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1. Details of the new phylogenetic analysis

1.1. Modifications to Baron *et al*. (2017) data matrix

The following list presents all character scoring modifications to the original taxon-character matrix of Baron *et al*. (2017). Unless explicitly mentioned, specimen numbers without asterisks have been scored from notes and photographs after their first-hand examination by at least one of the authors, specimens marked with † were coded based only on photographic material, and specimens marked with * were coded on direct observation of the specimens.

Aardonyx celestae; score modifications based on the first-hand observation of all specimens mentioned in Yates *et al*. (2010).

19: 0 >1. 21 0 >1. 54: 0 >?. 57: 0 >?. 156: 1 >0. 202: 1 >0. 204: 1 >0. 266: 1 >0. 280: ? >0. Ch 286: 2 >1. 348: 0 >?. 365: ? >1. 376: ? >0. 382: 0 >?. 439: 0 >1. 450: 1 >0.

Abrictosaurus consors; score modifications based on NHMUK RU B54†. Further bibliographic source: Sereno (2012).

7: 0>?; 26 0>?; 35. 2>0/1; 47: 0>?; 54 1>?; 369 0>?; 424 1>?.

Agilisaurus louderbacki; score modifications based on Barrett *et al*. (2005) and scorings in Butler *et al*. (2008) and Barrett *et al*. (2016).

6: 0>?; 11: 0>1; 35: 1>0; 54: 1>0; 189: ?>0.

Agnosphitys cromhallensis; score modifications based on cast of VMNH 1751. Further bibliographic source: Fraser *et al*. (2001).

15: ? >0; 16: ? >0; 21: ? >1; 24: ? >1; 30: 0 >?; 159: 0 >1; 160: - >0; 164: - >?; 165: ? >0; 167: ? >0; 172: 0 >?; 176: 0 >?; 177: 1 >0; 180: ? >0; 185: 0 >?; 221: 0 >?; 222: 0 >?; 252: 0 >1; 253: 0 >1; 254: 1 >?; 256: 0 >1; 258: 1 >?; 259: ? >0; 292: ? >1; 298: ? >0; 303: 1 >2; 305: 2 >1; 306: ? >2; 315: 1 >0; 317: ? >1; 318: ? >0; 409: ? >0; 411: 1 >0; 419: 1 >0; 421: ? >0.

Antetonitrus ingenipes; score modifications based on BP/1/4952 (holotype).

199: 1 > 0. 202: 0 >1. 266 1 >0. 272: ? >0/1. 280: ? >0. 297: 1 >0. 307: 2 >12. 310: 1 >?. 358: 1 >2. 364: 0 >?. 366: - >0. 382: 0 >?. 405: 0 >1.

Asilisaurus kongwe; score modifications based on NMT RB 9 (holotype), 10-16, 18-21, 34, 101, 110-121, 123-130, 132-133, 135-136, 138-146 and 817. Further bibliographic source: Nesbitt *et al*. (2010).

37: ? >0; 40: ? >1; 42: ? >1; 44: ? >1; 45: ? >0; 46: ? >1; 47: ? >0; 48: ? >0; 49: ? >0; 76: 0 >?; 121: - >?; 122: - >?; 123: - >?; 127: 0 >1; 132: 0 >?; 148: 0 >?; 149: ? >1; 156: 1 >0; 160: - >0; 164: - >?; 167: ? >0; 168: ? >0; 170: - >?; 176: 0 >?; 177: 1 >0; 187: ? >0; 191: - >?; 192: 1 >?; 203: ? >0; 204: 1 >0; 207: ? >0; 209: 0 >?; 213: 0 >?; 214: 1 >?; 216: 0 >?; 221: 0 >?; 222: 0 >?; 223: 1 >0; 224: 0 >1; 225: 0 >?;

227: 0 >?; 229: 0 >?; 230: 0 >1; 231: - >?; 232: ? >0; 252: 0 >?; 253: 0 >?; 254: 0 >?; 255: 0 >1; 257: ? >0&1; 258: ? >1; 261: 0 >?; 293: 0 >?; 294: 0 >?; 295: 1 >?; 296: 0 >?; 297: 0 >?; 298: ? >0; 303: 0 >?; 306: 1 >0; 307: 1 >?; 315: 1 >0; 317: 0 >?; 319: 0 >?; 325: 1 >?; 330: ? >1; 332: 0 >?; 335: ? >0; 343: - >?; 344: - >?; 345: - >?; 349: 1 >?; 350: - >?; 352: 0 >?; 357: ? >0; 360: ? >1; 361: ? >1; 365: 0 >1; 366: ? >0; 369: 0 >0&1; 371: - >0; 373: ? >0; 381: - >?; 382: ? >1; 388: ? >0; 395: ? >0; 397: ? >0; 402: ? >0; 405: 1 >?; 407: 1 >?; 408: 0 >?; 411: ? >0; 439: 1 >?.

Chindesaurus bryansmalli; score modifications based on PEFO 33982 (holotype).

193: 0 >?; 198: 0 >?; 207: ? >0; 217: ? >0; 218: ? >0; 229: 1 >0; 230: ? >1; 232: ? >0; 292: 1 >?; 208: 0 >?; 312: ? >0; 313: 1 >2; 317: 1 >?; 318: ? >1; 333: ? >2; 335: ? >0; 338: 1 >?; 346: ? >0; 371: - >0; 380: 1 >0; 381: - >?; 383: 0 >?; 387: 1 >?; 388: 0 >?; 391: ? >1; 392: 0 >?; 398: 1 >?; 402: 1 >?; 403: 0 >1; 410: ? >1; 411: 1 >0; 412: 0 >1; 413: ? >1; 415: ? >0; 418: ? >1; 419: ? >0.

Coelophysis bauri; score modifications based on AMNH 7223, 7224 (neotype), 7227, 7228, 7229, 7230, 7231, 7232, 7234, 7235, 7236, 7237, 7238, 7257, 7258, 7243, 7244, 7245, 7246, 7247, 7248, 7249, 7250, 7251, 7252, 7253, 7254, 7255, and NMMNH P-42200. Further bibliographic source: Colbert (1989).

20: 1 >0; 25: 1 >0; 27: ? >0; 28: ? >0; 33: 0 >1; 42: 0 >1; 47: 1 >0/1; 80: 0 >?; 81: 1 >0; 84: 1 >0; 117: 0 >?; 127: 0 >1; 135: ? >1; 140: 2 >?; 141: 0 >1; 186: ? >0; 199: 1 >2; 205: ? >1; 207: 1 >0; 219: 0 >1; 239: ? >0; 245: 1 >0; 247: 1 >0; 251: 1 >0; 256: 1 >0/1; 257: 1 >?; 262: ? >1; 264: 1 >?; 270: 0 >1; 272: 1 >2; 273: 1 >0; 284: 0 >1; 286: 0 >1; 300: ? >0; 321: 1 >2; 323: 0 >1; 324: 0 >?; 326: 1 >0/1; 330: 0 >1; 331: 1 >0; 333: 1 >0; 335: 0 >?; 348: 1 >?; 349: 0 >1; 353: 2 >?; 354: 0 >?; 360: 2 >0; 362: 2 >1; 366: ? >0; 370: 2 >1; 371: 0 >?; 372: 1 >0; 374: 1 >0; 378: ? >1; 379: ? >0; 380: ? >0; 382: 1 >?; 386: 0 >1; 402: 1 >?; 406: 1 >?; 416: 1 >?; 417: 0 >?; 419: 0 >?; 425: 1 >0; 426: ? >0; 438: 1 >0.

Coloradisaurus brevis; score modifications based on PVL 5904 (holotype). Further bibliographic sources: Apaldetti *et al*. (2012, 2014).

12: 1 >?. 20: 0 >?. 25: 0 >?. 28: 1 >?. 81: 1 >0. 104: 0 >?. 106: 1 >0. 130: 0 >1. 132: 1 >?. 144: 1 >0. 159: 1 >?. 167: 2 >?. 204: 1 >0. 208: 1 >0 . 260: 0 >1. 323: 1 >0. 365: ? >1. 374: 1 >0. 382: 0 >1 . 392: 1 >0. 395: 0 >1. 415: 1 >0. 418: 0 >1. 434: 3 >1. 439: 0 >1. 444: 0 >1. Ch 450: 0 >1. .

Cryolophosaurus ellioti; score modifications based on FMNH PR1821 (holotype). Further bibliographic source: Smith *et al*. (2007).

1: 0 >?; 3: 0 >?; 4: 1 >?; 30: 0 >?; 35: 1 >1/2; 38: 1 >?; 39: ? >2; 42: 0 >1; 55: ? >0; 63: ? >1; 64: 1 >?; 65: ? >0; 74: 0 >1; 80: 0 >1; 82: 1 >0; 84: ? >0; 88: 0 >1; 90: 0 >1; 91: 0 >?; 93: 0 >?; 97: 0 >1; 100: ? >1; 105: ? >0; 113: ? >1; 117: 0 >?; 139: ? >0; 142: 0 >1; 143: 0 >1; 174: 0 >?; 175: 0 >?; 176: 0 >?; 177: 0 >?; 183: 0 >?; 185: 0 >?; 188: ? >0; 196: 1 >?; 199: ? >0; 202: 1 >0; 206: 0 >?; 208: 0 >?; 209: ? >0; 215: 2 >?; 229: 1 >?; 230: ? >1; 261: 0 >1; 292: ? >1; 299: 1 >?; 303: 1 >2; 316: ? >0; 321: 0 >2; 323: 1 >1/2; 332: 0 >?; 355: ? >0; 364: ? >1; 366: ? >0; 368: 1 >0; 386: 0 >1; 387: ? >2; 388: ? >1; 390: ? >1; 394: ? >1; 395: ? >1; 399: 0 >1; 400: 0 >1; 402: ? >1; 411: 1 >0; 415: ? >0; 416: 0 >?; 419: ? >0/1; 422: 1 >0.

Dilophosaurus wetherilli; score modifications based on UCMP 37302 (holotype), 37303, and 77270. Further bibliographic sources: Welles (1984); Tykoski (2005).

2: 0 >1; 10: 1 >1/2; 13: 0 >1; 14: ? >0; 15: 0 >1; 20: 0 >1; 21: 0 >1; 27: 0 >?; 35: 1 >2; 38: 0 >1; 41: 1 >?; 42: 0 >1, 46: 0 >?; 54: 0 >1; 57: 0 >?; 70: 0 >1, 71: 1 >-; 73: 1 >?; 82: 1 >?; 83: 1 >?; 98: 0 >1; 99: ? >0; 100: ? >1; 106: ? >0; 107: ? >1; 108: ? >0; 115: 0 >?; 127: 0 >1, 130: 0 >1; 131: 0 >1; 133: 0 >1; 142: ? >0; 145: 2 >1; 154: 1 >?; 155: 0 >?; 167: 0 >1; 168: 0 >?; 171: 1 >?; 173: 0 >?; 179: 0 >1; 180: 0 >1; 181: 1 >?; 182: 1 >?; 184: 1 >?; 186: ? >1; 187: 0 >1&2; 194: ? >2; 198: 0 >1, 208: ? >1; 213: 0 >1, 214: ? >0; 218: 0 >?; 219: 0 >?; 224: 0 >?; 227: 0 >1, 228: 0 >1; 329: 0 >?; 231: 0 >?; 335: 0 >?; 337: 0 >?; 338: 0 >?; 245: 0 >1; 246: 0 >1, 251: 0 >1; 257: 0 >1, 270: ? >1; 274: 2 >0; 277: 0 >1, 291: 0 >1; 305: 2 >1; 307: 0 >1; 317: 0 >1; 319: 1 >?; 321: ? >2; 322: 1 >2; 326: 1 >?; 327: ? >1; 328: ? >-; 330: 0 >1, 333: 1 >2; 334: 1 >1/2; 336: 2 >1; 341: ? >0; 350: 0 >1; 352: 0 >1; 369: 1 >?; 370: 2 >1; 374: 0 >1; 380: 0 >1; 384: ? >1; 391: 0 >1; 395: ? >1; 399: 0 >1; 400: 0 >1, 403: 0 >1; 407: ? >1; 409: 0 >?; 419: ? >0; 420: ? >1; 421: 0 >?; 422: ? >0; 425: ? >1; 432: 1 >0; 434: 2 >3; 437: ? >0; 438: 1 >?; 443: ? >1; 444: ? >1; 445: 0 >?; 457: 0 >?.

Diodorus scytobrachion; score modifications based on Kammerer *et al*. (2011).

126: 0 >?; 128: 0 >?; 129: 2 >?; 130: ? >0; 148: 0 >?; 157: 1 >0; 160: - >0; 164: - >?; 184: 1 >?; 254: 1 >?; 255: 1 >0; 260: 0 >?; 353: ? >1; 357: 0 >1; 358: 0 >1; 360: 1 >0; 361: ? >1; 363: ? >0; 371: - >0; 381: - >?; 386: ? >0.

Dracoraptor hanigani; score modifications based on NMW 2015.5G.1–2015.5G.11 (holotype). Further bibliographic source: Martill *et al*. (2016).

Characters 1, 19, 20, 22, 26, 28, 29, 30, 36, 49, 64, 95, 162, 163, 165, 174, 175, 176, 178, 185, 226, 269, 282, 321, 351, 354, 366, 371, 405, 408, 438, 441, 445, 453−457: changed from (0) to (?). Characters 13, 14, 119, 198, 328, 334, 346, 427, 428, 429, 431, 451: changed from (?) to (0). Characters 15, 18, 33, 38, 46, 94, 236, 285, 364, 365, 404, 407, 443, 444: changed from (1) to (?). Characters 23, 199: changed from (0) to (1). Characters 25, 34, 61, 193, 205, 264, 336, 348, 350, 374: changed from (1) to (0). Characters 39, 442: changed from (2) to (?). Characters 50−53, 164: changed from (-) to (?). Character 56: changed from (0) to (0/1). Characters 114, 190, 191, 204, 207, 228, 262, 392, 414: changed from (?) to (1). Character 151: changed from (3) to (2). Characters 206, 376, 387: changed from (?) to (2). Character 370: changed from (2) to (1). Character 434: changed from (?) to (2/3).

Dracovenator regenti; score modifications based on BP/1/5243 (holotype). Further bibliographic sources: Yates (2005); Ezcurra (2012).

Character 9: changed from (0) to (1). Character 10: changed from (2) to (1/2). Character 11: changed from (2) to (?). Characters 14, 119: changed from (?) to (0). Characters 15, 16, 17, 31, 34, 44, 48, 179: changed from (1) to (?). Characters 13, 19: changed from (1) to (0). Characters 22, 26, 32, 33, 36, 37, 127, 154, 155, 167: changed from (0) to (?). Character 24: changed from (1) to (1/2). Character 35: changed from (2) to (1). Characters 43, 131, 141: changed from (?) to (1). Character 147: changed from (0) to (0/1). Character 180: changed from (?) to (0/1).

Efraasia minor; score modifications based on SMNS 12684 and 12667. Further bibliographic sources: Galton (1973); Yates (2003a).

4: 1 >0; 5: 0 >?; 6: 0 >?; 12: 0 >1; 13: ? >?; 20: 1 >0; 23: 1 >0; 25:? >0; 27: 0 >?; 30: 1 >?; 33: 0 >1; 37: 1 >0/1; 39: 2 >1; 41: 0 >?; 42: 0 >?; 44: ? >1; 49: 0 >?; 54: 0 >?; 66: 1 >?; 75: 1 >0; 76: 0 >?; 80: 1 >2; 81: 1 >0; 82: 0 >?; 84: ? >1; 86: 1 >0; 87: 1 >?; 88: 1 >?; 89: ? >0; 90: ? >1; 91: ? >0; 92: ? >0; 93: ? >1; 96: 0 >?; 99: ? >0; 106: ? >1; 108: ? >1; 117: ? >2; 122: 0 >1; 126: 0 >?; 127: ? >1; 132: 1 >?; 133: 1 >?; 139: 1 >?; 140: ? >?; 142: 0 >?; 143: 0 >?; 144: 1 >?; 145: 2 >?; 154: 2 >1; 159: ? >0; 163: 0 >?; 165: ? >0; 166: ? >0; 170: ? >0; 172: 0 >?; 174: 2 >1; 176: 0 >1; 180: ? >0; 192: 0 >?. 206: 1>2. 210: 1 >0. 216: 1 >0. 244: 0 >?. 256 0 >1. 283 1 >0. 298 1 >0. 308 1 >0. 325 1 >?. 329 1 >?. 331 1 >0. 362 2 >1/2. 395 0 >?. 405 0 >?. 442: 2 >?.

Emausaurus ernsti; score modifications based on SGWG 85† (holotype). Further bibliographic source: Haubold (1991).

30: 0 >1; 66: 1 >0; 70: 0 >?; 75: 0 >?; 77: 0 >?; 78: 0 >?; 79: 0 >? ; 145: 2 >1; 168: 0 >-; 269: 0 >?; 274: 3 >1; 282: 0 >?; 285: 0 >?; 288: 1 >?; 382: ? >1; 383: ? >1; 457: 0 >?.

Eodromaeus murphi; score modifications based on PVSJ 560 (holotype). Further bibliographic source: Martínez *et al*. (2011).

2: ? >0; 3: ? >0; 11: 0 >?; 16: ? >0; 18: ? >1; 19: ? >1; 20: ? >1; 21: ? >0; 22: ? >0; 24: ? >1; 28: ? >0; 30: ? >0&2; 35: ? >1; 37: ? >0; 38: 0 >?; 42: 0 >?; 43: 1 >0; 48: 0 >?; 49: ? >0; 54: 1 >?; 60: 0 >?; 66: 1 >?; 75: 0 >?; 76: 1 >?; 99: 0 >?; 100: 1 >?; 103: 1 >?; 121: - >?; 122: - >?; 123: - >?; 126: ? >0; 130: 1 >0; 143: 0 >?; 144: 1 >?; 145: 2 >?; 148: 0 >?; 153: 1 >?; 160: - >0; 163: ? >0; 166: ? >0; 167: 1 >0; 194: 2 >?; 195: 1 >0; 196: 0 >?; 204: 0 >1; 205: ? >0; 214: 0 >?; 220: ? >0; 226: 0 >?; 231: 0 >1; 241: 1 >0; 253: ? >1; 257: ? >1; 258: ? >1; 259: ? >0; 260: ? >0; 261: ? >0; 266: - >?; 272: ? >1&2; 279: ? >0; 281: 0 >?; 290: ? >1; 293: ? >0; 294: ? >0; 295: ? >0; 296: ? >0; 297: ? >0; 298: ? >0; 299: ? >0; 300: ? >1; 301: ? >1; 302: ? >0; 303: 1 >2; 304: ? >0; 305: ? >1; 306: ? >2; 307: ? >0; 308: ? >0; 310: ? >0; 314: ? >0; 315: ? >1; 316: ? >0; 317: ? >1; 318: 0 >1; 319: ? >0; 321: ? >1; 323: ? >1; 324: ? >0; 326: ? >1; 328: ? >0; 329: ? >2; 331: ? >0; 334: ? >0; 341: 1 >0; 343: - >?; 344: - >?; 345: - >?; 351: ? >0; 353: ? >1; 354: ? >0; 355: ? >0; 357: ? >0; 360: 0 >1; 364: ? >1; 365: ? >0; 366: ? >0; 368: ? >0; 371: - >0; 372: ? >0; 377: ? >1; 382: ? >1; 387: 2 >1; 388: ? >0; 389: 1 >0; 391: ? >0; 393: ? >1; 395: ? >0; 402: ? >0; 417: 0 >?; 419: 0 >?; 423: 0 >?; 424: 1 >0; 429: 0 >?; 439: 0 >?; 452: 0 >?.

Eocursor parvus; score modifications based on SAM-PK-K8025. Further bibliographic source: Butler (2010).

145: 2 >1; 313: 1 >2; 357: 1 >0; 369: 0 >1; 457: 0 >?.

Eoraptor lunensis; score modifications based on PVSJ 512 (holotype). Further bibliographic source: Sereno *et al*. (2012).

1: 1 >0; 5: 0 >?; 11: 0 >1; 20: 1 >0; 21: 0 >1; 24: 0 >1; 26: 0 >1; 28: ? >0; 32: - >?; 33: 0 >1; 42: 0 >1; 43: 1 >0; 50: - >?; 51: - >?; 52: - >?; 53: - >?; 54: 1 >0; 55: ? >0; 61: 0 >1; 71: 1 >0; 76: 1 >0; 78: 1 >0; 79: 1 >0; 82: ? >1; 85: ? >0; 97: 0 >?; 100: 1 >0; 106: 1 >0; 121: - >?; 122: - >?; 123: - >?; 127: 1 >?; 133: 1 >0; 135: 1 >0; 160: - >0; 164: - >?; 168: 0 >?; 172: 0 >?; 188: ? >0; 193: 1 >0; 195: ? >0; 204: 1 >0&1;

205: 1 >0; 213: 0 >1; 219: ? >0; 223: 0 >?; 225: ? >0; 228: 1 >0; 229: 0 >1; 230: ? >1; 232: ? >0; 239: 0 >?; 241: 1 >0; 259: ? >0; 266: - >?; 273: 1 >0; 277: 1 >0; 283: 0 >1; 296: ? >0; 300: ? >1; 303: 1 >2; 307: ? >0; 308: 1 >?; 309: 1 >?; 317: 1 >?; 325: 1 >1&2; 327: ? >1; 328: - >?; 333: ? >0&2; 340: ? >1; 343: - >?; 344: - >?; 345: - >?; 348: ? >0; 350: - >?; 353: ? >1; 354: ? >0; 357: ? >0; 358: ? >2; 360: 2 >1; 368: ? >0; 370: 2 >1; 372: 1 >0; 381: - >?; 387: 2 >1; 388: ? >0; 389: ? >0; 390: ? >0; 391: ? >0; 392: ? >0; 393: ? >1; 395: ? >0; 401: ? >0; 402: ? >0; 403: 1 >0; 409: 0 >?; 411: 1 >0; 415: ? >0; 417: 0 >1; 418: ? >1; 419: 1 >0; 423: ? >0; 424: ? >0; 431: ? >0; 435: 1 >0; 438: ? >0; 439: 1 >?; 440: ? >1; 441: 0 >?; 446: ? >0.

Eucoelophysis baldwini; score modifications based on NMNNH P-22298 (holotype). Further bibliographic sources: Sullivan and Lucas (1999) and Ezcurra (2006).

321: 1 >0: 325: 1 >?: 332: 0 >?: 333: 1 >2: 346: ? >0: 347: ? >1: 354: 2 >0: 357: 1 >0: 360: ? >0: 361: ? >0: 362: 2 >?: 363: ? >0: 370: 2 >1: 372: 0 >1: 378: 1 >0: 382: 0 >1: 383: 1 >?: 385: 0 >?: 386: 0 >?: 387: 1 >?: 388: 0 >?: 389: 0 >?: 390: 1 >?: 391: 0 >?: 0 >?: 439: 0 >1.

Euparkeria capensis; score modifications based on GPIT 1681; SAM-PK-5867 (holotype), 5883, 6047, 6048, 6049, 6050, 7659, 7696, 7700, 7704, 7706, 7707, 7709, 7710, 7712, 10671, 13664, 13665, 13666, 13667; SAM-PK-K8050, K8051, K8309; and UMZC T692. Further bibliographic sources: Ewer (1965), Gow (1970), Gower and Weber (1998), Senter (2003), Sobral et al. (2016), and Sookias (2016).

Characters 22, 44, 311, 419, 443: changed from (1) to (0). Characters 30, 33, 56, 91, 141, 209, 227, 240, 326, 348, 369, 390, 430: changed from (0) to (1). Character 100: changed from (0) to (-). Characters 102, 266, 376: changed from (?) to (-). Characters 110, 211, 212, 263, 338, 340, 425, 455: changed from (?) to (1). Characters 142, 201, 268, 272, 288, 457: changed from (0) to (?). Characters 166, 226, 228, 229, 259, 264, 265, 316, 357, 361, 382, 395, 399, 400, 402, 411, 417, 420, 424: changed from (?) to (0). Character 202: changed from (-) to (?). Character 216: changed from (0) to (2). Character 312: changed from (-) to (0). Character 313: changed from (-) to (2). Character 336: changed from (2) to (0).

