

Supplementary Data 1

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Hip joint articular soft tissues of non-dinosaurian Dinosauromorpha and early Dinosauria:
evolutionary and biomechanical implications for Saurischia

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TABLE S1. Archosauromorph taxa studied and imaging techniques used to investigate hip joint anatomy. All photogrammatized specimens were also photographed.

Institutional Abbreviations—**BMNH**, Burpee Museum of Natural History, Rockford, Illinois, U.S.A.; **BSP**, Paläontologisches Museum München, Munich, Germany; **BYU**, Brigham Young University Museum of Paleontology, Provo, Utah, U.S.A.; **CM**, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, U.S.A.; **DINO**, Dinosaur National Monument, Jensen, Utah, U.S.A.; **DMNH**, Denver Museum of Natural History, Denver, Colorado, U.S.A.; **DNM**, Dinosaur National Monument, Jensen, Utah, U.S.A.; **FHPR**, Utah Field House of Natural History, Vernal, Utah, U.S.A.; **FIP**, Florida Institute of Paleontology, Fort Lauderdale, Florida, U.S.A.; **FMNH**, Field Museum of Natural History, Chicago, Illinois, U.S.A.; **GPIT**, Institute for Geosciences, Eberhard-Karls-Universität Tübingen, Tübingen, Germany; **GR**, Ruth Hall Museum of Paleontology, Abiquiu, New Mexico, U.S.A.; **HMN**, Museum für Naturkunde Berlin, Berlin, Germany; **IGM**, Mongolian Geological Institute, Ulaanbaatar, Mongolia; **IVPP**, Institute of Vertebrate Paleontology and Paleoanthropology, Beijing, China; **LACM**, Natural History Museum of Los Angeles County, Los Angeles, California, U.S.A.; **MACN**, Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina; **MB.R**, Museum für Naturkunde Berlin, Berlin, Germany; **MCZ**, Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A.; **MDM**, Mesalands Dinosaur Museum, Tucumcari, New Mexico, U.S.A.; **MLP**, Museo de La Plata, La Plata, Argentina; **MNA**, Museum of Northern Arizona, Flagstaff, Arizona, U.S.A.; **MOR**, Museum of the Rockies, Bozeman, Montana, U.S.A.; **MPEF**, Museo Paleontológico Egidio Feruglio, Trelew, Argentina; **MUVC**, University of Missouri Vertebrate Collection, Columbia, Missouri, U.S.A.; **NAMAL**, North American Museum of Ancient Life, Lehi, Utah, U.S.A.; **NGMC**, National Geological Museum of China, Beijing, China; **NHMUK** (formerly **BMNH**), Natural History Museum, London, U.K.; **NMT**, National Museum of Tanzania, Dar es Salaam, Tanzania; **PEFO**, Petrified Forest National Park, Petrified Forest, Arizona, U.S.A.; **PVL**, Instituto Miguel Lillo, Tucumán, Argentina; **PVPH**, Museo Carmen Funes, Plaza Huincul, Argentina; **PVSJ**, Instituto y Museo de Ciencias Naturales, San Juan, Argentina; **RAM**, Raymond M. Alf Museum of Paleontology, Claremont, California, U.S.A.; **SMNS**, Staatliches Museum für Naturkunde Stuttgart, Stuttgart, Germany; **TMM**, Texas Memorial Museum, Austin, Texas, U.S.A.; **TPI**, North American Museum of Ancient Life, North American Museum of Ancient Life, Lehi, Utah, U.S.A.; **TTUP**, Museum of Texas Tech University, Lubbock, Texas, U.S.A.; **UCMP**, University of California Museum of Paleontology, Berkeley, California, U.S.A.; **UMNH**, Utah Museum of Natural History, Salt Lake City, Utah, U.S.A.; **YPM**, Yale Peabody Museum of Natural History, New Haven, Connecticut, U.S.A.

