambeosaurus lambei*

FIGURE S9: AMNH 5381, *Panoplosaurus mirus*

FIGURE S10: AMNH 5382, *Lambeosaurus clavinitialis*

FIGURE S11: AMNH 5386, *Prosaurolophus maximus*

FIGURE S12: AMNH 5405, *Euoplocephalus tutus*

FIGURE S13: CMN 344, *Styracosaurus albertensis*

FIGURE S14: CMN 347, *Centrosaurus apertus*

FIGURE S15: CMN 348, *Centrosaurus apertus*

FIGURE S16: CMN 351, *Lambeosaurus lambei*

FIGURE S17: CMN 2245, *Chasmosaurus belli*

FIGURE S18: CMN 2277, *Prosaurolophus maximus*

FIGURE S19: CMN 2278, *Gryposaurus notabilis*

FIGURE S20: CMN 2280, *Chasmosaurus russelli*

FIGURE S21: CMN 2759, *Panoplosaurus mirus*

FIGURE S22: CMN 2869, *Lambeosaurus lambei*

FIGURE S23: CMN 2870, *Prosaurolophus maximus*

FIGURE S24: CMN 8503, *Lambeosaurus* sp.

FIGURE S25: CMN 8633, *Lambeosaurus* sp.

FIGURE S26: CMN 8676, *Corythosaurus intermedius*

FIGURE S27: CMN 8703, *Lambeosaurus clavinitialis*

FIGURE S28: CMN 8704, *Corythosaurus intermedius*

FIGURE S29: CMN 8705, *Lambeosaurus magnicristatus*

FIGURE S30: CMN 8795, *Centrosaurus apertus*

FIGURE S31: CMN 34825, *Corythosaurus* sp.

FIGURE S32: CMN 41357, *Vagaceratops irvinensis*

FIGURE S33: FMNH 1479, *Lambeosaurus lambei*

FIGURE S34: MCSNM 345, *Gryposaurus notabilis*

FIGURE S35: NHMUK R9527, *Lambeosaurus* sp.

FIGURE S36: ROM 758, *Lambeosaurus* sp.

FIGURE S37: ROM 764, *Gryposaurus notabilis*

FIGURE S38: ROM 767, *Centrosaurus apertus*

FIGURE S39: ROM 768, *Parasaurolophus walkeri*

FIGURE S40: ROM 776, *Corythosaurus intermedius*

FIGURE S41: ROM 787, *Prosaurolophus maximus*

FIGURE S42: ROM 794, *Lambeosaurus lambei*

FIGURE S43: ROM 839, *Chasmosaurus* sp.

FIGURE S44: ROM 843, *Chasmosaurus belli*

FIGURE S45: ROM 845, *Corythosaurus intermedius*

FIGURE S46: ROM 868, *Corythosaurus* sp.

FIGURE S47: ROM 869, *Lambeosaurus clavinitialis*

FIGURE S48: ROM 870, *Corythosaurus casuarius*

FIGURE S49: ROM 871, *Corythosaurus casuarius*

FIGURE S50: ROM 873, *Gryposaurus notabilis*

FIGURE S51: ROM 1215, *Panoplosaurus mirus*

FIGURE S52: ROM 1218, *Lambeosaurus lambei*

FIGURE S53: ROM 1928, *Prosaurolophus maximus*

FIGURE S54: ROM 1933, *Corythosaurus casuarius*

FIGURE S55: ROM 1947, *Corythosaurus* sp.

FIGURE S56: TMM 41262, *Prosaurolophus maximus*

FIGURE S57: TMP 1966.004.0001, *Lambeosaurus magnicristatus*

FIGURE S58: TMP 1980.022.0001, *Gryposaurus notabilis*

FIGURE S59: TMP 1980.023.0004, *Corythosaurus intermedius*

FIGURE S60: TMP 1980.040.0001, *Corythosaurus casuarius*

FIGURE S61: TMP 1981.037.0001, *Lambeosaurus clavinitialis*

FIGURE S62: TMP 1982.037.0001, *Corythosaurus* sp.

FIGURE S63: TMP 1982.038.0001, *Lambeosaurus lambei*

FIGURE S64: TMP 1984.001.0001, *Prosaurolophus maximus*

FIGURE S65: TMP 1984.121.0001, *Corythosaurus casuarius*

FIGURE S66: TMP 1986.126.0001, *Styracosaurus albertensis*

FIGURE S67: TMP 1991.081.0001, *Gryposaurus notabilis*

FIGURE S68: TMP 1997.012.0128, *Lambeosaurus lambei*

FIGURE S69: TMP 1997.085.0001, *Centrosaurus apertus*

FIGURE S70: TMP 1997.132.0001, *Euoplocephalus tutus*

FIGURE S71: TMP 1998.098.0001, *Panoplosaurus mirus*

FIGURE S72: TMP 2002.076.0001, 'pachyrhinosaur'

FIGURE S73: UALVP 31, *Euoplocephalus tutus*

FIGURE S74: UALVP 16248, *Centrosaurus apertus*

FIGURE S75: USNM 8897, *Centrosaurus apertus*

FIGURE S76: USNM V 12712, *Prosaurolophus maximus*

FIGURE S77: YPM 2015, *Centrosaurus apertus*