Fruitadens haagarorum; score modifications based on LACM 115747†. Further bibliographic source: Butler *et al*. (2010).

4: 1>?; 35: 2>0; 129: 2>0; 155: 1>0; 189: 1>?; 193: 1>0; 234: 0>0/1

Guaibasaurus candelariensis; score modifications based on MCN PV 2355 (holotype), 2356 and UFRGS PV0725T.

215: 1 >?; 217: ? >0; 221: 0 >?; 222: 0 >?; 223: ? >1; 225: 1 >?; 226: ? >0; 228: 0 >1; 232: ? >0; 247: 0 >?; 252: ? >1; 253: ? >1; 255: ? >1; 256: ? >1; 258: ? >1; 259: ? >0; 263: ? >1; 264: ? >0; 267: ? >1; 269: ? >0; 293: ? >0; 294: ? >0; 295: ? >0; 296: ? >0; 297: ? >0; 298: ? >0; 300: ? >1; 301: 0 >1; 302: 1 >0; 304: 1 >0; 305: ? >1; 306: 2 >1; 307: ? >0; 309: 0 >1; 313: ? >2; 314: ? >0; 315: ? >1; 317: ? >1; 323: 0 >?; 325: 2 >?; 326: ? >1; 327: 0 >1; 328: - >?; 330: 0 >1&2; 333: 0 >2; 336: 2 >1; 341: ? >0; 343: - >?; 344: - >?; 345: - >?; 350: - >?; 353: ? >1; 357: ? >0; 371: - >0; 381: - >?; 387: 1 >2; 388: ? >0; 390: ? >1; 391: ? >0; 396: ? >0; 398: 0 >?; 402: 0 >?; 403: 0 >1; 404: ? >1; 405: ? >0; 413: 0 >1; 415: 1 >0; 418: ?

>1; 419: ? >0; 423: ? >0; 425: ? >1; 427: ? >1; 428: ? >1; 429: ? >0; 430: 0 >?; 431: 0 >?; 432: 0 >?; 434: 0 >3; 439: 0 >?; 464: 0 >1; 450: 0 >1.

Gongxianosaurus shibeiensis; score modifications based on He *et al*. (1998).

247: 1 > ?. 263: 0 > ?. 358: 0 > ?. 361: 1 > ?. 367: 0 > ?. 407: 1 > ?.

Herrerasaurus ischigualastensis; score modifications based on PVL 2054, 2559, 2566 (holotype), PVSJ 104, 373, 407, 461 and MACN-Pv 18060. Further bibliographic sources: Novas (1994), Sereno (1994), and Sereno and Novas (1994).

11: ? >0; 12: ? >0; 17: - >?; 27: 1 >0; 31: 0 >0&1; 32: - >0; 43: 0 >1; 50: - >?; 51: - >?; 52: - >?; 53: - >?; 56: 0 >1; 57: ? >0; 58: 0 >2; 67: 0 >1; 69: 0 >1; 86: 0 >1; 88: 1 >0; 93: 1 >?; 95: 0 >1; 99: 1 >0; 103: 0 >1; 104: 0 >1; 111: 0 >?; 121: - >?; 122: - >?; 123: - >?; 130: 1 >0; 133: 1 >0; 141: 0 >1; 160: - >0; 164: - >?; 172: 1 >0; 180: 1 >0; 188: ? >0; 205: 1 >0; 213: 0 >?; 214: 1 >?; 215: 0 >1; 222: 0 >1; 241: 0 >1; 247: ? >1; 251: ? >0; 252: ? >1; 254: 0 >1; 256: 0 >1; 272: ? >2; 276: - >?; 277: 1 >0&1; 281: 0 >1; 285: 0 >1; 301: 0 >1; 303: 0 >1; 308: 1 >0; 309: 1 >0&1; 313: 1 >2; 325: 2 >1; 326: 1 >?; 327: 0 >1; 333: 0 >1; 343: - >?; 344: - >?; 345: - >?; 348: 0 >?; 355: 1 >0; 358: 2 >?; 360: 0 >1; 371: - >0; 375: 1 >0; 376: 0 >?; 381: - >?; 411: 1 >0; 412: 0 >1; 418: 0 >1; 419: 1 >0; 423: 1 >0; 425: ? >1; 439: 1 >?; 446: 0 >1.

Heterodontosaurus tucki; score modifications based on SAM-PK-K337 (holotype) and K1332. Further bibliographic sources: Santa Luca (1980), Norman *et al*. (2011), and Sereno (2012).

Characters 32, 44, 54, 104, 130, 171, 241, 290, 305, 308, 388, 399, 402, 420, 431: changed from (1) to (0). Character 35: changed from (1) to (2). Characters 55, 82, 86, 87, 113, 160, 227, 233, 270, 274, 285, 291, 369: changed from (0) to (1). Characters 57, 96, 190, 226, 228, 229, 232, 345, 396, 419, 441: changed from (?) to (0). Character 100: changed from (0) to (-). Characters 170, 209, 254, 349, 362, 395, 400, 434, 443, 444: changed from (?) to (1). Characters 230, 257, 411, 428: changed from (1) to (?). Character 231, 457: changed from (0) to (?). Character 340, 442: changed from (?) to (2). Character 350: changed from (?) to (-).

Hexinlusaurus multidens; score modifications based on ZDM T6001† (holotype). Further bibliographic sources: He and Cai (1984) and Barrett *et al*. (2005)

28: 1 >0; 55: 0 >1; 67: 0 >1; 78: 0 >-; 79: 0 >-; 94: ? >1; 96: ? >0; 97:? >0; 126: 1 >?; 127: ? >1; 128: ? >0; 130: 0 >1; 167: ? >1; 168: ? >2; 180: ? >0; 229: ? >0; 254: ? >1; 255: 0 >1; 340: ? >2; 360: ? >2; 361: ? >0; 362: ? >2; 363: ? >0; 389: ? >0; 401: ? >1; 410: ? >1; 426: ? >0; 432: ? >0; 433: ? >0; 436: ? >1; 437: ? >0; 438: ? >0; 441: 1 >0; 447: ? >0; 457: 0 >?.

Ignotosaurus fragilis; score modifications based on PVSJ 884 (holotype). Further bibliographic source: Martínez *et al*. (2012a).

Characters 298, 351: changed from (0) to (?).

Jeholosaurus shangyuanensis; score modifications based on Barrett and Han (2009) and Han *et al*. (2012).

7: 0>0&1; 38: ?>0; 103: ?>1; 145: 2>1; 189: 1>?; 205: 1>0; 424: 1>0.

Lagerpeton chanarensis; score modifications based on MCZ 4121, PULR 06 (holotype), PVL 4619, and 4625. Further bibliographic source: Sereno and Arcucci (1993).

Characters 210, 218, 227, 308, 383, 400, 403, 419, 452, 453: changed from (?) to (0). Character 216: changed from (0) to (2). Character 228, 407: changed from (?) to (1). Character 301, 309, 348, 406: changed from (0) to (1). Characters 334, 346, 361, 412, 432: changed from (1) to (0). Character 390: changed from (?) to (0&1). Character 434: changed from (3) to (0).

Laquintasaura venezuelae; score modifications based on MBLUZ P1434, 1515, and various IVIC unnumbered specimens. Further bibliographic sources: Barrett *et al*. (2008; 2014).

4: 1 >?; 229: ? >0; 244: ? >0; 245: 1 >?; 256: ? >0; 260: ? >0; 294: ? >1; 296: ? >0; 297: ? >1; 298: ? >1; 302: ? >0; 304: ? >1; 305: ? >1; 306: ? >2; 307: ? >1; 309: ? >0; 310: ? >0; 313: ? >2; 315: ? >0; 316: ? >0; 318: ? >0; 322: 1 >?; 331: 1 >?; 353: ? >1; 354: ? >0/1; 357: ? >0/1; 359: ? >0; 362: ? >2; 364: ? >1; 365: ? >2; 366: ? >2; 368: ? >2; 375: ? >0; 381: ? >1; 382: 0 >1; 383: ? >0; 384: ? >1; 387: ? >1; 388: ? >0; 389: ? >0; 390: ? >0; 392: ? >0; 394: 0 >0/1; 395: 1 >0/1; 400: ? >1.

Lesothosaurus diagnosticus; score modifications based on SAM-PK-K1105†, 1319; BP/1/4881, 4949, 7853, NHMUK PV C109, R8501, 11000, 11002, 11003, 11004, 11956, RU B17 (syntype), 23 (syntype), MNHN LES 17, 18, and NM QR 3076. Further bibliographic sources: Thulborn (1970, 1972); Santa Luca (1984); Sereno (1991), Knoll & Battail (2001); Knoll (2002a-c), Butler (2005), Knoll *et al*. (2010), Porro *et al*. (2015), Barrett *et al*. (2016), Baron *et al*. (2017), and Sciscio *et al*. (2017).

32: ? >-; 35: 1 >0; 36: 0 >1; 54: 1 >0; 55: 0 >1; 65: 1 >0; 71: 2 >0; 78: 0 >-; 79: 0 >-; 90: 0 >1; 100: 1 >0; 101: 1 >?; 102: 0 >?; 103: 0 >?; 104: 1 >?; 110: ? >1; 113: 1 >0; 116: 1 >?; 132: 0 >1; 145: 2 >1; 157: 1 >0/1; 168: 0 >-; 178: 1 >0; 192: 0 >?; 241: 1 >0; 251: 1 >0; 256: 1 >0; 268: 0 >?; 288: 1 >?; 290: 1 >0; 307: 2 >1/2; 345: 0 >-; 360: 2 >1; 457: 0 >?.

Lewisuchus admixtus; score modifications based on PULR 01 (holotype), 53; PVL 3454, 4629, and MACN-Pv 18954*. Further bibliographic sources: Arcucci (1998); Bittencourt *et al*. (2014).

Characters 1, 30, 109, 146, 168, 209, 227, 228, 254, 256, 372, 373, 409, 421, 457: changed from (0) to (?). Characters 31, 34, 37, 55, 104, 111, 149, 170, 207, 245, 375, 383, 402, 413: changed from (1) to (0). Character 32, 100: changed from (0) to (-).Character 35: changed from (0) to (2). Character 58: changed from (2) to (1). Characters 73, 80, 89, 98, 115, 136, 143, 144, 220, 233, 304, 308, 310, 311, 312, 314, 315, 316, 336, 339, 355, 357, 361, 363, 366, 374, 399, 400, 407, 419, 420: changed from (?) to (0). Character 93, 113, 114, 246, 258, 365, 389: changed from (0) to (1). Character 94, 131, 148, 161, 186, 257, 227, 234, 305, 309, 349, 362, 382, 406, 425: changed from (?) to (1). Character 145, 313, 333, 340: changed from (?) to (2). Character 179: changed from (0) to (0/1). Character 350: changed from (?) to (-). Character 370, 439: changed from (1) to (?). Character 371: changed from (-) to (?). Character 376: changed from (1) to (-).

Leyesaurus marayensis; score modifications based on Apaldetti *et al*. (2011).

25 1 >?. 54: ? >0. 67: 0 >1. 81: 1 >?. 132: 1 >?. 167: 2 >1. 204: 1 >0. 247: 1 >?.

Liliensternus liliensterni; score modifications based on MB R2175 (holotype). Further bibliographic source: Huene (1934).

Characters 29, 36, 55, 56, 67, 78, 79, 89, 112, 119, 126, 136, 138, 159, 162, 163, 165, 166, 167, 168, 170, 172, 180, 193, 198, 202, 207, 209, 223, 226, 229, 232, 233, 248, 259, 281, 286, 298, 300, 317, 331, 346, 347, 352, 354, 355, 357, 366, 368, 396, 399, 411, 413, 415, 417, 419, 420, 422, 437: changed from (?) to (0). Characters 31, 68, 71, 130, 190, 195, 212: changed from (1) to (?).Characters 32, 65, 69, 70, 179, 323, 351, 409, 445: changed from (0) to (?).Characters 252, 320, 365, 407, 412,: changed from (0) to (1). Characters 58, 358: changed from (?) to (2). Characters 61, 113, 114, 148, 169, 188, 189, 196, 200, 204, 205, 208, 225, 228, 244, 245, 249, 267, 273, 280, 304, 305, 310, 321, 327, 329, 330, 348, 362, 390, 391, 393, 394, 395, 400, 401, 402, 403, 404, 406, 410, 414, 416, 418, 423, 424, 425, 432: changed from (?) to (1). Characters 160, 164: changed from (?) to (-). Characters 177, 191, 261, 264, 380: changed from (1) to (0). Character 303: changed from (1) to (2). Character 328: changed from (-) to (?). Characters 336, 360,370: changed from (2) to (1). Characters 333, 340, 353, 376, 387: changed from (?) to (2).

Lophostropheus airelensis; score modifications based on unnumbered University of Caen specimen. Further bibliographic source: Larsonneur and Lapparent (1966); Cuny and Galton (1993); Ezcurra and Cuny (2007).

Character 159: changed from (?) to (0). Character 160: changed from (?) to (-). Character 174 and 175: changed from (0) to (?). Character 177: changed from (?) to (0). Character 190 and 195: changed from (?) to (1). Character 191: changed from (?) to (0). Character 201 and 202: changed from (1) to (?). Character 203: changed from (0) to (1). Character 207: changed from (?) to (0). Character 215: changed from (2) to (2/3). Character 218: changed from (1) to (?). Character 220: changed from (0) to (?). Character 221: changed from (1) to (?). Character 222: changed from (0) to (1). Character 226 and 229: changed from (?) to (0). Character 295, 297, and 318: changed from (0) to (?). Character 305 and 338: changed from (?) to (1). Character 308: changed from (0) to (1). Character 317, 337, 341, and 342: changed from (?) to (0). Character 343−345: changed (?) to (-).

Lufengosaurus huenei; score modifications based on Young (1942) and Barrett *et al*. (2005).

27: 2 > ?. 54: 1 >0. 64: 1 >0. 70: 1 > ?. 81: 1 > 0. 170: 0 > ?. 180: 1 > 0. 190: 0 >1. 194: 2 > 12. 204: 1 > 0. 206: 1 > ?. 222: 0 > 1. 237: 0 > ?. 244: 0 > 1. 253: 1 > 2. 260: 0 > 1. 280: ? > 0. 286: 1 > 2. 311: 1 > ?. 324: 0 > 2. 326: 0 > 1. 395: 0 > 1 . 405: 0 > 1. 415: 1 > ?. 422: 1 > ?. 439: 0 > ?. 450: 0 > 1.

Lutungutali sitwensis; score modifications based on Peecook *et al*. (2013).

225: 0 >?; 227: 0 >1; 232: ? >0; 292: ? >0; 325: ? >1; 327: 0 >1; 328: - >?; 331: ? >0; 334: ? >0; 335: ? >0; 336: 1 >?; 341: ? >0; 342: ? >0; 346: ? >0; 348: ? >1; 349: ? >1.

Massospondylus carinatus; score modifications based on BP/1/4376, 4693, 4779, 4930, 4934, 4998, 5238, 5241, and 6161. Further bibliographic sources: Cooper (1981) and Chapelle (2016).

15: 1 >?. 23: 0 >?. 37: 0 >1. 40: 1 >0. 54: 1>0/1. 62: 0 >0/3. 81: 1 >0. 93: 1 >0. 99: ? >0. 112: 1 >0. 132: 1 >0. 167: 2 >1. 180: 1 >0. 184: 1 >0. 191: ? >0. 195: ? >0. 199: 1 >2. 200: 1 >0. 204: 1 >0. 207: 1 >0. 208: ? >1. 210: ? >0. 222: ? >1. 229: ? >1. 242: 1 >0. 247: ? >1. 259: 1 >0. 260: 0 >1. 269: 3 >2. 290: 0

>1. 299: 1 >0; 313: ? >1. 329: ? >2. 330: ? >2. 346: ? >0. 347: ? >0. 347: ? >0. 360: 0 >1. 365: ? >1. 366: ? >0. 369: ? >1. 374: ? >0. 376: ? >0. 385: ? >0. 392: ? >0. 395: 0 >1. 406: 0 >1. 413: 0 >1. 415: 1 >0. 417: 0 >?. 421: ? >0. 436: 0 >1. 439: 0 >1. 442: 0 >1. 442: 0 >1.

Massospondylus kaalae; score modifications based on Barrett (2009).

15: ? >1. 37: 0 >1. 54: 1 >0. 81: 1 >?. 106: 1 >0. 107: 1 >0. 132: 1 >?. 134: 1 >?. 145: 2 >?. 167: 2 >1. 174: 2 >1/2. 175: 0 >?.

Manidens condorensis; score modifications based on MPEF PV 3211* (holotype) and 3809*.

1: ? >1; 4: ? >1; 31: 0 >?; 16: ? >1; 26: ? >1; 30: ? >1; 31: ? >0; 33: 0 >?; 34: ? >0; 35: 2 >0; 36: 1 >0; 39: 2 >1; 48: ? >0; 49: ? >1; 53: ? >1; 58: ? >0; 67: 0 >1; 75: 1 >0; 78: 1 >0; 81: 1 >0; 83: ? >1; 85: 0 >1; 86: ? >1; 87: ? >1; 92: ? >1; 95: ? >0; 96: ? >0; 99: ? >0; 103: ? >1; 104: ? >0; 105: ? >0; 106: ? >0; 107: ? >0; 112: ? >0; 119: ? >0; 127: ? >1; 132: 0 >1; 136: 1 >0; 137: ? >0; 140: 2 >?; 141: 1 >0; 149: 1 >?; 158: 0 >0/1; 162: 1 >0; 163: 1 >0; 164: 0 >?; 166: ? >1; 174: 2 >1; 180: ? >0; 188: ? >0; 193: ? >0; 197: ? >0; 198: ? >0; 201: ? >0; 204: ? >0; 210: ? >0; 218: 1 >?; 220: ? >1; 221: 1 >?; 222: 2 >?; 225: 1 >?; 246: 0 >?; 249: 1 >0; 300: ? >1; 303: ? >0; 305: ? >0; 307: 1 >2; 311: 0 >1; 312: 0 >?; 314: 0 >1; 315: ? >1; 317: ? >1; 323: 0 >?; 324: 2 >1; 331: ? >0; 339: ? >0; 343: ? >0; 346: ? >1; 347: ? >1.

Marasuchus lilloensis; score modifications based on PVL 3870, 3871 (holotype), 3872, 4670, 4671, and 4672. Further bibliographic source: Sereno and Arcucci (1994).

Characters 2, 87, 107, 165, 168, 171, 184, 185, 195, 201, 216, 217, 218, 219, 227, 232, 246, 351, 409, 421, 438, 445: changed from (0) to (?). Character 30: changed from (?) to (0/1). Characters 75, 98, 106, 163, 166, 177, 208, 241, 265, 399, 437: changed from (?) to (0). Characters 89, 186, 299, 317, 336, 346, 357, 361, 370, 374, 413, 430: changed from (1) to (0). Character 100, 266: changed from (?) to (-). Characters 108, 192, 212, 244, 257, 305, 340, 406, 428: changed from (0) to (1). Character 172, 264: changed from (?) to (1). Character 187, 245, 335: changed from (1) to (?). Character 202: changed from (-) to (?). Character 231: changed from (0) to (-). Character 382: changed from (1) to (0/1). Character 389: changed from (0) to (0&1). Character 433: changed from (0) to (0/1). Character 434: changed from (3) to (0).

Nyasasaurus parringtoni; score modifications based on NHMUK PV R6856. Further bibliographic source: Nesbitt *et al*. (2013).

198: ? >0; 222: ? >0; 252: 1 >?; 253: 1 >?; 254: 1 >?; 256: 1 >?; 257: ? >0.

Pampadromaeus barberenai; score modifications based on ULBRA-PVT016 (holotype).

2: ? >0; 5: 0 >?; 11: 0 >1; 13: 0 >?; 14: ? >0; 17: - >?; 19: ? >0; 20: ? >0; 26: 1 >0; 27: ? >0; 30: 1 >0&2; 31: 0 >0&1; 32: - >0; 34: 1 >0; 35: 0 >1; 41: 0 >1; 42: 0 >1; 43: ? >0; 45: 1 >0; 47: 1 >0; 50: - >?; 51: - >?; 52: - >?; 53: - >?; 55: ? >0; 58: 0 >?; 61: 0 >1; 66: 1 >?; 69: 0 >1; 81: 0 >1; 83: ? >1; 121: - >?; 122: - >?; 123: - >?; 132: 0 >?; 141: 0 >?; 144: 0 >1; 145: 1 >2; 160: - >0; 164: - >?; 166: ? >0; 168: 3 >2; 176: 0 >1; 180: 1 >0; 202: ? >0; 210: ? >0; 212: ? >1; 215: ? >0; 216: ? >0; 217: ? >0; 218: ? >0; 219: ? >0; 220: ? >0; 221: ? >0; 222: ? >0; 223: ? >0; 224: ? >1; 225: ? >0; 227: ? >0; 228: ? >0; 230: ? >1; 232: ? >0; 241: ? >0; 244: 0 >1; 252: ? >1; 253: ? >1; 255: ? >1; 261: ? >0; 263: ? >1; 264: ? >0; 267: ? >0; 292: ? >1; 295: 1 >0; 296: ? >0; 300: 0 >1; 301: 0 >1; 303: 1 >2; 305: ? >1; 306: ? >1; 307: ? >0; 309: 1

>0; 315: 0 >1; 318: 0 >?; 320: ? >1; 353: ? >1; 354: ? >0; 356: ? >0; 357: ? >0; 358: ? >2; 360: 0 >1; 363: ? >0; 368: ? >0; 371: - >0; 374: ? >0; 381: - >?; 382: ? >1; 385: ? >0; 386: ? >0; 388: ? >0; 391: ? >0; 421: ? >0.

Panphagia protos; score modifications based on PVSJ 874 (holotype). Further bibliographic sources: Martínez and Alcober (2009) and Martínez *et al*. (2012b).

2: ? >0; 3: ? >0; 29: ? >0; 42: ? >1; 50: - >?; 51: - >?; 52: - >?; 53: - >?; 74: ? >0; 76: 0 >?; 79: 1 >0; 82: 1 >?; 95: 0 >?; 121: - >?; 122: - >?; 123: - >?; 144: 0 >1; 160: - >0; 174: 0 >1; 175: 1 >?; 176: 0 >1; 180: 1 >0; 188: ? >0; 198: 1 >0; 203: 0 >1; 205: - >0; 218: ? >0; 223: ? >0; 230: ? >1; 292: 0 >1; 295: ? >0; 300: ? >1; 313: 1 >2; 315: 0 >1; 317: 0 >1; 324: ? >0; 327: ? >1; 328: ? >0; 329: ? >2; 331: ? >0; 337: ? >0; 341: ? >0; 342: ? >0; 350: - >?; 390: 1 >0; 410: ? >1; 413: ? >0; 416: ? >1; 418: ? >0; 419: 1 >0; 433: ? >0.

Pantydraco caducus; score modifications based on NHMUK PV P24 (holotype). Further bibliographic sources: Yates 2003b and Galton & Kermack (2010).

Ch. 2: ? > 0. Ch. 3: ? > 1. Ch. 37: 0 > ?. Ch. 67: 0 > ?. Ch. 129: 1 > 0. Ch. 139: 1 > 0. Ch. 175: 0 > 1. Ch. 180: 1 > 0. Ch. 206: 0 > 2. Ch. 303: 0 >?. Ch. 307: 0 > 1. Ch. 324: 2 > ?. Ch. 329: 1 > ?. Ch. 387: 2 > 1. Ch. 402: 0 > ?. Ch. 439: 0 > 1.

Pisanosaurus mertii; score modifications based on PVL 577 (holotype). Relative skull length scorings use the length of the mandible as a proxy to skull length.