TAXON	SPECIMEN IDENTIFICATION	IMAGING TECHNIQUE
Outgroup archosauromorphs		
<i>Gracilisuchus stipanicorum</i>	MCZ 4116, MCZ 4118	Photogrammetry
Phytosaur indet.	TMM 43685	Photogrammetry
<i>Chanaresuchus bonapartei</i>	MCZ 4035, 4036, 4037, PVL 6244	Photogrammetry

Table 1. (continued)

<i>Vancleavea campi</i>	PEFO 2427, 34035, 14269	Photography
<i>Trilophosaurus buettneri</i>	TMM 31025.77, 31025.79B, 31025.140, 31025.190, 31025.781, 31025.1000, 31025.1050, 31025. 1073	Photogrammetry
<i>Hyperodapedon sanjuanensis</i>	MCZ 2643, 3640, 3641, 4608, 4610, 4611, 4637	Photogrammetry
Outgroup Dinosauromorphs		
<i>Asilisaurus kongwe</i>	NMT RB159	Laser scan
<i>Silesaurus</i> sp.	GR 261, PEFO 34347	Photogrammetry
<i>Eucoelophysis baldwini</i>	GR 195, 225	Photogrammetry
<i>Lagosuchus talampayensis</i>	MCZ 4137, MCZ 4346 (Cast of PVL 4619)	Photogrammetry
<i>Lagerpeton chanarensis</i>	MCZ 4121	Photogrammetry
<i>Dromomeron</i> sp.	GR 218, 219, 234, TTUP 12539X, 18331, UMNH VP H4-712-100626	Photogrammetry
Ornithischians		
<i>Lesothosaurus diagnosticus</i>	NHMUK RUB 17	Laser scan
Sauropodomorphs		
<i>Adeopapposaurus mognai</i>	PVSJ 610	Photogrammetry
<i>Alamosaurus sanjuanensis</i>	TMM 41541, 40597, 45889, 45891	Photogrammetry
<i>Amargasaurus cazaui</i>	MACN N-15	Photogrammetry
<i>Ammosaurus major</i>	YPM 208	Photogrammetry
<i>Anchisaurus polyzelus</i>	YPM 1883	Photogrammetry
<i>Argyrosaurus superbus</i>	FMNH P13019	Photogrammetry
<i>Apatosaurus</i> sp.	CM 3018, 83, 35, 21752, YPM 1940, 1960, 1980, 1981, FMNH 25112, LACM 52844, UMNH VP 21125, FMAC 403, BYU 681-4499, 681-12914, 681-16964	Photogrammetry

Table 1. (continued)

<i>Barosaurus lentus</i>	NAMAL 106, YPM 429	Photogrammetry
<i>Diplodocid</i> indet.	UMNH VP 7558	Photogrammetry
<i>Giraffatitan brancai</i>	FMNH P 25107	Photogrammetry
<i>Brachytrachelopan mesai</i>	MPEF-PV 1716	Photogrammetry
<i>Camarasaurus</i> sp.	BYU 661-9047, CM 11338, 11393, DNM 2401, 4514, TMM 42423, UMNH VP 5285, YPM 1901, 1910, 4625, 5851, 5857	Photogrammetry
<i>Cedarosaurus weiskopfae</i>	DMNH 37045	Photography
<i>Dicraeosaurus</i> sp.	MB.R 4886	Photogrammetry
<i>Efraasia minor</i>	SMNS 12216	Photogrammetry
<i>Haplocanthosaurus priscus</i>	CM 572, FHPR 1106	Photogrammetry
<i>Leoneriasaurus taquetrensis</i>	MPEF-PV 1663	Photogrammetry
<i>Mussaurus patagonicus</i>	MLP unnumbered	Photogrammetry
<i>Panphagia protos</i>	PVSJ 874	Photography
<i>Diplodocus</i> sp.	DMNH 1494, 462, DINO 2921, CM 84, 94, 21710, 21788, 21745, BYU 681-17014, BMNH unnumbered	Photogrammetry
<i>Giraffatitan brancai</i>	HMN SII	Photogrammetry
<i>Patagosaurus fariasi</i>	MACN CH 233, 239, 240, 933, 1299, 1986	Photogrammetry
<i>Plateosaurus</i> sp.	MB.R 4430, SMNS 58958, F14 91294, F29 91302, F61 91309, F65 91310, GPIT 1	Photogrammetry
<i>Rapetosaurus krousei</i>	FMNH PR 2209	Photogrammetry
<i>Ruehleia bedheimensis</i>	MB.R 4179	Photogrammetry
<i>Sarhsaurus aurifontanalis</i>	TMM 43646-282	Photogrammetry
<i>Sauroposeidon proteles</i>	YPM 5449	Photogrammetry
<i>Supersaurus vivianae</i>	BYU 725-13018	Photogrammetry