2: ? >0; 3: ? >0; 41: ? >0; 128: ? >0; 129: 0 >?; 130: 1 >0; 135: ? >0; 136: ? >1; 148: ? >0; 149: ? >0; 158: ? >0; 160: - >0; 164: - >?; 167: ? >0; 168: ? >0; 171: ? >0; 172: ? >0; 179: 2 >1; 188: 0 >?; 193: 0 >?; 197: 0 >?; 198: 0 >?; 199: 0 >?; 200: 1 >?; 203: 1 >?; 206: 0 >?; 207: 1 >?; 212: 1 >?; 213: ? >0; 215: ? >1&2; 320: 1 >?; 337: 0 >?; 351: 0 >?; 353: 1 >?; 354: 0 >?; 356: 0 >?; 357: 0 >?; 358: 2 >?; 359: 0 >?; 360: 1 >?; 361: 0 >?; 362: 1 >?; 364: 1 >?; 367: 1 >?; 368: 0 >?; 370: 2 >?; 371: 0 >?; 373: 1 >?; 374: 1 >?; 375: 1 >?; 376: 1 >?; 387: ? >1; 392: ? >1; 393: ? >1; 395: ? >0; 398: 0 >?; 402: 1 >0; 411: 1 >?; 412: 1 >?; 413: 0 >?; 415: 0 >1; 416: 1 >?; 425: ? >0; 433: ? >0; 440: ? >1; 441: ? >0; 448: 0 >?; 449: 0 >?.

Plateosaurus engelhardti; score modifications based on MB R 1937, 5586, “Skelett XXV” (skull and neck in exhibition), SMNS 13200, 12949, plus numerous other specimens, and AMNH 6810. Further bibliographic sources: Huene (1926), Moser (2003), Prieto-Marquez and Norell (2011).

3: 0 >1; 6: 0 >1; 12: 0 >1; 13: ? >1; 14: 0 >1; 19: 0 >1; 21: 0 >1; 25: ? >0; 36: 1 >0; 39: 2 >1; 46: 1 >0; 58: 0 >3; 64: 1 >0; 73: 0 >1; 79: ? >0; 80: 0 >2; 81: 1 >0; 90: ? >1; 94: ? >1; 96: 1 >0; 107: 0 >2; 113: 0 >1; 114: ? >1; 140: 1 >0; 141: 1 >0; 145: 1 >1/2; 162: 1 >0; 164: 0 >?; 179: 1 >0; 180: 1 >0; 187: 0 >1; 191: 0 >0/1; 202: ? >0; 206: 0 >1/2; 208:? >1; 217: 0 >1; 221: 1 >0; 225: 0 >1; 226: 0 >1; 232: ? >0; 235: ? >0; 237: ? >1; 238: ? >0; 239: ? >0; 240: 1 >0; 244: 0 >1; 245: 1 >0; 246: 0 >1; 249: 1 >0; 256: 1 >0; 259: ? >0; 260: 1 >0/1; 261: 0 >1; 264: 1 >0; 269: 2 >1; 274: 1 >0; 275: ? >1; 294: 1 >0; 298: 0 >0/1; 299: 1 >0; 303: 0 >0/2; 307: 2 >0; 311: 0 >0/1; 313: 2 >1; 317: 1 >0; 321: 0 >2; 328: 0 >?; 330: ? >1; 331: ? >0; 354: 0 >1; 357: ? >0; 360: 2 >1; 365: 0 >1; 374: ? >0; 374: 1 >0; 378: 1 >2; 381: ? >0;

386: 0 >1; 388: ? >1; 390: 0 >1; 394: 1 >0; 395: ? >0; 399: 0 >1; 402: 1 >0; 406: 1 >0; 415: 1 >0/1; 419: 1 >0/1; 428: 0 >1; 437: ? >1.

Procompsognathus triassicus; score modifications based on SMNS 12591 (holotype). Further bibliographic source: Sereno and Wild (1992). All scorings for cranial characters were changed to missing entities ('?'), as the skull once referred to the holotype specimen belongs to a crocodylomorph (Sereno and Wild 1992).

190: ? >0; 193: ? >0; 194: 2 >?; 200: ? >1; 203: ? >1; 204: ? >1; 205: ? >0; 209: 1 >?; 212: 1 >?; 214: ? >0; 229: ? >0; 244: ? >1; 245: ? >0; 246: 0 >?; 262: 1 >?; 264: 1 >0; 269: 0 >?; 282: 0 >?; 286: 0 >?; 299: 1 >?; 304: 1 >?; 310: 1 >?; 333: 2 >0; 337: 0 >?; 340: ? >2; 342: 0 >?; 349: ? >1; 360: ? >1; 362: ? >1; 365: 0 >?; 389: 1 >?; 392: ? >1; 397: 1 >?; 401: 0 >?; 402: 1 >?; 404: ? >1; 405: ? >0; 414: 1 >?; 421: 1 >0; 426: 0 >?; 438: 1 >?; 446: ? >1.

Pulanesaura eocollum; score modifications based on personal observation of multiple specimens mentioned in McPhee *et al*. (2015).

Ch. 180: 1 > 0. Ch. 190: 0 > ?. Ch. 199: 2 > 01. Ch. 200: ? > 1. Ch. 202: 0 > 1. Ch. 204: 1 > 0. Ch. 210: 1 > 0. Ch. 226: ? > 1. Ch. 227: 1 > 0. Ch. 280: ? > 0. Ch. 330: ? > 2. Ch. 395: ? > 0. .

Riojasaurus incertus; score modifications based on PVL 3808 (holotype) and 3805 (for ischial characters). Scorings of craniomandibular and manual characters were changed to missing entries ('?') as no specimens confidently assigned to *R. incertus* preserve these regions.

1-185: changed to ?; 188: ?>0 ; 195: ?>1; 199: ?>0; 219: ?>0; 247: 1>?; 269 through 291 changed to ?; 311: 0>1; 312: ->0 ; 313: ->1; 331: ?>1; 374: 0>1.

Sacisaurus agudoensis; score modifications based on first-hand study of all specimens mentioned in Langer and Ferigolo (2013).

15: ? >0; 16: ? >0; 31: 0 >0&1; 32: - >0; 43: 1 >0; 69: 0 >1; 111: 1 >?; 119: ? >0; 121: - >?; 122: - >?; 123: - >?; 157: 1 >0&1; 160: - >0; 164: ? >0; 169: 0 >2; 170: - >0; 171: 1 >0; 174: 2 >1; 175: 0 >1; 176: 0 >1; 179: ? >1; 227: 0 >?; 229: 0 >?; 246: 1 >?; 293: 0 >?; 294: 0 >?; 295: 0 >?; 296: 0 >?; 297: 0 >?; 298: 0 >?; 301: 1 >?; 302: 0 >?; 303: ? >1; 304: 0 >?; 307: 0 >?; 308: ? >0; 309: 0 >?; 310: 0 >?; 314: 1 >?; 318: 1 >?; 323: 0 >?; 324: 0 >?; 327: 0 >1; 328: - >?; 331: ? >0; 333: ? >2; 334: 0 >?; 341: ? >0; 343: - >?; 344: - >?; 345: - >?; 346: ? >0; 361: ? >1; 371: - >0; 372: 0 >1; 381: - >?; 382: ? >0&1; 388: ? >0; 393: 1 >2; 395: 0 >1; 409: ? >0; 438: ? >0; 439: ? >1; 445: ? >0; 447: ? >0; 449: 0 >?.

Saltopus elginensis; score modifications based on NHMUK PV R3915 (holotype). Further bibliographic source: Benton and Walker (2011).

219: 0 >?; 240: ? >1; 241: ? >0; 242: ? >0; 290: ? >0; 296: ? >0; 318: 0 >?; 323: 0 >?; 324: 2 >?; 325: 2 >?; 330: 0 >?; 370: ? >0; 374: 0 >?; 410: ? >0.

Sanjuansaurus gordilloi; score modifications based on PVSJ 605 (holotype). Further bibliographic source: Alcober and Martínez (2010).

Characters 31, 32, 320, 437: changed from (?) to (1). Character 34, 184, 185, 232, 246, 351, 405, 422, 423, 424, 438: changed from (0) to (?). Character 39, 313: changed from (?) to (2). Character 179:

changed from (?) to (0/1). Character 180, 308, 312, 315, 346, 347, 348, 368, 421, 425, 454, 455: changed from (?) to (0). Character 197, 215, 222, 227, 247, 332, 333, 360, 369, 389, 403, 418: changed from (0) to (1). Character 205, 214, 265, 375, 390, 415: changed from (1) to (0). Character 203, 204: changed from (1) to (0&1). Character 210, 387: changed from (1) to (2). Character 266, 376: changed from (0) to (-). Character 380, 404, 406: changed from (1) to (?). Character 381: changed from (-) to (?).

Sarcosaurus woodi; score modifications based on NHMUK PV R4840 (holotype). Further bibliographic source: Carrano and Sampson (2004).

Character 202: changed from (0) to (?). Character 295: changed from (3) to (0). Character 304: changed from (0) to (1). Character 307: changed from (0) to (1). Character 310: changed from (1) to (0). Character 317: changed from (1) to (0). Character 335: changed from (0) to (?). Character 337: changed from (?) to (0). Character 338: changed from (0) to (1). Character 339: changed from (0) to (?). Character 347: changed from (?) to (0). Character 351: changed from (0) to (1). Character 362: changed from (?) to (1). Character 366: changed from (?) to (0). Character 368: changed from (0) to (?).Character 372: changed from (?) to (1). Character 380: changed from (1) to (0).

Saturnalia tupiniquim; score modifications based on MCP 3844-PV* (holotype), 3845-PV* and 3846-PV*.

2: ? >0; 29: ? >0; 37: ? >0; 44: 1 >?; 47: 1 >?; 55: ? >0; 69: ? >1; 81: ? >0; 83: ? >1; 87: ? >0; 90: ? >1; 94: ? >1; 95: ? >0; 96: ? >0; 99: ? >0; 104: 0 >1; 105: ? >0; 106: ? >0; 108: ? >0; 119: ? >0; 120: ? >0; 124: ? >0; 125: ? >0; 126: ? >0; 129: ? >0; 130: ? >0; 136: 0 >?; 147: ? >0; 149: ? >0; 156: 1 >0; 158: ? >0; 159: ? >0; 160: ? >0; 162: ? >0; 163: ? >0; 165: ? >0; 166: ? >0; 169: 2 >1; 170: ? >0; 171: ? >0; 174: ? >1; 176: ? >1; 177: ? >1; 179: ? >0; 180: ? >0; 183: ? >0; 189: ? >1; 191: ? >1; 202: ? >0; 203: 0 >1; 204: 0 >?; 205: - >?; 208: 1 >?; 214: 0 >0&1; 216: ? >0; 228: ? >0; 232: ? >0; 247: 0 >1; 251: 0 >1; 256: 0 >1; 257: 0 >1; 266: - >?; 292: 0 >1; 295: ? >0; 296: ? >0; 297: ? >0; 298: ? >0; 300: ? >1; 301: ? >1; 303: 1 >2; 306: 2 >1; 307: ? >0; 392: 1 >0; 411: 1 >0; 412: 0 >1; 416: ? >1; 418: ? >1; 419: 1 >0; 423: 1 >0; 425: ? >1; 444: ? >1; 313: ? >2; 315: 0 >1; 318: 0 >1; 324: ? >0; 325: 2 >1; 326: ? >1; 327: 0 >1; 329: ? >2; 330: 2 >1; 339: ? >0; 343: - >?; 344: - >?; 345: - >?; 346: ? >0; 348: ? >1; 356: 1 >0; 360: 0 >1; 371: - >0; 381: - >?; 389: 0 >1.

Scelidosaurus harrisonii; score modifications based on NHMUK PV 1111 (lectotype) and R6704.

1: 0 >?; 3: ? >0; 8: 1 >?; 9: 0 >?; 10: 0 >?; 20: 0 >?; 22: 0 >?; 30: 0 >?; 32: - >?; 35: ? >0; 39: 1 >2; 40: 1 >?; 43: ? >0; 44: 1 >0; 45: 0 >1; 57: ? >0; 58: 0 >2; 61: 0 >1; 86: 0 >1; 90: ? >1; 94: ? >1; 95: ? >1; 97: ? >1; 103: ? >0; 105: ? >0; 107: 1 >0; 108: ? >0; 135: ? >0; 137: - >?; 143: 0 >1; 145: 2 >1; 157: 0 >0&1; 160: - >0; 163: - >?; 164: - >?; 172: 0 >?; 175: 0 >1; 180: ? >0; 184: ? >0; 186: ? >1; 187: ? >0; 188: ? >0; 202: - >?; 213: ? >0; 217: ? >0; 218: ? >0; 220: ? >0; 222: ? >1; 223: 0 >1; 224: ? >0; 225: ? >1; 228: ? >0; 232: ? >0; 236: - >?; 238: - >?; 240: ? >0; 251: ? >1; 256: 0 >1; 259: ? >0; 263: ? >1; 264: ? >0; 269: ? >0; 303: 1 >2; 309: 1 >0; 317: ? >1; 328: - >?; 329: ? >0; 348: - >?; 350: - >?; 352: ? >0; 357: ? >0; 358: 0 >2; 375: ? >0; 379: 0 >1; 382: 0 >1; 390: ? >0; 391: ? >0; 394: ? >1; 395: ? >1; 403: 2 >1;

411: ? >0; 413: ? >0; 415: ? >1; 417: ? >0; 419: ? >1; 423: ? >1; 424: ? >1; 425: ? >1; 438: ? >0; 439: ? >0; 443: 1 >?.

Silesaurus opolensis; score modifications based on ZPAL Ab111/361 (holotype), 362, 363, 364, 403, 404, 406, 411, 413, 415, 423, 432, 452, 457, 460, 461, 837, 907, 1216, 1218, 1228, 1271, 1272, 1884 and 1885. Further bibliographic sources: Dzik (2003), Piechowski and Dzik (2010), Piechowski *et al*. (2014)

1: ? >0; 2: ? >0; 7: 0 >?; 11: 0 >?; 13: - >0; 14: 0 >?; 17: - >?; 18: 0 >1; 19: - >1; 20: 1 >0; 23: ? >0; 25: - >?; 26: 0 >?; 28: ? >0; 29: ? >0; 31: 1 >0&1; 33: ? >1; 41: 0 >?; 42: 0 >?; 43: ? >1; 54: ? >0; 55: ? >0; 56: ? >0; 57: 0 >?; 58: 0 >2; 60: 0 >1; 64: ? >0; 65: ? >0; 68: ? >1; 70: ? >0; 71: ? >0; 72: ? >0; 73: ? >0; 77: ? >0; 78: ? >0; 79: ? >0; 81: 1 >0; 85: ? >0; 86: 0 >1; 93: 0 >?; 100: ? >0; 112: ? >0; 113: ? >1; 121: - >?; 122: - >?; 123: - >?; 128: 1 >0; 132: 0 >1; 133: 1 >0; 134: ? >0; 136: ? >0; 137: ? >0; 138: ? >0; 145: 0 >1; 151: 2 >1; 158: ? >0; 160: ? >0; 164: - >?; 171: ? >0; 174: 2 >1; 175: 0 >1; 186: ? >1; 191: - >?; 192: 0 >1; 194: 2 >0; 196: 0 >1; 213: ? >1; 214: 0 >2; 216: ? >0; 218: 1 >0; 224: 0 >1; 226: ? >0; 231: - >1; 244: 0 >1; 245: - >1; 251: 1 >1&2; 254: 0 >1; 256: 0 >1; 258: 0 >1; 259: ? >0; 264: - >?; 273: 0 >?; 303: 1 >2; 304: 0 >1; 306: 1 >0; 317: 0 >1; 327: ? >1; 328: - >?; 331: 1 >0; 333: 2 >?; 340: 1 >2; 343: - >?; 344: - >?; 345: - >?; 350: - >?; 354: 2 >0&2; 357: 1 >0; 361: 1 >0; 365: 1 >0; 369: 0 >0&1; 370: 2 >1; 372: 0 >0&1; 378: 1 >0&1; 381: - >?; 388: 1 >0; 393: 1 >1&2; 402: 1 >0&1; 413: 0 >0&1; 415: 0 >1; 423: 1 >0; 425: ? >1; 435: 0 >?; 440: 0 >1.

Staurikosaurus pricei; score modifications based on MCZ 1669 (holotype). Further bibliographic source: Bittencourt and Kellner (2010).

2: ? >0; 3: ? >0; 37: ? >0; 121: - >?; 122: - >?; 123: - >?; 126: ? >0; 127: 0 >?; 130: 1 >0; 131: 0 >1; 133: 1 >0; 135: ? >0; 137: 0 >1; 148: 0 >?; 149: ? >0; 159: ? >0; 160: ? >0; 161: ? >0; 162: ? >0; 163: ? >0; 165: ? >0; 170: ? >0; 171: ? >0; 172: ? >0; 175: 0 >?; 180: ? >0; 184: ? >0; 188: ? >0; 191: ? >0; 194: ? >1; 195: ? >0; 200: ? >1; 205: ? >0; 206: ? >0; 215: 0 >1; 225: 0 >1; 226: 0 >1; 227: ? >0; 229: 0 >1; 243: 1 >?; 294: 1 >0; 298: ? >0; 300: ? >1; 301: 0 >1; 302: ? >0; 303: 0 >1; 307: ? >1; 308: ? >0; 313: 1 >?; 319: 1 >0; 321: ? >1; 323: ? >1; 324: ? >0; 325: 2 >1; 326: 1 >?; 327: ? >1; 328: ? >0; 329: ? >2; 330: 1 >?; 331: ? >0; 333: 0 >1; 341: ? >0; 343: - >?; 344: - >?; 345: - >?; 348: 0 >1; 353: ? >1; 360: 0 >1; 366: ? >0; 369: 0 >1; 371: - >0; 376: ? >1; 380: 1 >0; 381: - >?; 386: ? >0; 387: 2 >1; 410: ? >1; 414: ? >1; 419: ? >0; 439: ? >0; 441: ? >0.

"Syntarsus" kayentakatae; score modifications based on MNA V2623 (holotype). Further bibliographic source: Tykoski (2005).

2: ? >0; 5: 0 >?; 8: 0 >1; 15: ? >0; 20: 1 >0; 22: 0 >1; 28: ? >0; 32: ? >0; 41: ? >0; 42: 0 >1; 45: ? >0; 50: - >?; 51: - >?; 52: - >?; 53: - >?; 54: 1 >0; 55: ? >0; 57: ? >0; 69: 0 >1; 76: ? >0; 77: ? >0; 78: ? >0; 79: ? >0; 81: 1 >0; 82: 1 >0; 88: ? >1; 90: 0 >1; 93: 1 >?; 97: ? >1; 121: - >?; 122: - >?; 123: - >?; 129: 0 >?; 134: ? >0; 145: 2 >0&1; 148: 1 >?; 160: - >0; 164: - >?; 165: 0 >?; 166: 0 >?; 167: 1 >0; 168: ? >0; 171: ? >0; 179: 1 >0; 180: ? >0; 188: ? >1; 189: ? >1; 190: ? >1; 191: ? >1; 193: ? >0; 194: ? >2; 195: ? >1; 197: ? >1; 198: ? >1; 199: ? >1; 201: ? >1; 204: ? >1; 205: ? >1; 206: ? >2; 215: ? >2; 220: ? >0; 251: ? >0; 252: ? >1; 253: ? >1; 254: ? >1; 255: ? >1; 256: ? >1; 257: ? >1; 258: ? >1; 259: ? >0; 261: ? >0;

271: 0 >?; 281: 0 >?; 289: 1 >?; 290: 1 >?; 292: ? >1; 297: ? >0; 298: ? >0; 299: ? >0; 301: ? >0; 302: ? >1; 303: ? >2; 304: ? >1; 305: ? >0; 306: ? >2; 307: ? >0; 308: ? >1; 309: ? >1; 310: ? >1; 311: ? >0; 312: ? >0; 313: ? >0; 314: ? >0; 315: ? >0; 316: ? >0; 318: ? >1; 319: ? >0; 320: ? >1; 321: ? >1; 323: ? >1; 325: ? >2; 326: ? >1; 328: ? >0; 329: ? >2; 330: 2 >1; 331: ? >0; 332: ? >0; 334: ? >0; 335: ? >0; 336: ? >2; 337: ? >0; 341: ? >0; 342: ? >0; 346: ? >0; 348: ? >1; 361: 0 >?; 375: 1 >0; 376: 2 >?; 381: - >?; 382: 1 >0; 389: 1 >0; 393: 1 >2; 394: ? >0; 398: 1 >?; 411: ? >0; 412: ? >1; 413: ? >0; 415: ? >1; 419: 1 >?; 425: ? >1; 427: ? >0; 434: 3 >?; 447: 0 >?.

Tawa hallae; score modifications based on GR 241 (holotype) and 242. Further bibliographic source: Nesbitt *et al*. (2009).

2: ? >0; 5: 0 >?; 8: ? >1; 9: 0 >1; 10: ? >2; 11: 2 >0; 15: ? >0; 17: 1 >0; 20: ? >0; 26: 0 >?; 28: ? >0; 32: - >?; 40: ? >0; 43: ? >1; 45: 0 >1; 46: 0 >1; 50: - >?; 51: - >?; 52: - >?; 53: - >?; 54: ? >0; 55: ? >0; 66: ? >1; 70: ? >0; 76: ? >0; 80: ? >0; 85: ? >1; 90: ? >1; 96: ? >0; 99: ? >0; 101: 0 >1; 104: 1 >?; 121: - >?; 122: - >?; 123: - >?; 127: 0 >1; 131: 1 >0; 133: 1 >0; 141: ? >0; 148: ? >0; 160: - >0; 164: - >?; 167: ? >0; 171: ? >0; 195: 1 >0; 212: ? >1; 223: 0 >?; 231: 1 >0; 244: 1 >0; 251: ? >1; 257: 1 >0&1; 260: ? >0; 261: ? >0; 264: ? >0; 266: - >?; 269: ? >0; 274: ? >0; 276: ? >0; 281: 0 >1; 287: ? >0; 289: 2 >1; 293: ? >0; 294: ? >0; 295: ? >1; 296: ? >0; 297: ? >0; 301: 0 >1; 304: 1 >0; 307: ? >0; 310: 1 >0; 313: ? >2; 315: 1 >0; 332: ? >0; 334: 0 >?; 335: ? >0; 340: ? >2; 343: - >?; 344: - >?; 345: - >?; 346: ? >0; 353: 2 >1&2; 357: ? >0; 368: 0 >1; 369: ? >1; 370: 2 >1; 376: 2 >1&2; 381: - >?; 402: 1 >0; 404: 0 >1; 407: ? >0; 411: 1 >0; 413: 0 >1; 415: 1 >0; 418: 1 >0; 423: 1 >0; 424: 1 >0; 437: ? >0; 438: ? >0; 446: ? >0; 447: ? >0; 450: ? >1.

Tazoudasaurus naimi; score modifications based on Allain and Aquesbi (2008).

Ch. 80: 0 > ?. Ch. 82: 0 > ?. Ch. 132: ? > 0. Ch. 206: ? > 01. Ch. 207: ? > 0. Ch. 229: 0 > 1. Ch. 278: ? > 0. Ch. 280 ? > 0. Ch. 286: ? > 0. Ch. 290: ? > 0. Ch. 308: ? > 0. Ch. 316: ? > 1. Ch. 382: ? > 0. Ch. 395: ? > 0. Ch. 413: 0 > 1. Ch. 415: 1 > 0. Ch. 437: ? > 1.

Thecodontosaurus antiquus; score modifications based on the study (first-hand or by photographs) of all specimens mentioned in Benton *et al*. (2000). Further bibliographic source: Galton (2007).

Ch. 2: ? > 0. Ch. 3: ? > 1. Ch. 99: 1 > 0. Ch. 103: 0 > ?. Ch. 104: 0 > ?. Ch. 129: 1 > 0. Ch. 162: 1 > ?. Ch. 164: 1 > -. Ch. 167: ? > 1. Ch. 168: ? > 0. Ch. 175: 1 > ?. Ch. 198: 0 > ?. Ch. 217: ? > 0. Ch. 218: ? > 0. Ch. 228: 1 > ?. Ch. 244: 0 > ?. Ch. 260: 0 > ?. Ch. 263: 0 > ?. Ch. 272: 0 > 12. Ch. 286: 2 > 1. Ch. 306: ? > 2. Ch. 309: 0 > 1. Ch. 311: 1 > 0. Ch. 318: ? > 0. Ch. 333: 2 > ?. Ch. 362: 2 > 12. Ch. 395: 0 > ?. Ch. 402: 0 > ?. Ch. 410: ? > 1. Ch. 412: 0 > 1. Ch. 415: 1 > 0.

Tianyulong confuciusi; score modifications based STMN 26-3†. Further bibliographic source: Sereno (2012).

13: 0>?; 31: 0>?; 32: 0>?; 34: ?>0; 35: 1>0/1; 47: 1>0; 80: 2>?; 126: 0>?; 157: 0>0&1; 176: 0>1; 180: 0>1; 217: 1>?; 228; 1>?; 229: 0>?; 230: 1>?; 230: 0>?; 387: 1>?; 388: 1>?.

Unaysaurus tolentinoi; score modifications based on UFSM 11069.

21: 0>1; 30: 2>?; 31: 0>?; 32: 0>?; 36: 1>0; 41: 1>?; 44: 1>?; 45: 1>?; 46: 1>?; 54: 0>?; 57: 0>?; 60: 0>?; 62: 0>?; 64: 1>0; 66: 0>?; 75: 0>?; 76: 1>0; 85: 0>?; 100: 0>1; 103: 0>1; 132: 0>?; 139: 0>?; 241;0>0/1; 259: 1>0; 283: 0>1.

Vulcanodon karibaensis; score modifications based on Cooper (1984).

Ch. 193: 1 > ?. Ch. 207: 0 > ?. Ch. 228: 1 > ?. Ch. 263: 1 > 0. Ch. 309: 1 > 0. Ch. 311: 1 > ?. Ch. 329: 1 > 2. Ch. 340: 0 > 01. Ch. 405: 0 > 1. Ch. 415: 1 > ?. Ch. 416: 0 > ?. Ch. 418: 0 > ?. Ch. 420: 1 > 0. Ch. 425: 1 > 0. .

Yunnanosaurus huangi; score modifications based on Young (1942) and Barrett *et al*. (2007).

Ch. 8: 0 > 1. Ch. 12: 1 > ?. Ch. 23: 0 > ?. Ch. 25: 0 > ?. Ch. 39: 2 > ?. Ch. 54: 1 > ?. Ch. 71: 1 > 2. Ch. 81: 1 > 0. Ch. 93: 0 > ?. Ch. 94: 0 > ?. Ch. 125: 1 > ?. Ch. 129: 1 > ?. Ch. 167: 2 > ?. Ch. 169: 2 > 0. Ch. 180: 1 > 2. Ch. 186: 1 > ?. Ch. 204: 1 > 0. Ch. 211: 0 > ?. Ch. 222: 0 > 1. Ch. 253: 0 > 1. Ch. 286: 1 > 12. Ch. 303: 1 > ?. Ch. 319: 1 > 0. Ch. 387: 2 > 1. Ch. 405: 0 > 1. Ch. 413: 1 > ?. Ch. 415: 1 > 0. Ch. 449: 0 > ?. Ch. 450: 0 > ?. Ch. 451: 0 > ?.

Zupaysaurus rougieri; score modifications based on PULR 076 (holotype). Further bibliographic sources: Arcucci and Coria (2003), Ezcurra (2007), Ezcurra and Novas (2007), Ezcurra (2012).

Character 16: changed from (1) to (?). Character 17: changed from (1) to (?).Character 21: changed from (?) to (1). Character 24: changed from (?) to (1). Character 26: changed from (0) to (?).Character 33: changed from (0) to (?). Character 48: changed from (1) to (0). Character 68: changed from (1) to (0). Character 76: changed from (1) to (0). Character 77: changed from (?) to (0). Character 78: changed from (?) to (0). Character 79: changed from (?) to (0). Character 82: changed from (1) to (0). Character 84: changed from (0) to (1). Character 88: changed from (0) to (1). Characters 94 and 96: changed from (1) to (?). Character 97: changed from (0) to (1). Characters 106, 107, and 108: changed from (?) to (0). Character 112: changed from (0) to (?). Character 133: changed from (1) to (0). Character 137: changed from (0) to (1). Character 141: changed from (?) to (1). Character 159: changed from (?) to (0). Character 160: changed from (?) to (-). Character 163: changed from (0) to (?). Character 164: changed from (-) to (?). Character 167: changed from (?) to (0). Character 187: changed from (0) to (1). Character 281: changed from (0) to (?). Character 383: changed from (0) to (?). Character 407: changed from (1) to (?). Character 409: changed from (0) to (?). Character 412: changed from (0) to (1). Character 413: changed from (1) to (0). Character 418: changed from (0) to (1).

1.2. Anatomical data sources for added taxa

Allosaurus fragilis; MOR 693, Dino 2560 (=UUVP 6000), Dino 11541, SMA 0005, cast of skull of Dino 11541*, and UMNH, various specimens. Further bibliographic sources: Gilmore (1920), Madsen (1976), Evers (2014).

Buriolestes schultzi; ULBRA PVT280 (holotype) and CAPPA/UFSM 0035.

Ceratosaurus nasicornis; USNM 4735 (holotype), MWC 1, and BYUVP 881. Further bibliographic sources: Gilmore (1920), Madsen and Welles (2000).

Daemonosaurus chauliodus; CM 76821 (holotype). Further bibliographic source: Sues *et al*. (2011).

Elaphrosaurus bambergi; MB R 4960 (holotype). Further bibliographic source: Rauhut and Carrano (2016).

Eoabelisaurus mefi; MPEF PV 3990*. Further bibliographic sources: Pol and Rauhut (2012).

Ixalerpeton polesinensis; ULBRA-PVT059 (holotype).

Piatnitzkysaurus floresi; PVL 4073 (holotype) and MACN-Pv CH-895. Further bibliographic sources: Bonaparte (1986), Rauhut (2004).

Scutellosaurus lawleri; MNA PI.175 (holotype), 172, UCMP 130580, 170829, 130581, 175166, 175167, and 175168. Further bibliographic sources: Colbert (1981), Rosenbaum and Padian (2000).

1.3. Data matrix

Euparkeria
000000000000-000-0-00000-000010-10000010000010000----
0011000000001000000000000010000100001100100100-0-000000010000000000---
00000000010000000 1?000000002000000000-000-000010010000000001000?0000-000000000??00-
00011111102000000000001000-?000010010110-00000110111000000100-
0?0???00???0?0?10?0?0??000001000000000000000000200000000000010-00000010011100---0011-
00010000000100--001-----0-1000-000000-010000000-0000000010000000-
0000000001000010000000?0000000000000000110?

Saltopus
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??10?????????0??????????00?00?0????1?????????????????1?00???1????0010?1??02???????????1
??????00??????1?00?00?????????????????????????????0?????0000??0??????10?0??0?????10???????
02?10?000?0000000

Dromomeron romerii
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111000001110--011-----0-0----0011010000000100-
0?010100??011?11000100?01?0?????????????????????????????????????

Dromomeron gregorii
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11101000011?0--1101-0000-1000-0011010000000000-
0?010?????01??????????1???

Lagerpeton
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11111000000110--011-----0-1100-00010100(0 1)0000000-
000101011001001100010010100000100010010000021101000000000??

Marasuchus
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0?????????????????????????100100000100010001000200000110000110-101000?0010100---0001-
?1100000000100--1000-0000-1100-{0 1}000010(0
1)000100010000001010?100010100000?00000011001{0 1}0010?000210?10000000000?

Nyasasaurus
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Silesaurus
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1)010000?2???1????0?????000?20101000?11?000000000000?0101011111?1101000?110000?1?01?010
100???100102001000000??10101010101????100101001 0002000?110101011000101001 0?10001000110111
0000001121000001011001001100 1????11001101011(1
2)101010100010???0????0?????????????????????000000001110212000000020101101010011 1?1000?0020
10200???0001?001(0 2)01010001010010(0 1)10(0 1)00111(0 1)00?11000100101(1 2)00010 0?0(0
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Asilisaurus
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Lutungutali
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Eucoelophysis
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Lewisuchus/Pseudolagosuchus
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100?00001??111000?0110??????0??????1?????01?????00010110 11????1?11?????????????????????
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Diodorus
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Sacisaurus
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11????1???0?????????????1?20?0??002?1???0101????1????0
02?010???00???0????0110010100110100101101001110 00?(0
1)10001001012010100?011?????0?????????????????????????????????01?????0?0????00000?

Pisanosaurus
?00?????????????????????????????????????11?????0???
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111???000?????????????????????????????00?0?(1
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Fruitadens
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0121201002011011??000????????0?0000?????0??01????0?3?1???121?1001?100?????????????????????
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120111000020 00?110?0??11111101111?110111?10111111?????????????????????????0??????0000

Manidens
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?000001???0????01???1110?00202001?120011000110020?101110?0?1?100??01??10000????0??????0?
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Abrictosaurus
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1?0??001???0111201000002012111 01--
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11???1101?????????1?????????????10?11????????0100000 1?0000

Tianyulong
00010110001???0111000000?0?100???0{0
1}11?2000011100??????00???0?????????????0???11
??01???000011?010??00???00010401?21(0 1)?0-
00??0121200?02011021??000???1???00?????1{0
1}?????????11?????1?1???1?????????????0???11??1??10000??11??0?????????????????????????????011
010????-
?0?111?????????????????????1???0??0?????????????????????12011?0?00?????11??????11????111???????
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Heterodontosaurus
000101100011010111000000101101100021102000001100100000100002000101120011000100020110111 0
10011100010-
100010000??01???0?0110101010000111000100000020000030112101110110012121010200111111100?00
1010010000010-00-0011211?0301000120010100??011010-1000011?1?11111111?1?001110-
100102100010010000101110111120100000200210101--00010010100210-1111100101?20100011-1-
01?0??120101?101101200110-
12110?00002000011010??0110110111111???1?1?1001?11100?000101010110021111000010000?

Eocursor
??1???0??????
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0??0?1??20?0?20110???000?????????0?00000?0-00-
00???????2?????11?01?????????????????010111????101101101001?????????????????1??1???????????11
12?10000120 12?110002000?0010100 2?1-20011?0101?20100?11-??0110000202010101101201010-
120111100020?001201011??11110?100?????????????????????????1????0???????0?0????1?000?

Laquintasaura
????01?????????????????????????1000-
??10??2?????????????????????10?000??00????0?????0????11????000?????????????????????0?????????????
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11??20?0?10?10?????00?0?????????????????????????11?????????????????0???0???????0000?????1??
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01?0??????0?1(0 1)00(0 1)202?20100101201010-12011101?11000?02(0 1)(0
1)01101?11??????1?1????????11?????????????????????????????0????????

Lesothosaurus
0??10101?0011100-1000?0?10?1001-00011120000111001000010?000??0001?1000100010--
000111000?1??11000?00????0000001000???0?01000001100101010000021100100??0010?01(0 1)00-
000-111-20000201101011 0?0?001?0????000010-00-
0???011??20111011101?01111?0?????00001101?11011110010001110-
1?0??100??00?0100?000??0?111201000011012(1 2)01000200010010120201110111001010201 00-11-1-
01100002010201001012010 10-
12011000002000012010110011 1??1100101011101 00?111?0?100100?1101101-??010?0?010000?

Scutellosaurus
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2)????????????????00?0??03????1????????0?0?011?1?????????????????????????????????????0????00
110000?????????????????00000?000110000?1011??2000?2?11020??000??0????02??000?0?00??01??110
02?0??011??10??1101?????????011?000111011001000?????????????????????????????????111201100?
0???22??????011???1010?2????0?1?10?01???0???1??1?0110000202120100101211000?1201?10?00101
00020101?01111???100111010101000111 1?????????????????????????????11??

Scelidosaurus
?001??0?????????????????0??010?0?0?01102?000011?011?2?01002011310010100100000000100110100
?1???11?1?1???0?000010????????1?????????1011101?0??101011???0110??1(0
1)000000?1010200?02111110??0001001???00??????0????????1110220001 0?1101?00???0011?0??0000
11????111111101010?10?????0?????????????????????????1112011000120111000002001100101002 00?001
1100101021100011?1?001000020212010010120101 0?1211?1?00020?00?211?110?111??1100101011?0?1
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Emausaurus
0??1??00??0??100-?000000?0?1010-
00010020??0111001010001??0000300000010??00??????00110?????????????0??????00???????????1?
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200012011000??000???10-
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Agilisaurus
00110?0000110100-1000000?011000-
000110200001110010111000?0000300010 10??10?01000100?011?0??0??1?00?0??????0??0?0??1????01
0?00111001011 1?1-0??000020001011010 1000-000-
111220000201111011000?0?0???11?????????????0???????1201?10120?0?0?????0?1-0-
?10001101??1000?110100?0-
100?????????????????????????????1112010100110121010002100?00101202011100110010102010 1011-1-
0110???10?0??1011??20101??1201?100101?????20?01??01?110?100101011??????1???0???00003110?
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Hexinlusaurus
?0?1??0?????????????????????10000-??11?02000011100100001 10?0000?0001110??10?010--
?00?1110??????1?00?????????????????????????0???????1001??11?????????????0?????????10010000-
11122000?2011010??000???0???01?????????????0??????120????11??1?0?0???0?1-0-
?1??01??????1??11?0?????????????????00??0??01?????????????1112010100 12?1210101--
100?00101222101101110010102011 1111-1-
0110????02020???1??2010???1201????00??0???????????1??????0?1?1?????????1???0???1?00??100
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Jeholosaurus
0?0101(0 1)000010110-10000001011000-000100200001101010000100?0010300010101-
100011111010?11100?02??1000?01??1?000?????????????011100011?01011101-
0020?011000?00101011?11000-
111?20000201 1?101100000????001000001??0100010211??300010121211001110011-
????11?101????1111111?1?00????0-?????????????????????????????1112010100 0201201101--
100?00111202111200110 01?????1???11-??011?00120202010110121111 0-
12011100002 11?1?2010110011110110010101100100 01??10???1100311000002110100000 1?0000

Dracoraptor
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Massospondylus carinatus
001010011200-0?0-11111?1-11?000-01001020010111100----{0 1}0100000(0
3)10011000001000???10111000101 0?1100??01101?01010??0?1??2?00---
01010110010?000001000200110211200000-000-
00102100121010001 1000???110?01000020100012010011?01?00001101 00?01??001??10?0000110101101
2111010101100-102?1100??000001111211?10100100000001?0121010001000?001?20?2?1-
22?0?001010200---00?0100???00?01010?101?11???0?01101-
?0?0??0???01?1010000?0??100011111011???00??10?????00101?011011100?0010000000

Massospondylus kaalae
????10011100-??0-1111111-1??00??01001020?00111100----
0???0000??0011?0?????????????1???????01?1?????1??1??000?????????00---
01010110?1??00001?000?00?00210200000-000-??1021001(1
2)?0100?11010???
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Leyesaurus
0??0??011?010??0-111??1??1??00??0100?02???0111100----
00?0000??00?1100??01?000001?11?????????????????????01??000?????00---
000??010?10?0?0011000?00?1021?200000-000-
001021?0021010??110?0?0?1101??000021??00?20?0?????????????????1???0?????????????????1??
???1???22?????????0?????
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0?0???????010?110?0????00????

Antetonitrus
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101?3??(0 1)????????0?1??11?????1?01000?0000012(1 2)01?00???000?1??????????00001010200--
-001010010000212120?-01011-001101111-
?000010000010001000000111000?????????????????????0?1?110??0?1?0?1?000000000?

Guaibasaurus
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??1?0?????????????????????????10000001110201100100020101001 22?0?11?2(1
2)0020010?0100???00?1?0?1???0?0101?1001?110001??1101???00020?10?1??01?0?0?110?0001011101
110?0000010110???0301?0?102110100010000000

Panphagia
?00?????????????????????????0?0???????0???11?????00?????????????????????????00?00011?1?????
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1000??010??01?0?0?0000011010000?0011????0000??01?????1?????????00011????1?????????????
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Plateosaurus
0010010111011100-11011110110010-11001011110110100----
0010300030001010000110000020111010101011100 1?0010010020000011012?00---
01010110010100000000(1 2)00110110100000-000-0010200002111000110000 1011{0
1}10210001110111{1 2}0100111110100000011100110001 0?10000001010001011110010{0 1}11100-
101012001-0001010111111001001 00{0 1}0001{0 2}0120111{0 1}0101000012212211-
21000001010200---0000100110002010101101011-0000-121101000121010010001 01?000100000011101{0
1}111{0 1}00010?0110100010110110110000000000000?

Unaysaurus
0??00?0111010?00-100111101?00???1110102??10????00----
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010??110?10?000??100110011021010 0000-000-
0010200002111 00???000?0?????????????????????????1?????????????????10?010????0{0
1}0011000 11?11111010101100-1?(0
1)??????????011?11?1???
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Saturnalia
?01?????????????????????????0???????0?????????????????0?????????????1??????????0?11?00?
?1???100??0????10000?????????00???000??00?????????????????0?0??????000000000?0013100??1?1
1000??010???111?02?00001101??00?00110(0
1)100000000110 00?1000?????0000110101111111111101 01120?1?????????????????????100000011
102011000000201011012210111021002001010200???0010101100002010101001001000011 1101?1000020
100011001000000101000101011111000000101100010301001102010?000?000000?

Efraasia
0??0??011101??00-110110101??0?0-1100{0 1}011??011?10?----
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00?1?010??0?000??????00110210100000-
00??0010200?01111000??000????????1???01???0??2?1?00101?00??0010??001???10101???0?00?1?0?
?111111101010?10??1010?200??000?0101111111010010000001201210100?000?001?100?1?-
?1000?01010200---00?1-0010000201010???1011-000??1101-
?0000???0001???10?????1??0001??110????00????0110?00?10100??0?110?00010000000

Aardonyx
0?101?010200-??0-1111101-1??0?0-0100002???0?????0----
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010??110?10?0??0100???00??011???000??0?????1????0121010????0?0???1?0?0??00011100012??0??
1??1???0??1??0?0011??01??1?????????????1?????????????11010??2?????????001??11?????????????
?????????????????????122????????2?000?10??2?0---00?010?10?00201120?1?1011-000?01111-
?0000??????1??01??????????00?????????????????????????0??1??1??????0???00?00000?

Pantydraco
0011?00??00-????101????-10?01????00??21000110100----
00?0000??0001??0????0?0???2101100110001?1011?001???0000??0??1????00---000??000?10?0??0-
000020000021010000-000-??12200?0110?010??010???111102?01?0?1000-
2110?????????????????????010101?????????????0??1???01??1?????????????????????????????????10
010??1001?0?210100?2000?00?220???1-?1?????????????????????0????????01?????????????????11?1-
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Thecodontosaurus
?01?????????????????????????????????????1??????????0?????????????????????????????????????001
0?0?11001?0?10??0000????????1??0---000??010?????????????0011??????0000-0?0-
00102000?2?0100???000??0????0??00?0?1000-
?0?????????0000?0?01????0101010???0000?1000?1?01111010?01?-0-??00?(1 2)001-
001?0101111111001?????????????2??1?0????0?0?????????????????????????????00???0?10?002010(1
2)0????0????????1101-
10000100000011?010000?0?????0101010???100?????????????????0??????0???01000000?

Herrerasaurus
0000?000000000000?1110000?10001(0
1)0000000200011101000???00102000300011010000000000100101100001???1101?00101100000??010???
?00???000??000000?0100110000000000200100000000?0000100000000000011000100111110?00000110110
00??211??100000010101001110?????????10111?1??101111111110?011110?000021 01?(0
1)0111001110121110000001110101210(0
1)0002000110121101?1022011001010200???00?000010000?0101011010010000 0?1101?10100200100100
0100000010100010101011100000010110001030100?101100100010000000

Chindesaurus
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??002????1?????????????????2?0??????????0??????
10000201010110100100000?1100?1??00??011?10001?0?0?1?????0101110110?0?????????????????????
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Staurikosaurus
?00?????????????????????????????????????0???
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00?0??000??01?0?01000001??1?000??001011000000001110011110?????????????????????????????????
????????????????????????????????10000001110101210100 0?000110111101?102?0010010?0200???0010001
10000201010110101100001111100?10?001001001000100000001010001???1????0?????????????????????0?
0??????????00????

Sanjuansaurus
????????????????????????????1??0?110?00??2????0?????????????????????????????0?????????????????????
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00??10???00000{0 1}0??0?????111101001 00?10(0 1)(0
1)0001?211001 00?0001010110?????????????10111?1011?????????????1110-
?????????????????0?????????????1?????????????????0??002?0????1?????????????11?01010100---
00000?010000201010????01??????0-
110??101001101001000100000???0001??0101110 00???0???????????1?????????????????0000??

Eodromaeus
?00??0?????????0?11100?1?0?00(0
2)1010100?2????0?????0????????10????????0???1?000????????
??00???000??00?0?0?0?????????00?0020?000000000?000010000000000000?000?0011110?0?10111011
010???01??1????001??0????11?0101???000011010?1011?111100011 10?10000(1
2)10011001?000101121010000000110201200100020101101 1?10?1?02?002002010200???0000101100002
0101010010010000??1????10000100 10?1?0?1???00???1000101?1??????00?0?????????????????????
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Coelophysis
0001000012210??1110010110000000-10100020111100{0 1}00----
1?1010013000101000000000????0110111?1?011100????10111?????001?????00---
0001?00101010000?1000100100201000000-000-
0010100000000010110000111111021111211010100?0011?0201111110?1010011?01011101000010?001101
111{0 1}?100111?0-100102001-111100011111210110000010002112011101201010012 21?2{0 1}?-
110000?2020200---00?1-11??00?2000101101101-000121100-
?0001211111111101111 0?110?1011??010??1?11011000 10??10311?0100211010000000000?

Syntarsus kayentakatae
0001?00112210?0111001111100000101110002001110011 0????001010003000101100000000000?00111101
11???1001?????????????????????????00???000???01010?000??1000(0
1)00?002000000000000???0010000000000??000??1111?0211111111?11121?0?????2?1??0??????????
?????????000?1?1011011111110?0?????????????????????????????????1????000?0121020111000000110
1121?21?0210020020?0?00???0?1011120000211?2011011010101 0?1100?000002001012010 1?000101011
011010111???11?11100??0?????11?1??021?1???0?0??000?

Eoraptor
0001?00100110?0101001001110000 0?1010002011010110 0????001010013000101100000000000011110???
???????????0??1?000?0?0011????00???000??001100000002000120011020000000000000?001?100?0000
100000000??0111?01000001101(0
1)0001000111100000001??0?0011?00101???000011?1?1101111111000110 0?1000010000001101111111131
0100000011002112 0??1002010?0012200(1 2)11?2200(0
2)0010101 00???0001?0110000201010100010010000??1101?1000010000010001???000???00?1010101110
000001011?101030100?1?2110000000000000

Procompsognathus
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0-?0?????????????????????101?????????????2??1?01???0?????????????????0?0???020?---0001-
?1??????0101?1001?0???????1100-
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Tawa
0001?00112010?01010010111??0000?01000?20??1111100????001?0001300011100100000???0??101000
010?1100?000101?0000??????1?0100???000100000000?010??0?000000003000000000000?000010000000
0000??000?1111?10?0110011?????0?00?1????00?00???????010???01???010101????1111111(0
1)10001100?000??2100011111001100111010010000?101012011000200 0?0?1????2??????0??020?0200?
??00?0001(1 2)0000201020100111100011(1
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Postosuchus
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Piatnitzkysaurus
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Allosaurus
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1.4. Most parsimonious tree search strategy and results

We analysed both the original Baron *et al*. (2017) data matrix and our revised taxon-character matrix (Section 1.3, above) under maximum parsimony in TNT 1.5 (Goloboff *et al.* 2008; Goloboff and Catalano 2016). Our search strategy differs from that employed by Baron *et al*.