Table 1. (continued)

<i>Tehuelchesaurus benetezii</i>	MPEF PV 1125	Photogrammetry
<i>Tornieria africana</i>	MB.R 2637, 2649, 2666, 2671, 2700, 2713, 2716, 2722, 2733	Photogrammetry
<i>Eoraptor lunensis</i>	PVSJ 512	Photography
Theropods		
<i>Chindesaurus bryansmalli</i>	GR155, PEFO 33982	Photography
<i>Herrerasaurus ischigualastensis</i>	MACN 18060, MCZ 4381, MLP 61-VIII-2-3, PVSJ 373	Photogrammetry
<i>Staurikosaurus pricei</i>	MCZ 1669	Photogrammetry
<i>Eodromaeus murphi</i>	PVSJ 560	Photography
<i>Tawa hallae</i>	GR 155, 235, H2-054-100606, H3-267-070526, H3-474, H3-485-120817, H4 -469-11818	Photogrammetry
<i>Coelophysis bauri</i>	AMNH 7224, AMNH 7228, AMNH 7229, AMNH 7230, AMNH 7233, CM 76863, 81179, DMNH 14729, 22702, GR 245, MNA V3118, TTUP 15041, UCMP 129618, UMNH VP H2-388-110816, YPM 41197	Photogrammetry, laser scan
<i>Liliensternus liliensterni</i>	MB.R 2175 (two individuals)	Photogrammetry
<i>Dilophosaurus wetherilli</i>	TMM 43246-126, UCMP 37302, 77270	Photogrammetry, laser scan
<i>Cryolophosaurus ellioti</i>	FMNH PR 1821	Photogrammetry
<i>Elaphrosaurus bambergi</i>	MB.R 4960	Photogrammetry
<i>Ceratosaurus</i> sp.	BYU VP 881- 12893, 765-4970, TPI 1010, UMNH VP 5278	Photogrammetry
<i>Ligabueino andesi</i>	MACN PV N42	Photography
<i>Carnotaurus sastrei</i>	MACN CH 894	Photogrammetry
<i>Eoabelisaurus mefi</i>	MPEF-PV 3990	Photogrammetry
<i>Torvosaurus tanneri</i>	BYU 725-2014, 725-2015, 725-4977	Photogrammetry

Table 1. (continued)

<i>Megalosaurus bucklandii</i>	BMNH (UK) 31811	Computed tomography
<i>Condorraptor curumili</i>	MPEF-PV 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1696, 1704	Photogrammetry
<i>Piatntzkysaurus floresii</i>	MACN CH 895	Photogrammetry
<i>Marshosaurus bicentesimus</i>	UMNH VP 6372, 6373, 6374, 6378, 6379, 6380, 6384, 6386, 6387	Photogrammetry
<i>Siats meekerorum</i>	FMNH PR 2716	Photogrammetry
<i>Tyrannotitan chubutensis</i>	MPEF PV 1156, 1157	Photogrammetry
<i>Allosaurus</i> sp.	BYU 671-8901, 725-4842, 725-5163, 725-17281, DINO 11541, DMNH 2149, 44397, DNM 2974, FMNH P 25114, MCZ 4397, UMNH VP 6317, 7149, 7892, 7894, 7896, 7899, 8114, 8118, 8119, 8121, 8122, 8124, 8232, 22267, 20726, UMNH VP-DNM 2540	Photogrammetry, laser scan
<i>Stokesosaurus clevelandii</i>	UMNH VP 2383, 2938, 6051, 6052	Photogrammetry
<i>Teratophoneus curriei</i>	RAM 9132, UMNH VP 16690	Photogrammetry
<i>Alioramus altai</i>	IGM 100-1844	Photogrammetry
<i>Daspletosaurus torosus</i>	AMNH 5438	Photogrammetry
<i>Tyrannosaurus rex</i>	BMNH (US) 2001.4.1, CM 9380, FMNH PR 2081, LACM 150164, MOR 555, TMM 40811	Photogrammetry, laser scan
<i>Gorgosaurus libratus</i>	FMNH PR 2211	Photography
<i>Coelurus fragilis</i>	YPM 2010	Photogrammetry
<i>Tanycolagreus topwilsoni</i>	TPI 1011	Photogrammetry
<i>Ornitholestes hermanni</i>	AMNH 619	Photogrammetry
<i>Compsognathus longipes</i>	BSP AS I-563	Photography
<i>Archaeornithomimus asiaticus</i>	AMNH 6570, AMNH 6576, AMNH 21790, AMNH 21798,	Photogrammetry