(2017), and was designed to find the maximum number of most parsimonious trees (MPTs) spread across the widest possible swathe of tree space. We began by using a new technology search (a combination of the following tree search algorithms: Wagner trees, TBR branch swapping, sectorial searches, Drift, and Tree Fusing). This first phase of the search was conducted until 100 hits to the same minimum length were achieved. Then, in the second phase, the resultant most parsimonious trees (MPTs) from the new technology search were subjected to a final round of TBR branch swapping. Zero length branches in any of the recovered MPTs were collapsed. In order to evaluate branch supports, decay indices (=Bremer support values) were calculated and a bootstrap resampling analysis, using 1,000 pseudoreplicates, was performed, reporting both absolute and GC (i.e., the difference between the frequencies of recovery in pseudoreplicates of the original group and the most frequently recovered contradictory group) frequencies. Templeton tests were conducted for statistical comparison between two alternative tree topologies using the script "templetontest.run" written by Alexander N. Schmidt-Lebuhn for TNT. The null hypothesis of this test is the absence of a significant difference between the two topologies in question (Templeton, 1983).

The analysis of the original matrix of Baron *et al*. (2017) resulted in 16,632 MPTs of 1,734 steps (CI: 0.3074, RI: 0.6066). Baron *et al*. (2017) reported only 94 MPTs (of the same length as the MPTs we found), but their strict consensus has the same topology as that recovered here based on all the MPTs found for their dataset. The difference in the number of MPTs recovered by Baron *et al*. (2017) and our search is because the original study did not conduct a second round of TBR branch swapping and, as a result, these authors reported only a small (but representative) sample of all the possible optimal trees. When all 16,632 MPTs we found are taken into account, 15 additional steps are necessary to recover a monophyletic Saurischia, not 20 as reported by Baron *et al.* (2017).

The analysis of our modified matrix (with the addition of new taxa) resulted in 298,416 MPTs of 1,929 steps (CI: 0.2732, RI: 0.6191), the strict consensus of which (Fig. S1b) shows a traditional monophyletic Saurischia. Only two additional steps are necessary to recover Ornithoscelida, after a topologically constrained search (forcing the monophyly of Neotheropoda + Ornithischia and setting *Saltopus elginensis, Agnosphitys cromhallensis*, *Tawa hallae*, *Eodromaeus murphi*, *Guaibasaurus candelariensis*, *Chindesaurus bryansmalli*, and *Daemonosaurus chauliodus* as floating taxa). In the suboptimal trees found in the constrained search, herrerasaurids and other forms such as *T. hallae* and *E. murphi* are placed outside Dinosauria. A comparison of one of the MPTs that recovered a traditional Saurischia and one of the trees found in the constrained search resulted in a non-significant Templeton test

(p>0.05)— in other words, our dataset does not provide statistically significant support for Saurischia over Ornithoscelida, even though Saurischia is a more parsimonious explanation of our data.

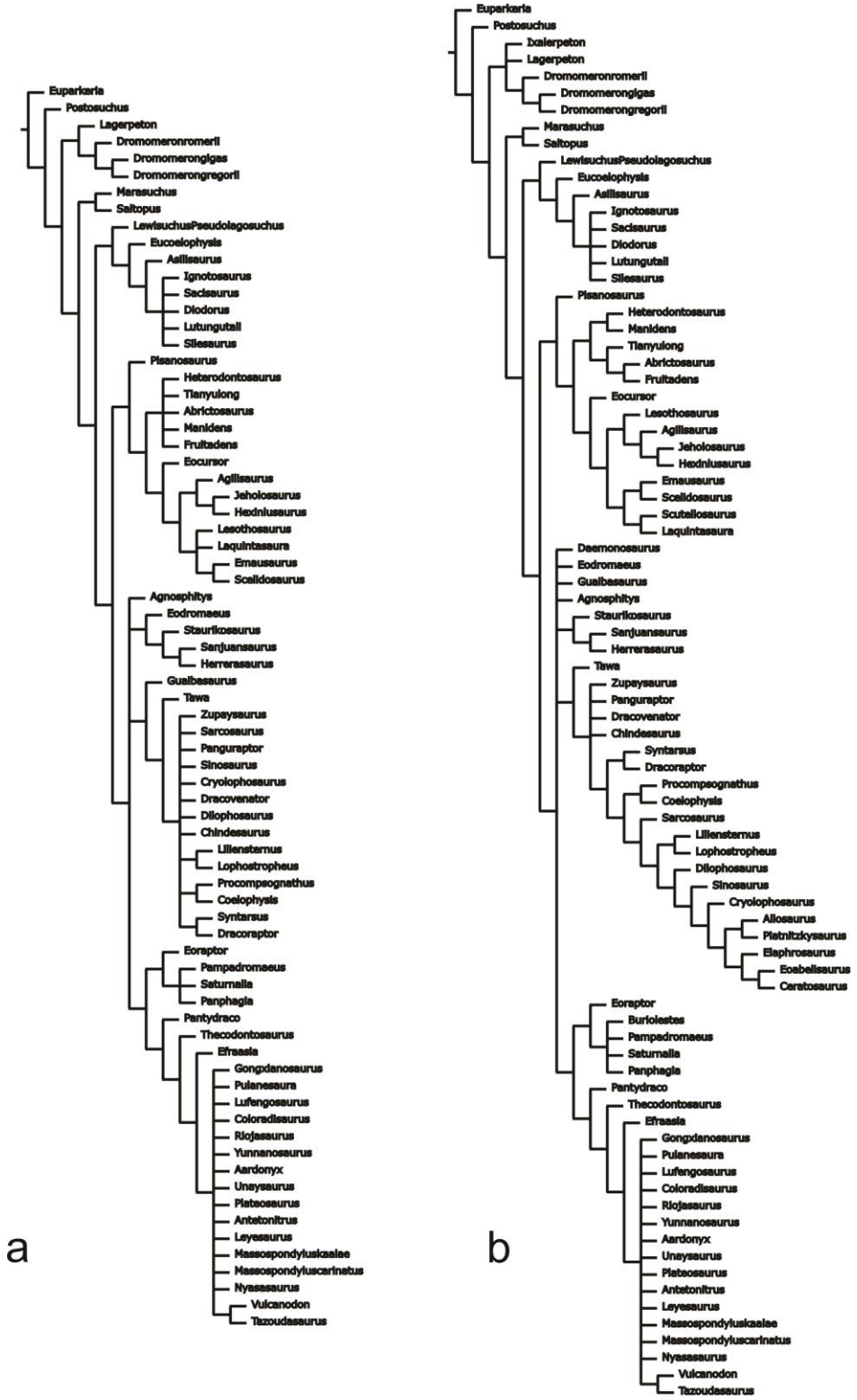

Fig. S1. Strict consensus trees of the MPTs found in the analyses of the rescored data matrix with the original taxon sampling (a) and with additional taxa (b).

Finally, the analysis of our modified matrix (without the addition of new taxa, such that only the taxon sample of Baron *et al*. [2017] is analyzed) resulted in >500,000 MPTs of 1,708 steps (CI: 0.3085, RI: 0.6792), the strict consensus of which (Fig. S2a) also shows a traditional monophyletic Saurischia. In this case, three additional steps are necessary to recover Ornithoscelida (using the same constraint settings as above). A comparison of one of the MPTs that recovered a traditional Saurischia and one of the trees found in the constrained search also resulted in a non-significant Templeton test (p>0.05), once again demonstrating lack of statistical significance for one hypothesis over the other.

Similarly, after another topologically constrained search (forcing the monophyly of Sauropodomorpha + Ornithischia and setting the above mentioned taxa as floaters), four additional steps are required to recover a Phytodinosauria/Ornithischiformes clade (Cooper, 1985; Bakker, 1986), to the exclusion of Theropoda (both with the addition of new taxa or not). In those suboptimal trees, herrerasaurids fall outside Dinosauria and forms such as *Saturnalia tupiniquim*, *Eoraptor lunensis*, *Pampadromaeus barberenai*, and *Panphagia protos* form the sister clade to Sauropodomorpha + Ornithischia. Their comparison to the optimal trees also resulted in non-significant Templeton test (p>0.05).

2. Comments on Baron *et al*. (2017) character sample

2.1. Ornithoscelida synapomorphies

In their original analysis, Baron et al. (2017) recovered 21 characters as synapomorphies of Ornithoscelida. These are the keystone anatomical features that support the theropod + ornithischian grouping in their phylogeny. As our analysis does not recover a monophyletic Ornithoscelida, these synapomorphies are not consistent with our results. However, we here provide comments on these characters.

The following list systematically reviews the distribution and phylogenetic informativeness of the 21 Ornithoscelida synapormophies recovered by Baron *et al*. (2017), based on our own observation and study of specimens and the revised scores we provide in our new dataset here. Anatomical data sources for the mentioned taxa are those given above (1.1). Final remarks address the optimization (at the Dinosauria node) of those characters in the phylogenetic hypothesis presented here (Fig. 1).

12. Premaxillary foramen (anterior premaxillary foramen): 0, absent; 1, present (Yates, 2007; Butler et al., 2008; Ezcurra, 2010). (0 >1). Early theropods and ornithischians indeed possess a discernible foramen piercing the lateral surface of the premaxilla, usually near the base of the

internarial process. However, a similar opening is also seen in several early sauropodomorphs, e.g. *Buriolestes schultzi*, *Efraasia minor*, *Plateosaurus engelhardti*, *Leyesaurus marayensis*, *Unaysaurus tolentinoi*. The widespread presence of this foramen in early sauropodomorphs means that it is optimised as present at the basal nodes of Ornithischia, Sauropodomorpha, and Theropoda. Accordingly, in our modified analysis, given the apparent absence of the foramen in non-dinosaurian dinosauromorphs, state "1" optimizes as an ambiguous synapomorphy of Dinosauria, interpreted as either secondarily lost in *Herrerasaurus ischigualastensis* or convergently acquired by Ornithischia and Saurischia. Furthermore, even when Ornithischia and Theropoda are forced to be sister taxa, the presence of this foramen in many early sauropodomorphs leads us to interpret this feature as an ambiguous synapomorphy of Dinosauria (rather than of Ornithoscelida). In summary, a premaxillary foramen does not unite theropods and ornithischians relative to other early dinosaurs.

35. *Maxilla, lateral surface: 0, completely smooth; 1, sharp longitudinal ridge present; 2, rounded/bulbous longitudinal ridge present (Gower, 1999; Weinbaum and Hungerbühler, 2007; Nesbitt, 2011). ORDERED*. (0 >1). A smooth facial surface of the posterior ramus of the maxilla is plesiomorphic in the context of early dinosauromorph evolution. In contrast, a laterally projecting ridge (either sharp or bulbous) near the ventral margin of the external antorbital fenestra (sometimes forming the margin itself) is indeed present in many ornithischians and theropods. However, it is also seen in some early sauropodomorphs, e.g. *Buriolestes schultzi*, *Pampadromaeus barberenai*, *Unaysaurus tolentinoi*, and non-dinosaurian dinosauromorphs, e.g. *Lewisuchus admixtus*. Moreover, it is lacking in the early theropod *Tawa hallae* and also not clearly seen in various ornithischians, e.g. *Scelidosaurus harrisonii*, *Tianyulong confuciusi*, *Manidens condorensis*. In fact, the identification of the ridge in ornithischians is hampered by the frequently overlapping presence of a "buccal emargination", which is lacking in other dinosaurs. In our modified analysis, the absence of a ridge optimizes as symplesiomorphic for Dinosauria, with states "1" and "2" appearing independently on various occasions in Ornithischia, Theropoda, and Sauropodomorpha. Even when Ornithoscelida is forced to be monophyletic, this character would not be synapomorphic of this group based on the revised scorings of this character. In summary, this is a complex character with a complex distribution among early dinosaurs and close outgroups, and does not clearly support a theropod + ornithischian clade.

54. *Exclusion of the jugal from the posteroventral margin of the external antorbital fenestra by lacrimal–maxilla contact: 0, absent; 1, present (Clark et al., 2000; Olsen et al., 2000; Benton and Walker, 2002; Sues et al., 2003; Clark et al., 2004; Rauhut, 2003; Langer and Benton, 2006; Butler et al., 2008; Nesbitt, 2011).* (0 >1). The definition of this character is complicated by the fact that state "0" implies the absence of an exclusion, i.e. the jugal reaching the external antorbital fenestra. The participation of the jugal in the fenestra is plesiomorphic in the context of early dinosaur evolution, as it is retained in nearly all early members of the group. In turn, the reverse condition is restricted

to particular taxa, e.g. *Manidens condorensis*, *Hexinlusaurus multidens*, and some specimens of *Massospondylus carinatus*. Accordingly, in the modified analysis, state "0" optimizes as symplesiomorphic for Dinosauria, with state "1" appearing a few times within dinosaurs. In our understanding of this character, the presence of a lacrimal-maxilla contact is subsidiary to the exclusion of the jugal from the external antorbital fenestra (and could be excluded from the definition of the character), as that contact can occur with the jugal forming part of the fenestra or not. In addition, the lacrimal of ornithischians overlaps the jugal, hampering the expression of the jugal at the fenestra. On the contrary, the jugal of most other dinosaurs overlaps the lacrimal and, thus, more frequently reaches the rim of the antorbital fenestra, despite a maxillary-lacrimal contact being present medial to it. In summary, this character has a confusing definition, but even when scored as defined, it does not optimize as clearly uniting theropods and ornithischians.

76. Quadrate, angled: 0, posteroventrally or vertical; 1, anteroventrally (Nesbitt, 2007, Nesbitt, 2011). (0 >1). The character definition does not make clear how to measure this angle—i.e., which reference points should be used. It would seem that the character is intended to define the direction in which the quadrate body is oriented, as seen in lateral view, when the skull is in articulation and the skull roof is held relatively horizontal: anterodorsally to posteroventrally (state "0") or anteroventrally to posterodorsally (state "1"). Considered as such, the scoring of this character depends on the availability of well preserved, articulated skulls, which are rare for early dinosaurs. Indeed, state "1" is seen in most early ornithischians (although not in *Scelidosaurus harrisonii*), but not in other putative early members of Ornithoscelida, e.g. *Coelophysis bauri*, *Eoraptor lunensis*, *"Syntarsus" kayentakatae*, *Zupaysaurus rougieri*. Accordingly, in our modified analysis, state "1" above optimizes as an ambiguous synapomorphy for Ornithischia. In summary, this feature thus does not clearly link theropods and ornithischians.

88. Paroccipital processes, proportions: 0, short and deep (height ≥ 1/2 length); 1, elongate and narrow (height < 1/2 length) (Butler et al., 2008). (1 >0). It is not clear if this character refers to the maximum or minimum width of the paroccipital process, or to the width of a particular part of the element. In any case, "short and deep" paroccipital processes are present in most early ornithischians. Yet, the reverse condition (state "1" above) is seen in many theropods, e.g. *Cryolophosaurus ellioti*, *"Syntarsus" kayentakatae*, *Zupaysaurus rougieri*. Accordingly, in the modified analysis, state "0" above optimizes as synplesiomorphic for Dinosauria, and state "1" is synapomorphic of Sauropodomorpha plus Theropoda (i.e., Saurischia). In summary, elongate paroccipital processes do not uniquely characterize theropods + ornithischians, but are actually a feature uniting saurischians.

90. Posttemporal foramen/fossa, position: 0, totally enclosed with the paroccipital process; 1, forms a notch or foramen in the dorsal margin of the paroccipital process, enclosed dorsally by the squamosal (Butler et al., 2008). (1 >0). Baron et al. (2017) found a discretely enclosed

foramen (state "0") to be synapomorphic of Ornithoscelida. Indeed, the reduction of the posttemporal fenestra is clearly apomorphic in the context of early dinosaur evolution and its further reduction to a foramen sized-aperture is typical of ornithischians and neotheropods and could, indeed, indicate the close relation of these two groups. Yet, several putative ornithoscelidans—including early theropods and ornithischians—have the reduced, but still notch-like foramen not enclosed in the paroccipital process (state "1"), including *Scelidosaurus harrisonii*, *Lesothosaurus diagnosticus*, *"Syntarsus" kayentakatae*, and *Tawa hallae*. Accordingly, in our modified analysis, state "0" is seen mostly in ornithischians, so that state "1" optimizes as symplesiomorphic for Dinosauria, with some changes to state "0". In summary, the discrete foramen is not a clear synapomorphy of theropods + ornithischians, and in fact, many members of both groups possess the notch-like condition that is primitive for dinosaurs.

97. Supraoccipital, proportions: 0, taller than wide or as wide as tall; 1, wider than tall. NEW. (1 >0). A "taller than wide" supraoccipital is, indeed, present in most early ornithischians. Yet, the reverse condition (state "1" above) is seen in most theropods, e.g. *Dracoraptor hanigani*, *Dilophosaurus wetherilli, Tawa hallae*, *Zupaysaurus rougieri*. In addition, *Eoraptor lunensis* was scored "0" in the original dataset, but the supraoccipital of the holotype lacks its lateral borders. Accordingly, in our modified analysis, state "1" optimizes as symplesiomorphic for Dinosauria, and state "0" as an apomorphy found only in Ornithischia. In summary, this character does not unite ornithischians with theropods, but is typical of early ornithischians.

100. Parabasisphenoid, ventral recess: 0, shallow; 1, well-developed. NEW. (0 >1). This character suffers from several issues. First, there are two recesses on the ventral surface of the parabasisphenoid in many early (and more derived) dinosaurs, and it is not clear if this characters refers to the "typical" parabasisphenoid recess ("median pharyngeal recess, hemispherical sulcus, hemispherical fontanelle"; see character 103) or to the more anteriorly positioned subsellar recess. Personal communication with the lead author of the Baron *et al*. study suggests that this character refers to the "typical" parabasisphenoid recess, whose presence/absence is encoded by character 103. If that is the case, then this is not a new character as Baron *et al*. stated, as it has been already used in studies of theropod phylogeny (Rauhut, 2003). Second, it is often difficult to clearly establish what "shallow" or "well-developed" means. For example, the recess seen in many ornithischians and sauropodomorphs is quite different from the deep pocket found apomorphically in neotheropods. Perhaps this is the difference Baron *et al*. (2017) want to stress? Indeed, they optimized the presence of a parabasisphenoid recess (character 103, state "1") as synapomorphic for Theropoda. But if that is the case, then how could a "well-developed" recess (as compared to a "shallow") unite theropods and ornithischians, as ornithischians do not have the recess denoted by character 103? In our understanding of this character, a "well-developed" parabasisphenoid recess is present in various sauropodomorphs (e.g. *Coloradisaurus brevis*, *Unaysaurus tolentinoi*), whereas various putative ornithoscelidans lack such a feature, as they possess a more shallow recess (e.g. *Eoraptor*

lunensis, *Tawa hallae*, *Eocursor parvus*, *Lesothosaurus diagnosticus*). A much fainter version of this recess is even seen in non-dinosaurian dinosauromorphs, such as *Lewisuchus admixtus*. Accordingly, in our modified analysis, state "1" ("well-developed recess") optimizes as convergently acquired within various dinosaur subgroups. In summary, this character is difficult to understand and we do not find evidence that any feature of the parabasisphenoid pneumatic system is uniquely shared by theropods and ornithischians.

145. Retroarticular process, upturn: 0, present and strong, retroarticular forms nearly a right angle with the rest of the mandible; 1, present and subtle, retroarticular is slightly upturned at its distal end; 2, absent, retroarticular extends straight out from the caudal part of the mandible, or turns slightly downward (new). ORDERED. (? >2). This is a complex character that combines the objective presence/development of an upturn in the retroarticular process with the general shape of the process. The putatively synapomorphic state "2" of Ornithoscelida, in which the process lacks any upturn, is seen in several of the Carnian sauropodomorphs (e.g. *Pampadromaeus barberenai*, *Buriolestes schultzi*), and is optimized as the plesiomorphic state of this group. Conversely, the retroarticular process of various putative ornithoscelidans (e.g. *Eocursor parvus*, *Lesothosaurus diagnosticus*, *Scelidosaurus harrisonii*, *Coelophysis bauri*, *Dilophosaurus wetherilli*) bears a slight upturn at its distal end. Accordingly, in our modified analysis, state "2" optimizes as symplesiomorphic for Dinosauria, with several instances of reversion to states "0" and "1". In summary, there is no clear retroarticular process morphology that links theropods and ornithischians to the exclusion of sauropodomorphs.

222. Number of dorsosacral vertebrae: 0, none; 1, one; 2, two (Gauthier, 1986; Yates, 2007; Ezcurra, 2010). ORDERED. (0 >1). Along with characters 215, 221, and 225 (in fact, character 215 partially duplicates the other three), this character deals with the complex addition of vertebrae to the dinosaur sacrum. Clearly, the presence of a trunk vertebra ("dorsosacral") incorporated to the sacrum is apomorphic in the context of early dinosaur evolution, and occurs in all putative members of Ornithoscelida. However, it is also present in most sauropodomorphs (e.g. *Massospondylus carinatus*, *Efraasia minor*), and also in herrerasaurs (e.g. *Sanjuansaurus gordilloi*). Accordingly, in our modified analysis, the presence of a "dorsosacral" vertebra optimizes as synapomorphic for Dinosauria, with some reversions within the group (see Novas, 1996). In summary, there is no set number of dorsosacral vertebrae that is uniquely shared by ornithischians and theropods.

228. Length of base of the proximal caudal neural spines: 0, greater than half the length of the neural arch, 1, less than half the length of the neural arch (Gauthier 1986, Yates and Kitching, 2003; Ezcurra, 2010). (0 >1). Less proximodistally expanded neural spines in the proximal tail vertebra are apomorphic in the context of early dinosaur evolution, appearing in most early theropods. With that said, it is not seen in some members of that group (e.g. *Coelophysis bauri*, *Dilophosaurus wetherilli*), and it is absent in some early ornithischians (e.g. *Heterodontosaurus tucki*,

Scelidosaurus harrisonii). Accordingly, in our modified analysis, state "1" optimizes as convergently acquired in some ornithischians and in Theropoda. In summary, this character does not unequivocally unite theropods and ornithischians, as it has a complex distribution within the early members of these clades.

241. Scapula, blade height versus distal width: 0, less than 3 times distal width; 1, more than 3 times distal width (Sereno, 1999). (0 >1). The ratio between the total length of the scapular blade and the anteroposterior width of its distal (dorsal) margin varies substantially among early dinosaurs and dinosauromorphs. A long and narrow blade (state "1") is, indeed, present in some theropods and ornithischians, as well as in herrerasaurids. However, various putative members of Ornithoscelida lack character state "1", in particular several early ornithischians (e.g. *Lesothosaurus diagnosticus*, *Heterodontosaurus tucki*, *Scelidosaurus harrisoni*), and some early theropods (e.g., *"Syntarsus" kayentakatae*, *Dilophosaurus wetherilli*). These species possess state "0". In our modified analysis, state "0" optimizes as symplesiomorphic for Dinosauria, with a long/narrow scapular blade appearing in herrerasaurids and theropods (with a subsequent reversal) and convergently acquired in some ornithischians (e.g. *Eocursor parvus*, *Jeholosaurus shangyuanensis*). In addition, this character is partially redundant with character 243. In summary, a narrow scapular blade is irregularly distributed among early dinosaurs and does not uniquely characterize ornithischians and theropods.

256. Humeral shaft in anterior/posterior view: 0, relatively straight; 1, bowed ventrally (new). (0 >1). This character is incompletely defined and we find it difficult to understand. Taking "ventrally" to meaning the distal part of the bone, it is not clear to which direction the shaft should be bowed to correspond to state "1". Among dinosaurs, Baron *et al*. (2017) scored *Efraasia minor*, *Herrerasaurus ischigualastensis*, *Saturnalia tupiniquim*, and *Scelidosaurus harrisonii*, as "0", possibly leading to the optimization of state "1" as synapomorphic for Ornithoscelida. However, we see no reason for considering the distal part of the humerus of these four species less "bowed" (in whatever direction) than that of the taxa scored as "1". Thus, we re-scored them to all possess the same condition (= "1"). Accordingly, in our modified analysis, state "1" optimizes as symplesiomorphic for Dinosauria. In summary, this character is difficult to interpret and we do not see any discrete differences in humeral shaft bowing among early dinosaurs.

308. Medioventral acetabular flange of ilium, closes the acetabulum: 0, present, partially or fully closes the acetabulum; 1, absent (modified from Butler et al., 2008). (0 >1). The reduction of the medial wall of the acetabulum—to create the "open" acetabulum that has long been considered a dinosaur hallmark—is clearly apomorphic in the context of early dinosaur evolution. The complete absence of this wall is seen in most members of all of the major dinosaur groups, but the wall is partially retained to varying degrees in early ornithischians (e.g. *Heterodontosaurus tucki*, *Lesothosaurus diagnosticus*, *Scelidosaurus harrisonii*), early sauropodomorphs (e.g. *Saturnalia*

tupiniquim, *Efraasia minor*, *Coloradisaurus brevis*), as well as in the putative theropod *Eodromaeus murphi*. However, we note that in some cases the retained medioventral flange can be small, and its shape variable, which may make this a difficult character to consistently score. In our modified analysis, the complete absence of an acetabular wall optimizes as convergently acquired within the three main dinosaur groups (see Novas, 1996). In addition, this character is partially redundant with character 292. In summary, the loss of the medioventral acetabular wall appears to have happened several times among early dinosaurs, and it is not a clear synapomorphy linking theropods and ornithischians.

360. Medial bowing of the femur: 0, present, strong sigmoidal profile in anterior/posterior view; 1, present, small medial bowing forming gentle continuous curve; 2, absent, femur is straight in anterior/posterior view (new). ORDERED. (0 >1). We have some issues interpreting this character. It is not stated if this character refers only to the femoral shaft, or if it accounts for the femoral head, the medial orientation of which makes the entire bone sigmoidal in anterior/posterior views, even if the shaft is only bowed medially (so that the difference between states "0" and "1" is not always clear). Our best understanding of this character is to infer it from the shaft anatomy only. Scored this way, the condition in most early sauropodomorphs (e.g. *Saturnalia tupiniquim*, *Pampadromaeus barberenai*), early neotheropods (e.g. *Dilophosaurus wetherilli*, *Tawa hallae*), herrerasaurs (e.g. *Herrerasaurus ischigualastensis, Staurikosaurus pricei*), and even some ornithischians (e.g. *Heterodontosaurus tucki*, *Lesothosaurus diagnosticus*) are difficult to discern, and we re-scored most of them were for state "1". As such, in our modified analysis, a non-sigmoidal femoral shaft optimizes as synapomorphic for Dinosauria. In summary, the definition of this character is not clear and we do not find any discrete similarity shared between theropods and ornithischians in how the femur is bowed.

370. Anterior trochanter (lesser trochanter), morphology: 0, a very small, round tubercle; 1, elongate ridge that is oriented proximodistally (finger-like or spike-like); 2, broadened, prominent, 'wing' or 'blade' shaped (modified from Bakker and Galton, 1974; Gauthier, 1986; Novas, 1992; Juul, 1994; Novas, 1996; Benton, 1999; Langer and Benton, 2006; Nesbitt et al., 2009c; Nesbitt, 2011). (1 >2). The expansion of the anterior trochanter is clearly apomorphic in the context of early dinosaur evolution, and this character has been considered in various guises by many previous authors (cited above). Baron et al. (2017) find that ornithoscelidans share a prominent 'wing' or 'blade'-shaped trochanter. However, although many members of the group do have this feature, we find that the trochanter is not so prominent (i.e. "wing" or "blade" shaped) in some putative members of Ornithoscelida (e.g. *Coelophysis bauri*, *Eoraptor lunensis*, *Tawa hallae*). In fact, various early neotheropods (e.g. *"Syntarsus" kayentakatae*, *Liliensternus liliensterni*, *Dilophosaurus wetherilli*) also do not have an anterior trochanter as expanded as that of more derived averostran theropods and ornithischians. In our modified analysis, state "2" optimizes as convergently acquired

among ornithischians and some theropods. In summary, there is no one condition of the anterior trochanter that unites ornithischians and all theropods, but ornithischians and some theropods do convergently share a similar-expanded

372. *Anterior trochanter, completely connected to the shaft of the femur: 0, present; 1, absent, anterior trochanter is separated from the shaft by a marked cleft (modified from Bakker and Galton, 1974; Gauthier, 1986; Novas, 1992; Juul, 1994; Novas, 1996; Benton, 1999; Langer and Benton, 2006; Nesbitt et al., 2009c).* (0 >1). As with the expansion of the anterior trochanter (see above), its separation from the femoral body is clearly apomorphic in the context of early dinosauromorph evolution. The separated condition (state "1") is typical of forms with a "wing shaped" anterior trochanter (character 370), but is also seen in taxa with a "finger-like" trochanter (e.g. *Eucoelophysis baldwini*, some specimens of *Silesaurus opolensis*). More importantly, the cleft is lacking both in forms with a reduced (e.g. *Coelophysis bauri*, *Tawa hallae*, *Eoraptor lunensis*), or more expanded (e.g. *Heterodontosaurus tucki*, *Cryolophosaurus ellioti*) trochanter. Accordingly, in the modified analysis, the cleft-like condition optimizes as convergently acquired among ornithischians and some neotheropods. In summary, this feature has a complex distribution among early dinosaurs, and a cleft-like separation between the anterior trochanter and the femoral shaft does not uniquely characterize ornithischians and theropods.

412. *Fibular facet on the lateral margin of the proximal surface of the astragalus: 0, large; 1, reduced to small articulation (Butler et al., 2008).* (0 >1). The reduction of the articular surface for the fibula on the astragalus is clearly apomorphic in the context of dinosauriform evolution. Yet, it is ambiguous as to what "large" and "small" mean in the definition of the character, as this distinction is not quantified, or described in detail. Langer and Benton (2006) used a threshold of less than 0.3 of the mediolateral length of the bone to define the apomorphic condition of a reduced fibular facet (followed here for the scoring of our modified matrix), which is seen in all early dinosaurs, not only in putative members of Ornithoscelida. Some putative ornithoscelidans, such as coelurosaurian theropods and most ornithischians, indeed have an even more reduced fibular facet in the astragalus, but this is also seen in most post-Carnian sauropodomorphs (e.g. *Coloradisaurus brevis*, *Plateosaurus engelhardti*), whereas various theropods (e.g. *Liliensternus liliensterni*, *Zupaysaurus rougieri*) do not share this condition (Rauhut, 2003). Accordingly, in our modified analysis, a reduced (less than 0.3 of the mediolateral length of the astragalus) fibular facet optimizes as synapomorphic for Dinosauria, given its presence in most early members of the major clades, including not only theropods and ornithischians, but also herrerasaurids (*Herrerasaurus ischigualastensis*) and sauropodomorphs (*Saturnalia tupiniqum*). In summary, we retain previous usage of this character as defined by Langer and Benton (2006), which unites all dinosaurs by the presence of a reduced fibular facet. If there is a subset of this character—an even more reduced facet—uniquely shared by

ornithischians and theropods, this was not demonstrated by Baron *et al*. (2017) using quantitative metrics or careful anatomical description. We do not see any evidence for such a feature.

424. Calcaneum, shape: 0, proximodistally compressed with a short posterior projection and medial process; 1, transversely compressed, with the reduction of these projections (modified from Langer and Benton, 2006; Nesbitt, 2011). (0 >1). State "1" is clearly apomorphic in the context of early dinosaur evolution, although not seen in the putative ornithoscelidans *Eoraptor lunensis* and *Eodromaeus murphy*, which indicates that it is absent in early theropods. Furthermore, we rescore the early theropod *Tawa hallae* as polymorphic for this feature (1>0/1), suggesting that it may be a more variable character. In our modified analysis, state "1" optimizes as convergently acquired among ornithischians and neotheropods. In summary, although ornithischians and many theropods share state "1", its absence in putative early members of that group suggests it may not optimize as a synapomorphy of an Ornithoscelida clade, but rather as convergence.

435. Metatarsal I: 0, reaches the proximal surface of metatarsal II; 1, does not contact the ankle joint and attaches onto the medial side of metatarsal II (modified from Gauthier, 1986; Rauhut, 2003; Nesbitt, 2011). (0 >1). State "1" is clearly apomorphic in the context of early dinosaur evolution, but it is not seen in various putative ornithoscelidans, including both early theropods and ornithischians (e.g. *Eoraptor lunensis*, *Heterodontosaurus tucki*, *Scelidosaurus harrisonii*, *Tawa hallae*). In our modified analysis, it optimizes as convergently acquired by neotheropods and some subgroups of Ornithischia. In summary, we find that some ornithischians and some theropods share this character by convergence; its absence in early members of both groups means that it is not optimized as a synapomorpy of an Ornithoscelida clade.

438. Fusion of distal tarsals to proximal ends of metatarsals: 0, absent; 1, present. NEW. (0 >1). State "1" is clearly apomorphic in the context of early dinosaur evolution, but although it is held to be an ornithoscelidan synapomorphy by Baron *et al*. (2017), it is not seen in many putative members of the group (e.g. *Coelophysis bauri*, *Eoraptor lunensis*, *Scelidosaurus harrisonii*, *Tawa hallae*, most averostran theropods). In addition, we note that this character is ontogenetically variable among neotheropods (Raath, 1977; Tykoski, 2005), and probably other dinosaurs as well. As we lack reliable data on the ontogenetic stages of many early dinosaur specimens (e.g., from bone histology), it is extremely difficult to score this character confidently. In our modified analysis, it optimizes as convergently acquired among some ornithischians and neotheropods, but this optimization may easily change when more palaeohistological data becomes available for early dinosaurs. In summary, this character is problematic because it is strongly related to ontogeny, but even so, it does not uniquely characterize theropods and ornithischians.

2.2. Sauropodomorpha plus Herrerasauridae synapomorphies

As above for Ornithoscelida, we briefly address below some of the characters that purportedly support the sister-group relation between sauropodomorphs plus herrerasaurids in the study of Baron *et al*. (2017).

30. Antorbital fenestra, shape: 0, triangular; 1, oval or circular; 2, rectangular (modified from Butler et al., 2008). (0>1)

A diversity of shapes (quadrangular, circular, triangular) is present among early dinosaurs, thus recognition of a pattern exclusively shared by Herrerasauridae and Sauropodomorpha is not clear.

89. Opisthotic, ventral ramus (crista interfenestralis): 0, extends further laterally than lateral-most edge of exoccipital in posterior view; 1, covered by the lateral-most edge of exoccipital in posterior view (Gower, 2002; Nesbitt, 2011).(1>0)

A ventral ramus extended further laterally than lateral-most edge of exoccipital also occurs in *Silesaurus opolensis* and *Lewisuchus admixtus*.

180. Conical, often unserrated tooth crowns: 0, absent, 1, present together with serrated crowns, 2, encompasses all dental elements of maxilla and dentary (new). ORDERED (0>1)

At least *Herrerasaurus ischigualastensis* and *Sanjuansaurus gordilloi* exhibit uniformly blade-like, and serrated teeth. Thus, no special resemblance with sauropodomorphs is recognized.

224. First primordial sacral, articular surface of sacral rib: 0, circular; 1, C-shaped in lateral view; 2, rectangular (modified from Langer and Benton, 2006; Nesbitt, 2011). (0>1)

This feature is shared by *Panphagia protos*, *Herrerasaurus ischigualastensis*, and probably also by *Staurikosaurus pricei* (in the holotype specimen the "ceiling" of S1 rib is broken). However, three main observations must be taken into consideration: (1) Outgroup condition: the three-vertebrae sacrum of *Silesaurus opolensis* shows sacral ribs 1 and 2 with all the components of the C-shaped condition, i.e. the transverse process conforming a dorsal "ceiling", a ventral "floor" extending horizontally at level of the bottom of the sacral centra, and a vertical crest uniting both ceiling and floor. The difference is that in *S. opolensis* the transverse process does not extend as laterally as the corresponding sacral rib. (2) Condition among purported early theropods: the first sacral of *Eoraptor lunensis* is dorsoventrally depressed, but no information is available regarding the shape of sacral ribs 2 and 3 in lateral view. In holotype specimen of *Eodromeus murphi*, the sacrum is obscured by the ilium, thus information on sacral ribs is not available. (3) Condition among early ornithischians: there is no agreement among authors (e.g., Novas, 1996; Buttler, 2005) regarding the homologies of

the sacral vertebrae of ornithischians. Hence, comparisons of sacral rib morphology between dinosaurs with three and five sacral vertebrae remains fraught with interpretive inconsistencies.

247. Coracoid: 0, subcircular in lateral view; 1, with postglenoid process (notch ventral to glenoid) (Nesbitt, 2011). (1>0)

A prominent and caudally projected postglenoid process is present in *Herrerasaurus ischigualastensis* and *Sanjuansaurus gordilloi*. A well-developed and topographically complex postglenoid process is also seen in the holotype of *Ischisaurus cattoi* (MACN-Pv 18060), so that herrerasaurids clearly have a postglenoid process. On the contrary, the putative ornithoscelidan *Eoraptor lunensis* possesses a less-prominent postglenoid process, and a similar condition is present in *Pantydraco caducus*, *Efraasia minor*, and *Liliensternus liliensterni*. Thus, most early dinosaurs, but not herrerasaurids, exhibit a not very prominent postglenoid process. In sum, we are unable to identify a shared synapomorphy between Herrerasauridae and Sauropodomorpha in coracoid morphology.

286. Ventrolateral twisting of the transverse axis of the distal end of the first phalanx of manual digit one relative to its proximal end: 0, absent, 1, present proximodorsal lip aligned with dorsal margin of medial distal condyle, 2, present proximodorsal lip aligned with central region of medial ligament pit of the distal condyle (Sereno, 1999; Pol et al., 2011b; Otero et al., 2015). ORDERED (0>1)

Eoraptor lunensis exhibits a sauropodomorph feature: a substantial medial rotation in the shaft of the first phalanx of digit I. As more common among early dinosaurs in general, *Herrerasaurus ischigualastensis* has a less marked torsion (15 degrees) than that of *E. lunensis* (35 degrees) and sauropodomorphs (45-60 degrees). Again, we are unable to identify a shared synapomorphy between Herrerasauridae and Sauropodomorpha here.

321. Ischial shaft, cross-section: 0, compressed mediolaterally into thin sheet (rectangular); 1, subcircular/ovoid and bar-like (rod-like); 2, triangular or D-shaped (new). (0>2)

In many putative ornithoscelidans (e.g. *Eoraptor lunensis* and *Liliensternus liliensterni*) the ischial cross section is also triangular.

330. Ischium, cross section of the distal portion: 0, platelike; 1, rounded or semicircular; 2, subtriangular or D-shaped (modified from Sereno, 1999; Langer and Benton, 2006; Yates, 2007; Ezcurra, 2010; Nesbitt, 2011). (0>2)

In many putative ornithoscelidans (e.g. *Panphagia protos* and *Liliensternus liliensterni*) the distal end is also D-shaped.

402. Transverse width of the distal tibia: 0, subequal to or less than the anteroposterior width (distal tibia is square/circular); 1, greater than the anteroposterior width (around 1.25 times or more) (modified from Gauthier, 1986; Ezcurra, 2010). (1>0)

The distal ends of the tibia of *Herrerasaurus ischigualastensis*, *Panphagia protos*, and *Saturnalia tupiniquim*, but also the putative ornithoscelidan *Eodromaeus murphi*, are notably similar, and do not differ much from the condition seen in most non-dinosaurian dinosauromorphs (e.g. *Marasuchus lilloensis*, *Lewisuchus admixtus*). Thus, Herrerasauridae and some early Sauropodomorpha may share a dinosaurian symplesiomorphy regarding the distal shape of the tibia, but the condition is again changed to a transversally expanded outline in "core-prosauropods" such as *Coloradisaurus brevis* and *Massospondylus carinatus*.

417. Astragalus, proximal surface: 0, lacks a marked rimmed and elliptical fossa posterior to the anterior ascending process; 1, possesses a marked rimmed and elliptical fossa posterior to the anterior ascending process (Langer and Benton, 2006; Nesbitt, 2011). (0>1)

The fossa is also found in the putative ornithoscelidans *Tawa hallae*, *Eodromaeus murphi*, *Chindesaurus bryansmalli*, and *Coelophysis rhodesiensis* (Raath, 1977), but not in *Asilisaurus kongwe* and *Silesaurus opolensis*. Thus, it seems to represent a dinosaurian synapomorphy.

440. Metatarsal IV, proximal portion, possesses an elongated lateral expansion that overlaps the anterior surface of metatarsal V: 0, absent; 1, present (Sereno, 1999; Langer and Benton, 2006; Nesbitt, 2011). (0>1)

A similar condition to that of *Herrerasaurus ischigualastensis* is present in *Marasuchus lilloensis*, as well as in the putative ornithoscelidan *Eoraptor lunensis*.

446. Digit 1: 0, metatarsal I robust and well-developed, distal end of phalanx 1–1 projects beyond the distal end of metatarsal II; 1, metatarsal I reduced, end of phalanx 1–1 does not extend much beyond the end of metatarsal II if at all; 2, metatarsal I reduced to a vestigial splint or absent, does not bear digits (Butler et al., 2008). ORDERED (1>0)

The putative ornithoscelidan *Tawa hallae* also shows condition "0", with a well-developed Mt I. Although its corresponding first phalanx is not preserved, it is expected that it projected beyond the distal end of Mt II. Thus, this feature also appears to be present in at least one early theropod, and may be a more widely distributed feature of early dinosaurs.

2.3. Problems with character distribution and definitions

A more general assessment of the data matrix of Baron *et al*. (2017) reveals that all taxa are scored equally for six of the 457 characters (numbers 29, 59, 150, 245, 248, and 268), whereas only one taxon is scored a different state for 46 of them (characters 1, 17, 32, 44, 50, 52, 53, 92, 102, 110, 112, 116, 118, 122, 138, 142, 146, 158, 182, 183, 185, 200, 216, 220, 233, 236, 250, 262, 270, 276, 288, 296, 337, 343, 345, 371, 381, 386, 396, 433, 441, 448, 451, 453, 456, and 457). This represents nearly 15% of the character sample, reducing the number of informative characters to 395. Moreover 16 of the unordered multistate characters (numbers 27, 30, 58, 107, 151, 155, 224, 253, 264, 274, 329, 336, 362, 370, 403, and 434) have a different state scored only for one taxon, making that state also uninformative for the parsimony analysis.

The inclusion of a large amount of uninformative data does not bias the results of parsimony analyses, although it could affect the results of model-based analyses (e.g., Bayesian). In some cases these extra uninformative characters may even be welcome, as they represent points for further expansion of the data matrix in the future. However, the proliferation of uninformative data artificially increases the size of the data matrix, making it appear larger than it actually is. Furthermore, these uninformative characters artificially inflate tree descriptive metrics, such as the consistency index, making the results of Baron et al. (2017) appear perhaps more robust (less homoplastic) than they actually are.

We also note another important issue: several characters are not independent, but totally or partially redundant with one another, namely: 2 vs 3; 21 vs 24; 100 vs 103; 153 vs 155; 215 vs 221/222/225; 241 vs 243; 252 vs 253; 260 vs 261; 269 vs 282; 294 vs 296; 309 vs 316; 397 vs 414. These may more seriously bias the results, overweighing some anatomical traits. Moreover, many characters used by Baron *et al*. (2017) have definition problems, an issue that is clearly not unique to their study and that has been partially inherited from previous phylogenetic studies on early dinosaurs. In order to improve the repeatability of the results, more precise definitions would be welcome, but this would be far beyond the proposed scope of our reply.

3. Phylogenetic definitions

A proposal by Baron *et al*. (2017) that we find especially problematic is the use of Saurischia to designate a group (= Sauropodomorpha + Herrerasauridae) completely different from that originally proposed and used for the entire last century (= Sauropodomorpha + Theropoda). Instead, we suggest an all-encompassing nomenclatural scheme that unambiguously accommodates the three possible ways to organize the three major dinosaur groups among one another: the traditional Saurischia model, the Baron *et al*. (2017) Ornithoscelida hypothesis, as well as the grouping of sauropodomorphs and ornithischians into a clade, an hypothesis suggested without a quantitative phylogenetic framework by both Cooper (1985;

i.e. Ornithischiformes) and Bakker (1986; i.e. Phytodinosauria). In this scheme (Fig. S2), each name is only applicable in the context of its respective hypothesis, e.g.: Saurischia = the most inclusive clade including *Megalosaurus* and *Cetiosaurus*, but not *Iguanodon*; Ornithoscelida = the most inclusive clade including *Megalosaurus* and *Iguanodon*, but not *Cetiosaurus*; Ornithischiformes/Phytodinosauria = the most inclusive clade including *Iguanodon* and *Cetiosaurus*, but not *Megalosaurus*. On March 26th, 2017, an identical nomenclature scheme was independently proposed in the social media by Thomas Holtz Jr. (https://twitter.com/TomHoltzPaleo/status/846110929104388097). Concerning the possible grouping of traditional Sauropodomorpha + Herrerasauridae, we propose the use of Sauropodomorpha for the entire clade, in agreement with its stem-based definition adopted by most workers (Upchurch, 1997).

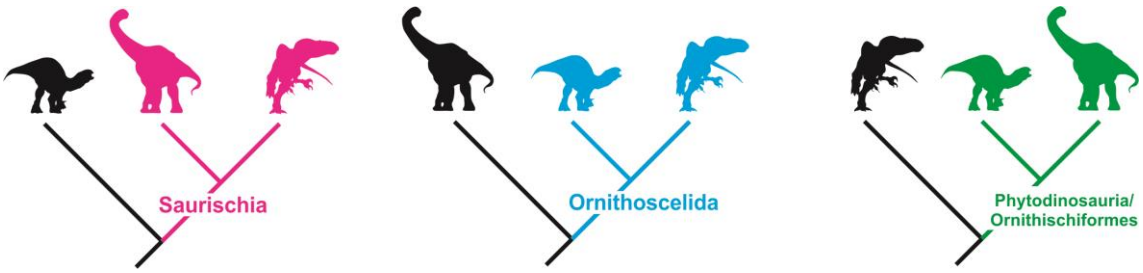

Fig. S2. Pictorical representations of the phylogenetic definitions for Saurischia, Ornithoscelida, and Ornithischiformes/Phytodinosauria. General oulines of *Megalosaurus*, *Cetiosaurus*, and *Iguanodon*.

4. Details of the ancestral states/biogeography analyses

Baron *et al*. (2017) used their new phylogeny to raise several hypotheses about ancestral states (of characters and geographic areas) in dinosaurs, but did not provide any quantitative tests that assessed the relative support of different hypotheses against one another. We here address one of these issues—the ancestral geographic area for dinosaurs—to draw attention to this question. Similar methods could also be used to assess other ancestral features of dinosaurs, such as diet and locomotion/posture, but are outside of the scope of our reply.

In order to test whether the new phylogeny changes assumptions about ancestral states, we explored the geographic origin of Dinosauria using the phylogeny of Baron *et al*. (2017). We investigated whether the arrangements of the core taxa, *Saltopus elginensis*, Silesauridae, and Dinosauria made substantial differences to predictions about the ancestral conditions, as suggested by Baron *et al*. (2017), exploring the three possible tree solutions: *Saltopus* (Silesauridae + Dinosauria), Silesauridae (*Saltopus* + Dinosauria), and Dinosauria (Silesauridae + *Saltopus*).

Each of the 74 taxa was coded for broad-scale geographic location (northern Pangaea: including modern North America, Europe, and Asia; southern Pangaea: including modern South America, Africa, Antarctica, Australia, and India) using standard literature sources (e.g., the ones used to score the taxa for the phylogenetic dataset). We explored the use of different quantitative methods for ancestral area reconstruction and evaluated the inferred ancestral geographic area of the node Dinosauria. Results are given first for the ML estimation of ancestral states applied to geographical regions and then for the use of DIVA and DEC ancestral reconstruction areas.