Table 1. (continued)

	AMNH 21799, AMNH 21800	
<i>Ornithomimus</i> sp.	RAM 6794, RAM 14182, AMNH 67292	Photogrammetry
<i>Struthiomimus altus</i>	AMNH 5375, AMNH 5385, AMNH 5339	Photogrammetry
<i>Patagonykus puertai</i>	PVPH 37	Literature value
<i>Shuvuuia deserti</i>	IGM 100-975, IGM 100-1805	Photogrammetry
<i>Parvicursor remotus</i>	IGM 100-1844	Photogrammetry
<i>Falcarius utahensis</i>	UMNH VP 12361, 12368, 12375, 14535, 14540, 14541, 14658, 14665	Photogrammetry
<i>Enigmosaurus mongoliensis</i>	IGM 100-84	Literature value
<i>Nothronychus graffami</i>	UMNH VP 16420	Photography
<i>Caudipteryx zoui</i>	NGMC 97-4-A	Literature value
<i>Khaan mckennai</i>	IGM 100-1002, IGM 100-0973	Laser scan
<i>Anzu wyliei</i>	CM 78000, 78001	Photogrammetry
<i>Citipati osmolskae</i>	IGM 100-928	Photogrammetry
<i>Oviraptor philoceratops</i>	AMNH 6517	Photogrammetry
<i>Conchoraptor gracilis</i>	IGM 100-3006	Photogrammetry
<i>Unenlagia comahuensis</i>	MACN cast of PVPH 78	Photogrammetry
<i>Bambiraptor feinbergi</i>	FIP 001	Laser scan
<i>Deinonychus antirrhopus</i>	MCZ 4371, RAM 1856 (cast of AMNH 3015), YPM 5235	Photogrammetry
<i>Velociraptor mongoliensis</i>	IGM 100-985, 100-986	Laser scan
<i>Utahraptor ostrommaysorum</i>	BYU 2586, 7510-10073, 7510- 14567, 7510-18078, 1833	Photogrammetry
Troodontidae indet.	AMNH 20257, AMNH 30250, AMNH 30251, AMNH 30253, AMNH 30298, AMNH 30300, AMNH 30301, AMNH 30303	Photogrammetry
<i>Sinornithoides youngi</i>	IVPP V9612	Computed tomography
<i>Archaeopteryx</i>	HMN 1880, BSP S6	Photography

Table 1. (continued)

<i>lithographica</i>		
<i>Patagopteryx deferrariisi</i>	MACN N-03, N-11	Photogrammetry
<i>Dinornis maximus</i>	BSP Ag68-I-2A7a	Photography
<i>Tinamus solitarius</i>	LACM 101689 SN	Photography
<i>Apteryx australis</i>	LACM 102342	Photogrammetry
<i>Rhea pennata</i>	LACM CSULB 6335	Photogrammetry
<i>Struthio camelus</i>	LACM 1014 SN, 1136 SN, LACM 112605	Photogrammetry
<i>Gallus gallus</i>	MUVC-AV 014	Photography
<i>Meleagris gallopavo</i>	MUVC-AV 017	Photography, computed tomography
<i>Aythya ferina</i>	BSP unnumbered	Photography