4.1. ML estimation of ancestral states

As in previous studies (Barrett *et al*. 2015), we used a maximum-likelihood (ML) approach to explore trait evolution. There are many methods to estimate ancestral states for continuous characters, but choices are more limited for discrete characters, such as here, where only ML estimation of ancestral states is appropriate (Pagel, 1994). We calculated ML reconstructions of ancestral character states using the 'ace' function of the ape R package (Paradis, 2011), with tree branch lengths estimated in terms of time, derived using the 'timePaleoPhy' function in the paleotree package (Bapst, 2015) and the 'DatePhylo' function in the strap R package (Bell & Lloyd, 2015). These enabled us to assess results according to two methods of estimating branch lengths, the 'equal branch length' (equal) method, which adds a pre-determined length of 1 Myr to the tree root and then evenly distributes zero-length branches at the base of the tree, and the 'minimum branch length' (mbl) method, which minimizes inferred branching times and closely resembles the raw, time-calibrated tree. A criticism of all methods for estimating basal branch lengths is that they are estimates. The 'equal' method arbitrarily assumes all basal branches are of equal duration, for which there is no evidence, and the mbl method tends to extend terminal branching events back in time, especially when internal ghost lineages are extensive (Barrett *et al*. 2015). This is not the case here, however, and the base of the tree barely extends below the Permian/Triassic boundary.

We ran our analyses for three evolutionary models with different rates of transition between the specified number of character states (two here), namely "ER", an equal-rates model, "ARD", an all-rates-different model, and "SYM", a symmetrical model. These were calculated using the 'ace' function in ape (Paradis, 2011) and the 'add.simmap.legend' function of the R package 'phytools' (Revell, 2012). The quality of fit to the data is assessed by a log-likelihood value, for which a high value indicates the best fit. These are indicated for the Dinosauria node at the captions of Figs. S3-S11 below.

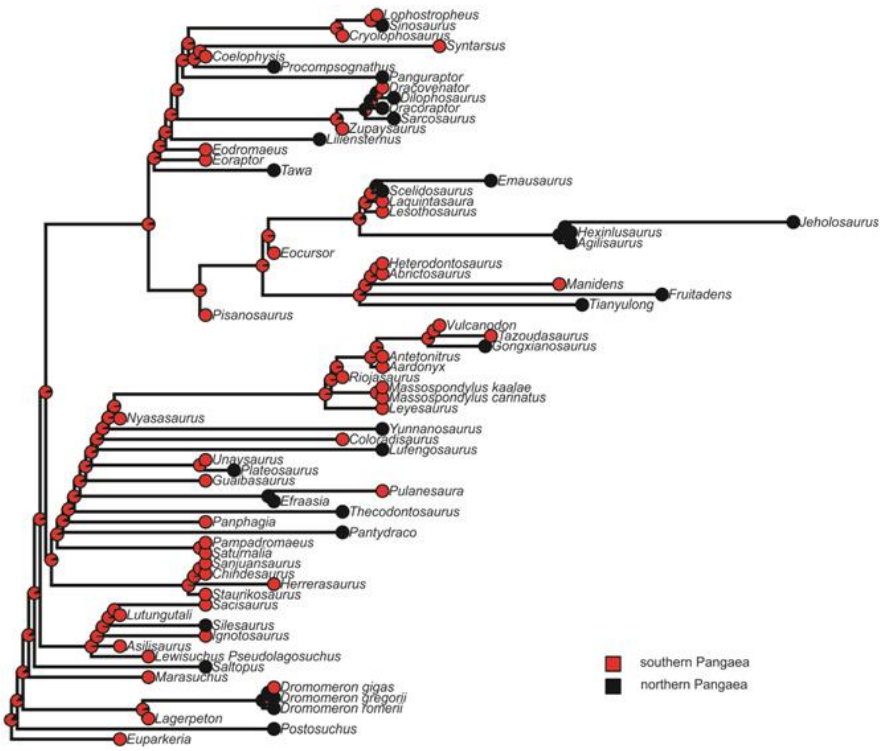

Fig. S3. Numerical estimation of ancestral states for dinosaur geographical origin. “ER” equal-rates model and *Saltopus elginensis* as the sister taxon to a Silesauridae + Dinosauria clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 93.7%.

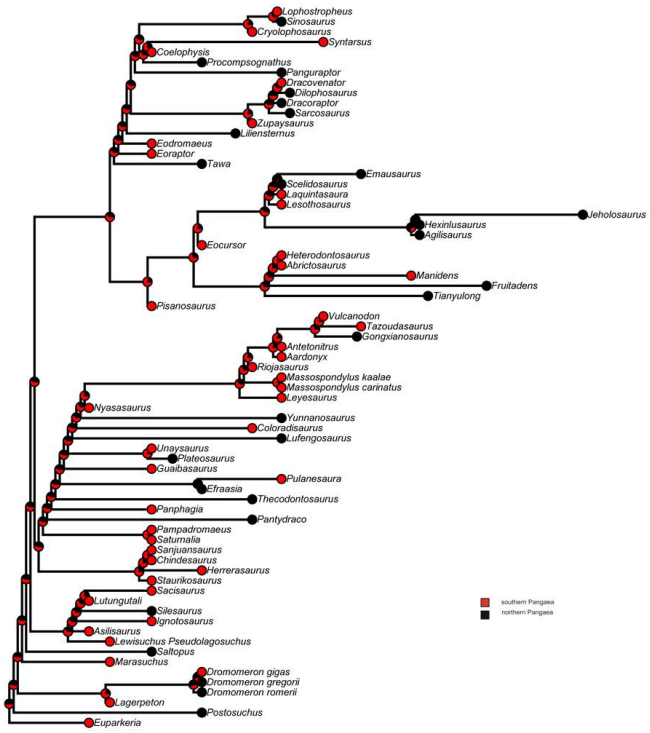

Fig. S4. Numerical estimation of ancestral states for dinosaur geographical origin. "ARD", all-rates-different model and *Saltopus elginensis* as the sister taxon to a Silesauridae + Dinosauria clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 55.7%.

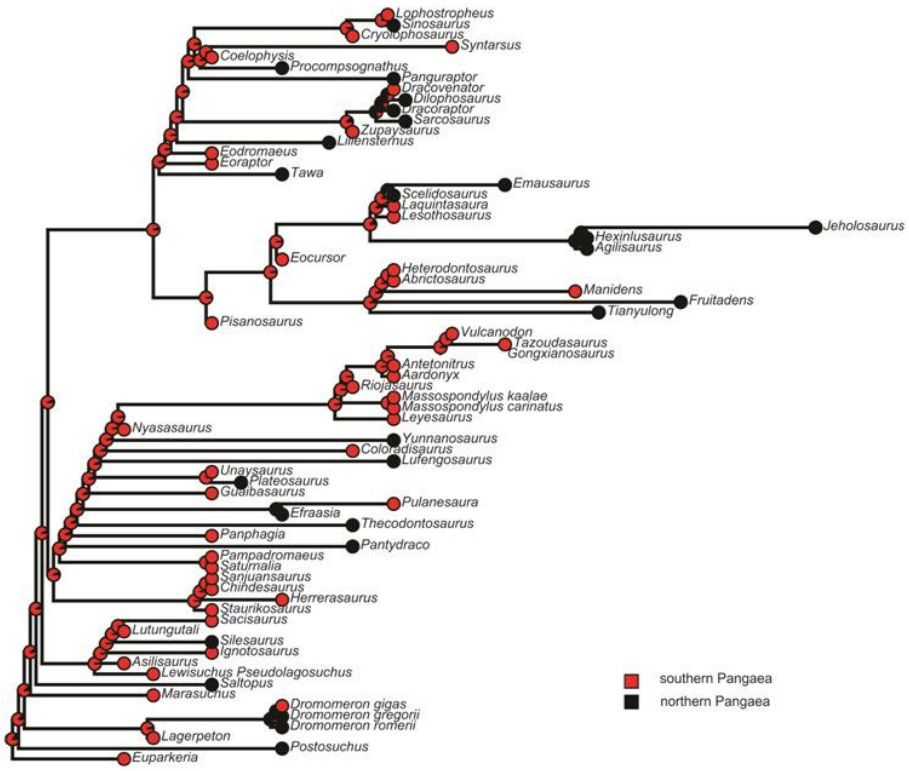

Fig. S5. Numerical estimation of ancestral states for dinosaur geographical origin. "SYM" symmetrical model and *Saltopus elginensis* as the sister taxon to a Silesauridae + Dinosauria clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 93.7%.

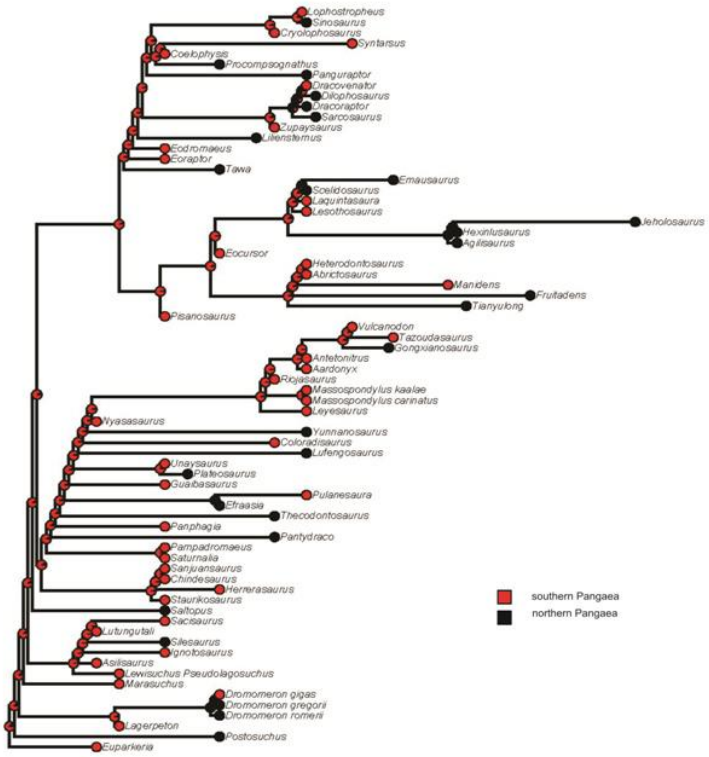

Fig. S6. Numerical estimation of ancestral states for dinosaur geographical origin. "ER" equal-rates model and Silesauridae as the sister taxon to a *Saltopus elginensis* + Dinosauria clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 92.2%.

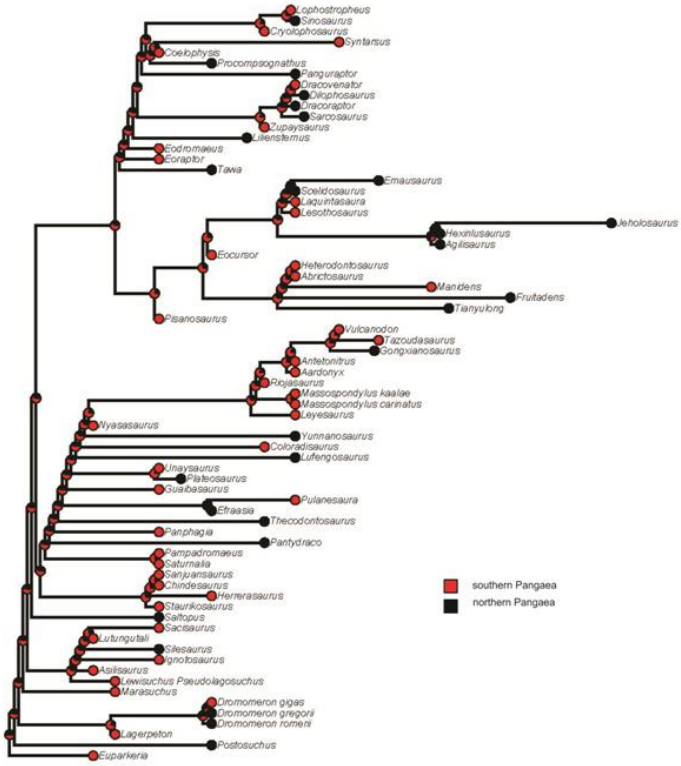

Fig. S7. Numerical estimation of ancestral states for dinosaur geographical origin. "ARD", all-rates-different model and Silesauridae as the sister taxon to a *Saltopus elginensis* + Dinosauria clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 55.7%.

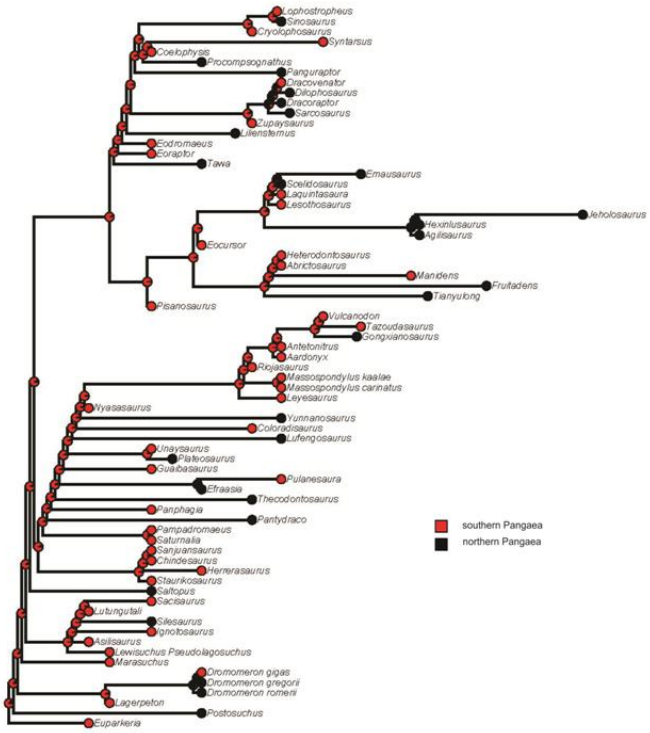

Fig. S8. Numerical estimation of ancestral states for dinosaur geographical origin. "SYM" symmetrical model and Silesauridae as the sister taxon to a *Saltopus elginensis* + Dinosauria clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 92.2%.

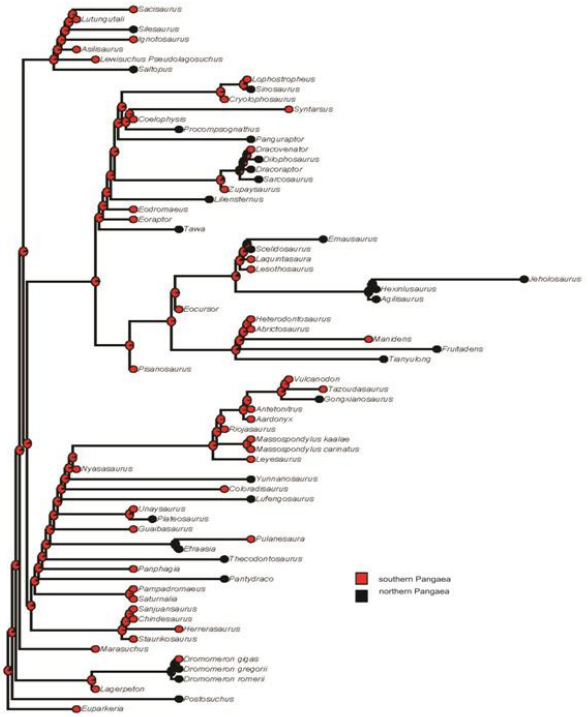

Fig. S9. Numerical estimation of ancestral states for dinosaur geographical origin. “ER” equal-rates model and Dinosauria as the sister taxon to a *Saltopus elginensis* + Silesauridae clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 93.9%.

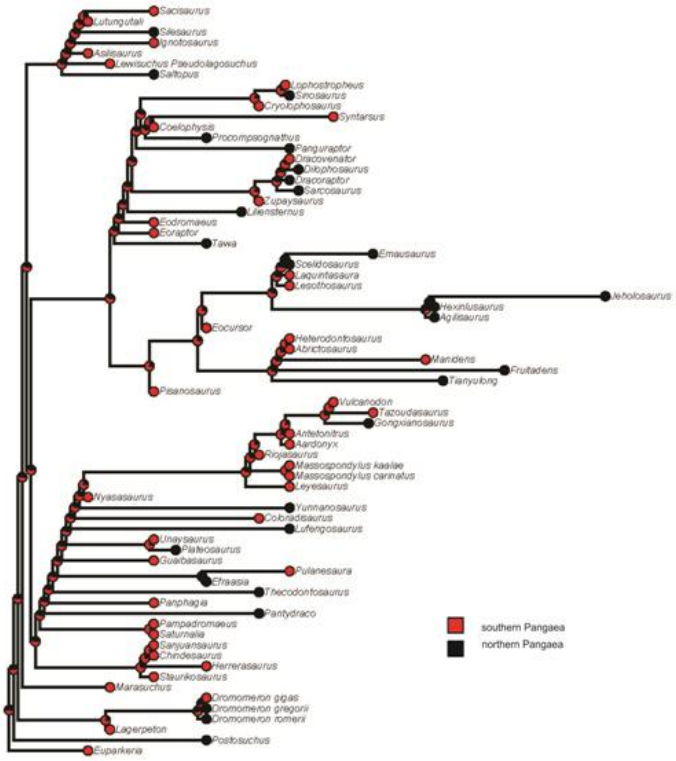

Fig. S10. Numerical estimation of ancestral states for dinosaur geographical origin. "ARD", all-rates-different model and Dinosauria as the sister taxon to a *Saltopus elginensis* + Silesauridae clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 55.6%.

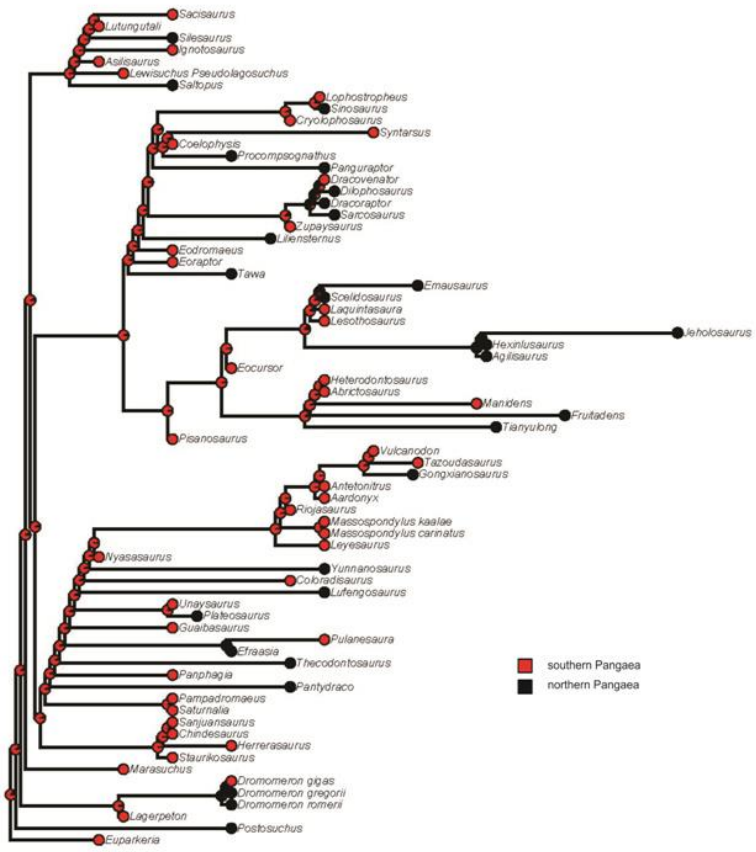

Fig. S11. Numerical estimation of ancestral states for dinosaur geographical origin. "SYM" symmetrical model and Dinosauria as the sister taxon to a *Saltopus elginensis* + Silesauridae clade. Log-likelihood for a southern Pangaea ancestral dinosaur = 93.9%.

4.2. DIVA and DEC ancestral reconstruction

We applied the modification of the Dispersal-Vicariance method of Ronquist (1997) as detailed by Yu *et al*. (2010; S-Diva) and the implementation of DEC model of Ree and Smith (2008) in the software RASP (Yu et al., 2015) for the same trees detailed above (see 4.1.; Figs. S12-S16). Tree branch lengths were estimated by calibrating the topologies using the first appearance datum of each terminal taxa implemented in the TNT script for calculating MSM* (Pol and Norell, 2001) that produces a raw time-calibrated tree.

In all the analyses conducted the inferred ancestral area of Dinosauria is reconstructed in southern Gondwana, although ancestral nodes of this clade (i.e., non-dinosaurian dinosauriformes) have various ancestral reconstructions indicating a less restricted ancestral area for some of these lineages.

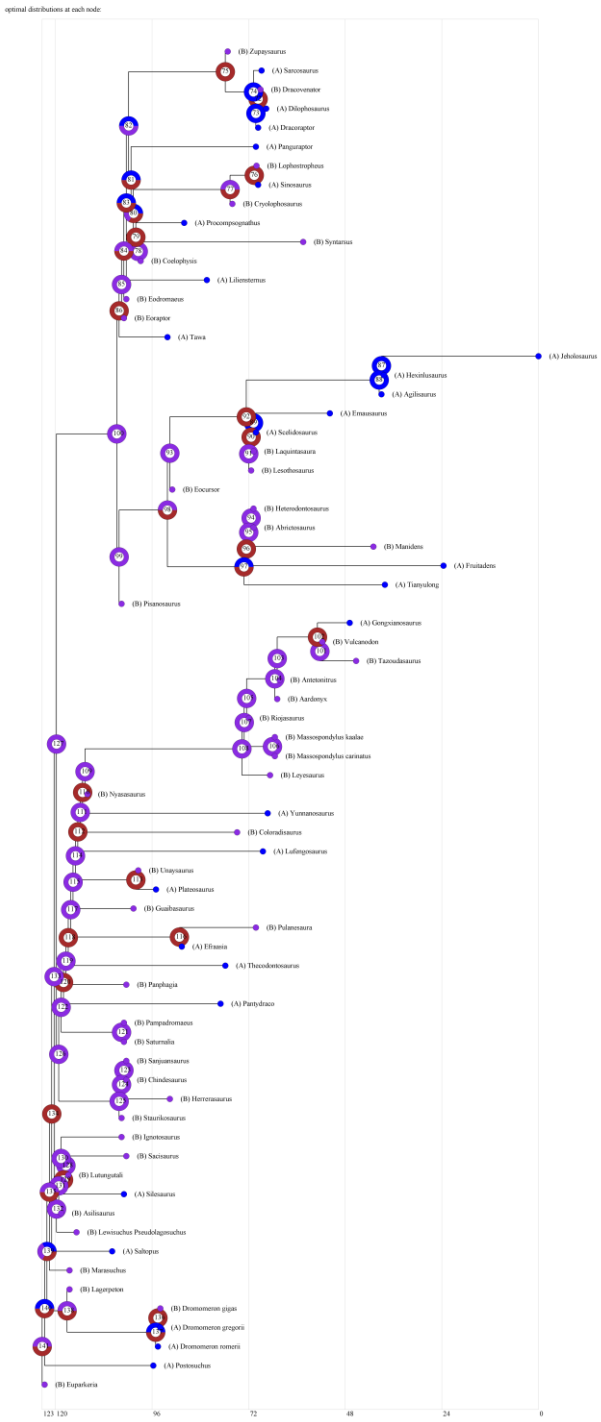

Fig. S12. Ancestral area states for dinosaur geographical origin using S-Diva. Tree with *Saltopus elginensis* as the sister taxon to a Silesauridae + Dinosauria clade. Blue represents northern Pangaea, purple represents southern Pangaea, and brown represents Pangaea (northern+southern). Ancestral area reconstruction for Dinosauria (node 127) is southern Pangaea.

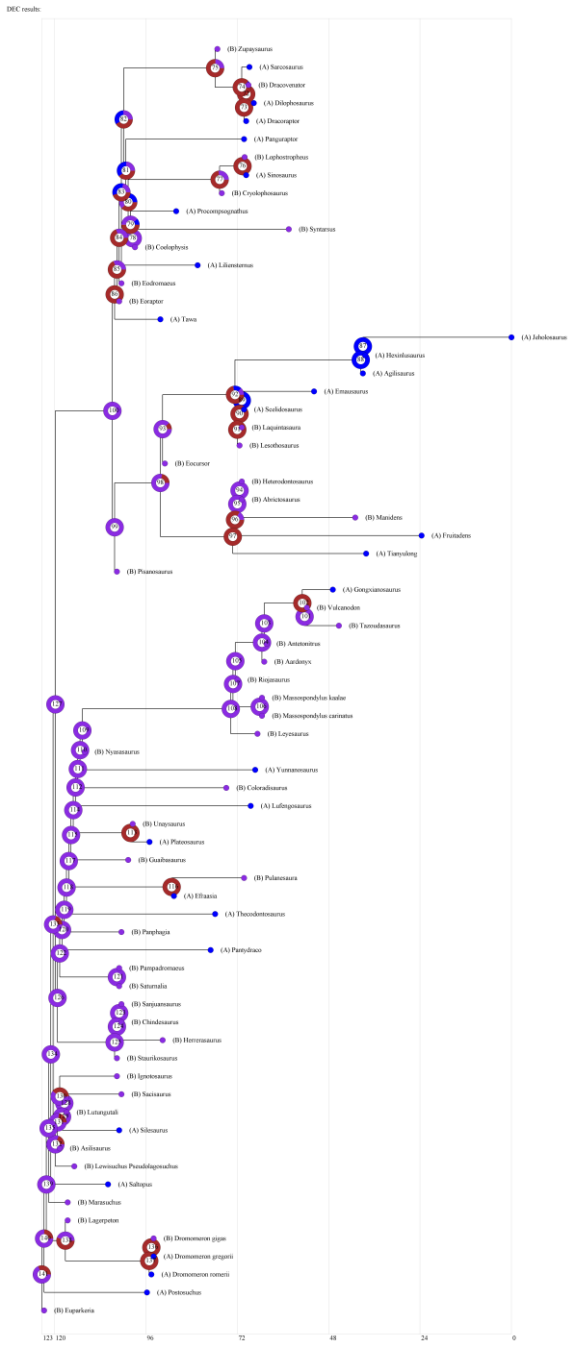

Fig. S13. Ancestral area states for dinosaur geographical origin using DEC. Tree with *Saltopus elginensis* as the sister taxon to a Silesauridae + Dinosauria clade. Blue represents northern Pangaea, purple represents southern Pangaea, and brown represents Pangaea (northern+southern). Ancestral area reconstruction for Dinosauria (node 127) is southern Pangaea.

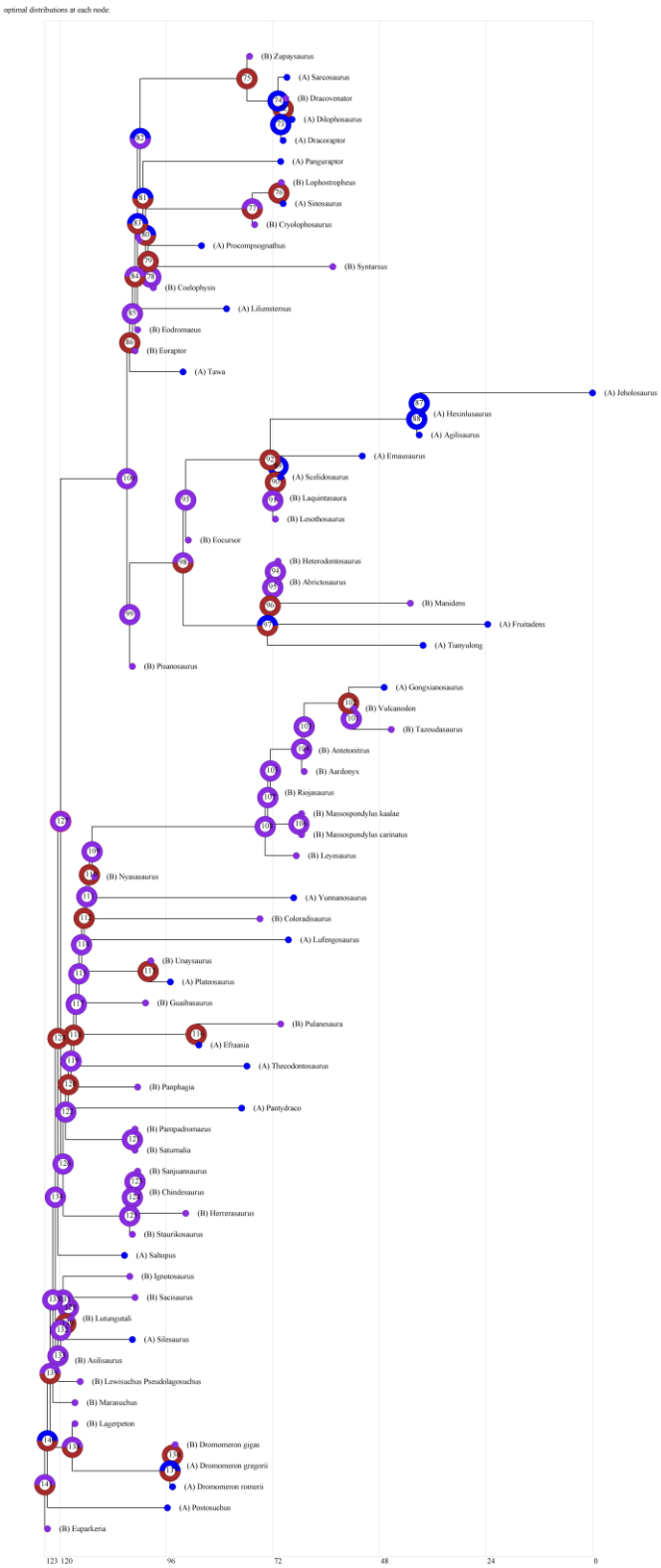

Fig. S14. Ancestral area states for dinosaur geographical origin using S-Diva. Tree with Silesauridae as the sister taxon to a *Saltopus elginensis* + Dinosauria clade. Blue represents northern Pangaea, purple represents southern Pangaea, and brown represents Pangaea (northern+southern). Ancestral area reconstruction for Dinosauria (node 127) is southern Pangaea.

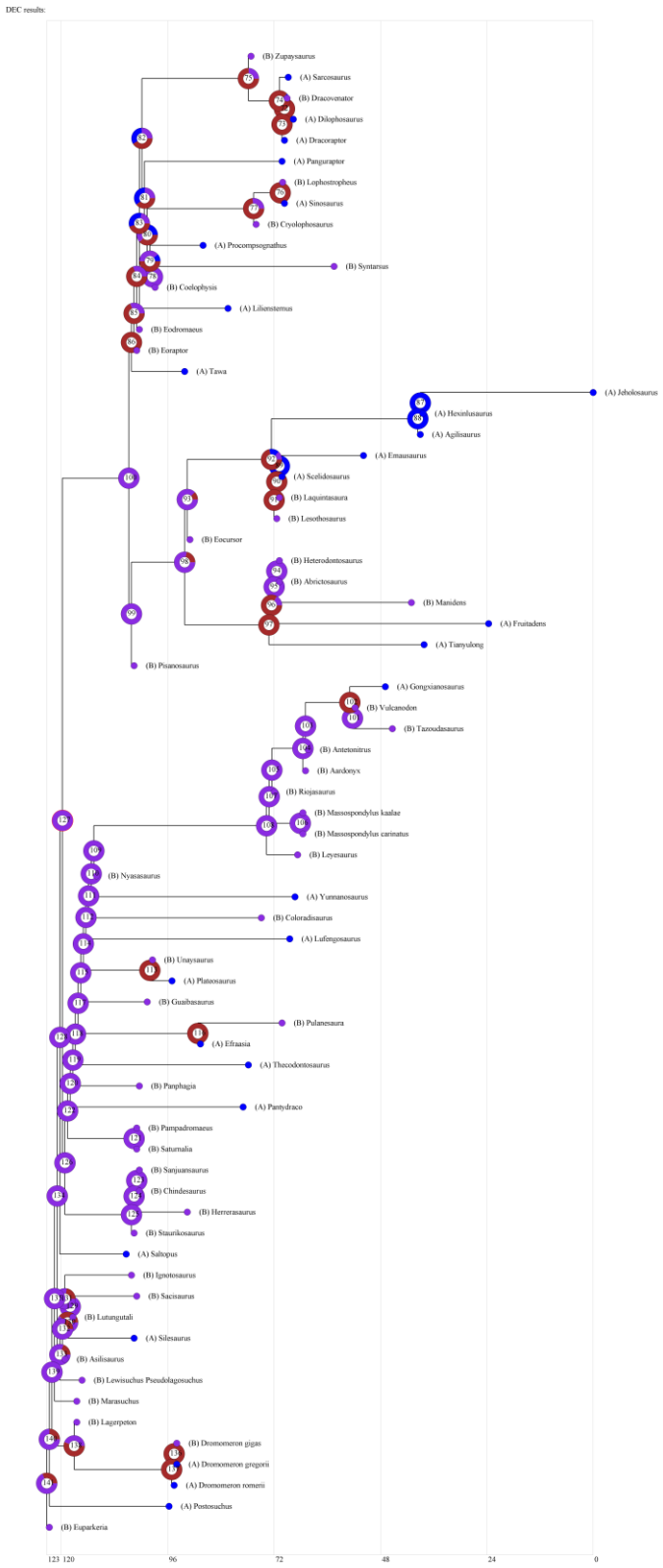

Fig. S15. Ancestral area states for dinosaur geographical origin using DEC. Tree with Silesauridae as the sister taxon to a *Saltopus elginensis* + Dinosauria clade. Blue represents northern Pangaea, purple represents southern Pangaea, and brown represents Pangaea (northern+southern). Ancestral area reconstruction for Dinosauria (node 127) is southern Pangaea.

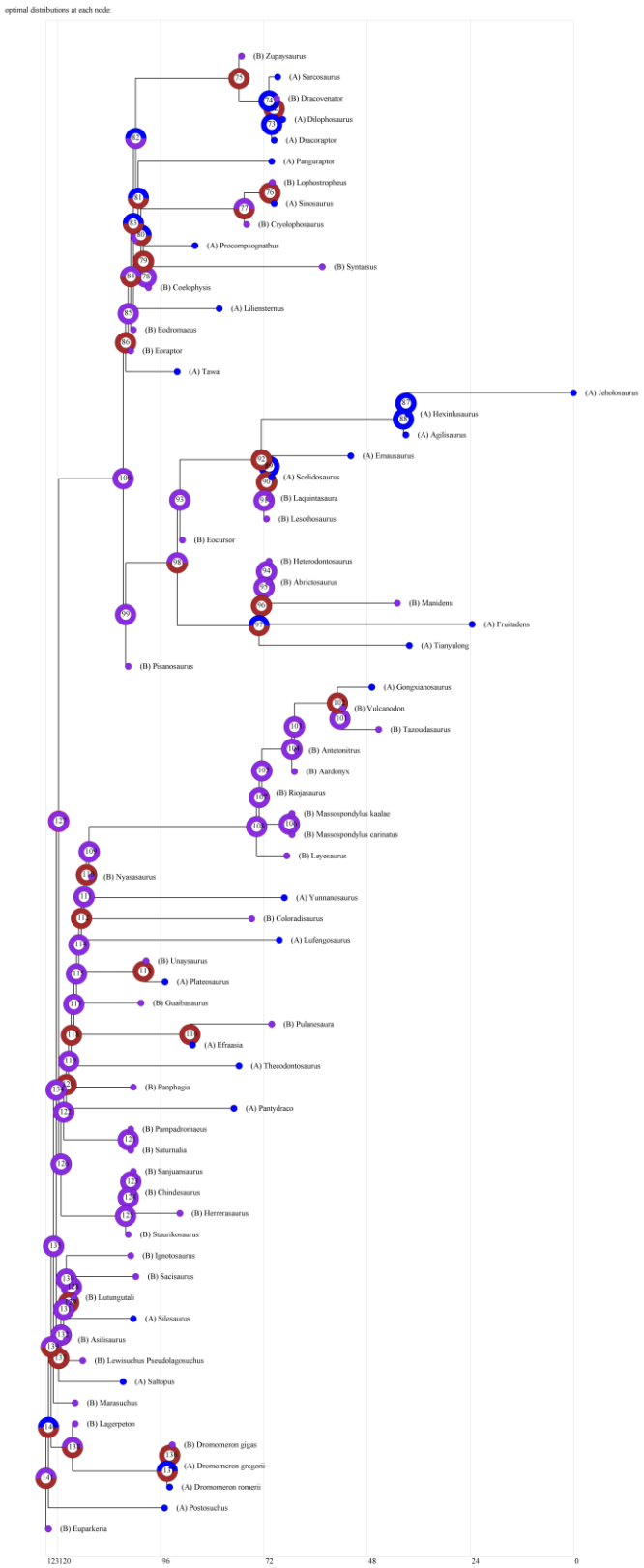

Fig. S16. Ancestral area states for dinosaur geographical origin using S-Diva. Tree with Dinosauria as the sister taxon to a *Saltopus elginensis* + Silesauridae clade. Blue represents northern Pangaea, purple represents southern Pangaea, and brown represents Pangaea (northern+southern). Ancestral area reconstruction for Dinosauria (node 127) is southern Pangaea.

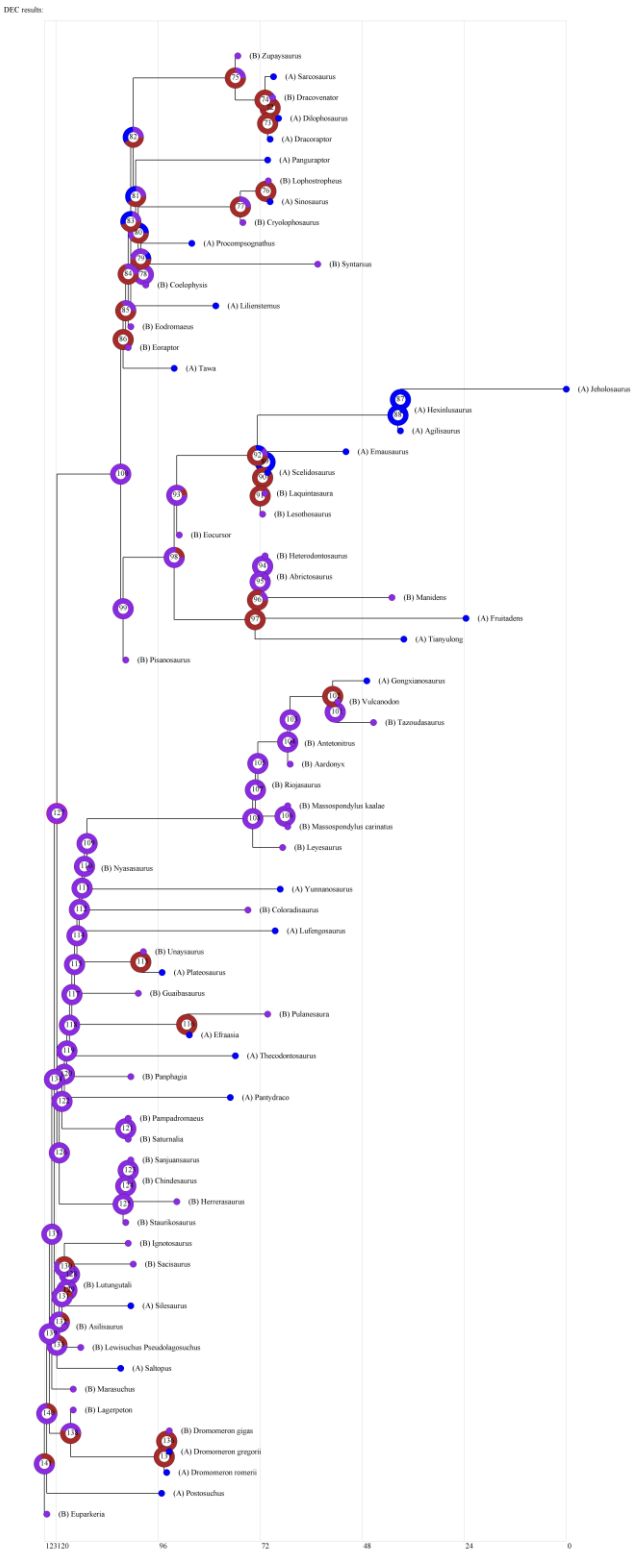

Fig. S17. Ancestral area states for dinosaur geographical origin using DEC. Tree with Dinosauria as the sister taxon to a *Saltopus elginensis* + Silesauridae clade. Blue represents northern Pangaea, purple represents southern Pangaea, and brown represents Pangaea (northern+southern). Ancestral area reconstruction for Dinosauria (node 127) is southern Pangaea.

5. *Nyasasaurus parringtoni* and the timing of dinosaur origins

Nyasasaurus parringtoni was described by Nesbitt *et al*. (2013) as "either the earliest known member of, or the sister-taxon to, Dinosauria". This somewhat conservative approach appropriate for a taxon based on such fragmentary material: a humerus and vertebrae, which are not definitively associated with one another. In contrast, Baron *et al*. (2017) found *N. parringtoni* to nest fairly deeply within Sauropodomorpha, leading to the conclusion that some key divergences within Dinosauria may "have occurred in the late Middle and very earliest Late Triassic". Baron et al. (2017) recognized the uncertainties surrounding *N. parringtoni*, due to the large amount of missing data, and excluded it from the main phylogeny figure in the main text, and in some sensitivity analyses that also removed other fragmentary taxa. However, this did not prevent the authors from interpreting the minimum divergence age of Dinosauria based on *N. parringtoni*, placing "the origin of dinosaurs at the boundary of the Olenekian and Anisian stages (around 247 Ma), slightly earlier than has been suggested previously".

Some of the features that apparently support the nesting of *Nyasasaurus parringtoni* within sauropodomorphs are expressed in two characters newly proposed by Baron *et al*. (2007). Both have difficulties in interpretation and are not very precisely defined.

206. Angle formed between pre- and postzygapophyses on anterior-to-middle cervical vertebrae: 0, very large, around 40 degrees, or over; 1, large, around 30 degrees; 2, small, around 20 degrees (new). ORDERED

State "2", which unites *Nyasasaurus parringtoni* with sauropodomorphs, is not only seen in early sauropodomorphs, but also in theropods with elongated cervical vertebra such as *"Syntarsus" kayentakatae* and *Elaphrosaurus bambergi*. Indeed, in these taxa, because both the pre- and postzygapophyses form smaller angles to the horizontal plane, they in fact form a larger angle in relation to one another, not a "small" angle as defined by Baron *et al*. (2007). Moreover, cervical vertebrae are associated to *N. parringtoni* not based on taphonomic evidence, but only in "shared" phylogenetic signal (Nesbitt et al. 2013), making circular reasoning pervasive in the assumptions regarding its affinities.

259. Humerus, distinct fossa on posterodorsal surface, just below the proximal edge: 0, absent; 1, present (new).

The presence of the fossa (state "1") unites *Nyasasaurus parringtoni* with sauropodomorphs. A fossa is indeed present on the posterodorsal surface of the humerus of *N. parringtoni*, (although this could potentially represent a taphonomic artefact), but this is not clearly seen in any well know early sauropodomorph. Therefore, both features provide dubious evidence for the nesting of *N. parringtoni* within Sauropodomorpha.

Even correcting for the two problematic characters discussed above, our modified analysis still finds *Nyasasaurus parringtoni* among sauropodomorphs (Figs. S1-S2). Yet, we stress that the incompleteness of the taxon (scored for only 25 of the 457 characters; = c. 5%), and the uncertain association of its parts, precludes the safe inference of its phylogenetic position at present. This could be attained only with a deeper investigation on the association of the fossils and their anatomical traits, and preferably with the discovery of new specimens. In the absence of a more firmly established phylogenetic position, we caution against making further macroevolutionary claims (e.g., divergence time of inferred clades) on taxa as clearly problematic as *N. parringtoni*.

In our understanding, the record of *Asilisisaurus kongwe*, from possibly the same beds as *Nyasasaurus parringtoni* within the Manda beds of Tanzania (Nesbitt *et al*., 2017), still represents our best proxy for estimating the divergence time of dinosaurs. As a member of the sister clade to Dinosauria (i.e. Silesauridae), it indicates that the dinosaurian lineage dates to at least the late Anisian. Further extension of that origin remains speculative, as is the case with the origin of the clade itself. At the present, the oldest unambiguous members of Dinosauria are still Late Triassic in age (Irmis, 2010; Langer, 2014).

6. Institutional abbreviations

AMNH, American Museum of Natural History, New York, USA; **BP**, Evolutionary Studies Institute, Johannesburg, South Africa; **BRSMG**, Bristol City Museums and Art Gallery, Bristol, UK; **BYUVP**, Earth Science Museum, Brigham Young University, Provo, USA; **CM**, Carnegie Museum of Natural History, Pittsburgh, USA; **FMNH**, Field Museum of Natural History, Chicago, USA; **GPIT**, Institut und Museum für Geologie und Paläontologie, Tübingen, Germany; **GR**, Ruth Hall Museum of Paleontology, Ghost Ranch, USA; **IVIC**, Instituto Venezolano de Investigaciones Científicas, Caracas, Venezuela; **LACM**, Natural History Museum of Los Angeles County, Los Angeles, USA; **MACN-Pv**, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Paleovertebrados, Buenos Aires, Argentina; **MB**, Museum für Naturkunde der Humboldt Universität, Berlin, Germany; **MBLUZ**, Museo de Biología de la Universidad del Zulia, Maracaibo, Venezuela; **MCN**, Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil; **MCP**, Museu de Ciências e Tecnologia PUC/RS, Porto Alegre, Brazil; **MCZ**, The Louis Agassiz Museum of Comparative Zoology, Harvard University, Cambridge, USA; **MEF**, Museo Paleontológico Egidio Feruglio, Trelew, Argentina; **MNA**, Museum of Northern Arizona, Flagstaff, USA; **MNHN**, Muséum National d’Histoire Naturelle,

Paris, France; **MOR**, Museum of the Rockies, Bozeman, USA; **MWC**, Museum of Western Colorado, Grand Junction, EUA; **NHMUK PV**, The Natural History Museum, Palaeontology Vertebrates, London, UK; **NMMNH**, New Mexico Museum of Natural History, Albuquerque, EUA; **NM QR**, National Museum, Bloemfontein, South Africa; **NMT**, National Museum of Tanzania, Dar es Salaam, Tanzania; **NMW**, Amgueddfa Cymru—National Museum Wales, Cardiff, UK; **PEFO**, Petrified Forest National Park, Holbrook, USA; **PULR**, Universidad Nacional de La Rioja, La Rioja, Argentina; **PVL**, Instituto Miguel Lillo, Tucumán, Argentina; **PVSJ**, Museo de Ciencias Naturales, San Juan, Argentina; **SAM**, Iziko South African Museum, Cape Town, South Africa; **SGWG**, Sektion Geologische Wissenschaften Greifswald, Ernst-Moritz Universität, Greifswald, Germany; **SMA**, Sauriermuseum, Aathal, Switzerland; **SMNS**, Staatliches Museum fur Naturkunde, Stuttgart, Germany; **UCMP**, University of California Museum of Paleontology, Berkeley, EUA; **UFRGS**, Institute of Geosciences, Universidade Federal do Rio Grande de Sul, Porto Alegre, Brazil; **UFSM**, Universidade Federal de Santa Maria, Santa Maria, Brazil; **ULBRA**, Universidade Luterana do Brasil, Canoas, Brazil; **UMNH**, Utah Museum of Natural History, University of Utah, Salt Lake City, USA; **UMZC**, Museum of Zoology, Cambridge University, Cambridge, UK; **USNM/NMNH**, National Museum of Natural History, Smithsonian Institution, Washington-DC, USA; **VMNH**, Virginia Museum of Natural History, Martinsville, USA; **ZDM**, Zigong Dinosaur Museum, Zigong, China; **ZPAL**, Institute of Paleobiology of the Polish Academy of Sciences, Warsaw, Poland.

7. References

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