A new macronarian sauropod from the Upper Jurassic of Portugal

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Supplementary data 2. Map of synapomorphies of the phylogenetic approaches

**Synapomorphies for the nodes of phylogenetic hypothesis obtained in the analysis I from Carballido et al. (2015) data matrix.**

**Node 1.** No synapomorphies; **Node 2.** 81 (0🡪1); **Node 3.** 141 (0🡪1), 168 (0🡪1), 232 (0🡪1), 261 (0🡪1), 328 (0🡪1); **Node 4.** 167 (0🡪1), 252 (0🡪1), 263 (0🡪1); **Node 5.** 299 (0🡪1), 300 (0🡪1), 336 (0🡪1); **Node 6.** 106 (0🡪2); **Node 7.** 232 (1🡪0); Node 8. 116 (1🡪0); **Node 9.** 300 (1🡪0), 341 (0🡪1); **Node 10, Eusauropoda.** 52 (0🡪1), 94 (0🡪1), 146 (0🡪1), 287 (0🡪1), 305 (0🡪1), 310 (0🡪1), 312 (0🡪1), 324 (0🡪1), 330 (0🡪1), 333 (0🡪1), 334 (0🡪1), 339 (0🡪1), 340 (0🡪1); **Node 11.** 118 (1🡪0), 182 (0🡪1), 230 (0🡪1); **Node 12.** 127 (0🡪1), 155 (0🡪1), 181 (1🡪2); **Node 13.** 161 (1🡪0), 164 (1🡪0), 310 (1🡪0); **Node 14.** 135 (0🡪1), 145 (0🡪1), 325 (0🡪1); **Node 15, Mamenchisauridae.** 106 (0🡪1), 115 (0&1🡪3), 120 (0🡪1&2), 124 (0🡪1), 125 (1🡪0), 126 (0🡪1), 139 (0🡪3), 152 (0🡪1), 174 (0🡪2), 187 (1🡪0); **Node 16.** 19 (1🡪0), 136 (0🡪1), 270 (0🡪1), 296 (0🡪1), 316 (0🡪1); **Node 17, Turiasauria.** 174 (0🡪1), 193 (0🡪2); **Node 18.** 149 (0🡪1), 207 (0🡪1), 309 (0🡪1), 317 (0🡪1), 319 (0🡪1); **Node 19, Neosauropoda.** 96 (0🡪1), 106 (0🡪2), 120 (0🡪1); **Node 20, Diplodocoidea.** 1 (1🡪0), 2 (1🡪0), 7 (0🡪1), 9 (0🡪1), 19 (0🡪2), 20 (0🡪1), 22 (0🡪1), 42 (1🡪2), 55 (0🡪1), 58 (1🡪2), 78 (0🡪1), 94 (1🡪2), 95 (1🡪3), 97 (0🡪1), 100 (1🡪0), 102 (0🡪1), 103 (1🡪3), 108 (0🡪3), 145 (1🡪2), 163 (1🡪0), 184 (0🡪1), 205 (0🡪1), 215 (0🡪1), 219 (0🡪1), 343 (0🡪1), 345 (1🡪0); **Node 21, Rebbachisauridae.** 203 (1🡪0), 208 (0🡪1); **Node 22.** 166 (0🡪1), 192 (0🡪1); **Node 23.** 152 (0🡪1), 193 (0🡪4), 289 (0🡪1); **Node 24.** 256 (1🡪0), 290 (0🡪1), 298 (0🡪1); **Node 25.** 152 (1🡪2), 173 (0🡪1), 238 (0🡪1); **Node 26.** 239 (0🡪1); **Node 27.** 158 (0🡪), 197 (0🡪1), 291 (0🡪1), 303 (0🡪1); **Node 28, Flagellicaudata.** 8 (0🡪1), 12 (1🡪2), 53 (1🡪0), 82 (0🡪1), 132 (0🡪1), 158 (0🡪1), 193 (0🡪2), 198 (0🡪1), 216 (1🡪2), 286 (0🡪1), 295 (1🡪0), 296 (1🡪0), 297 (0🡪1), 327 (0🡪1); **Node 29, Dicraeosauridae.** 4 (0🡪1), 26 (0🡪1), 34 (1🡪0), 43 (0🡪1), 50 (0🡪1), 84 (0🡪1), 85 (0🡪1), 103 (3🡪2); **Node 30.** 35 (0🡪1), 47 (0🡪1), 113 (1🡪0), 115 (1&2🡪3), 135 (1🡪0), 139 (1🡪0); **Node 31.** 171 (0🡪1); **Node 32, Diplodocidae.** 25 (0🡪1), 27 (0🡪1), 28 (0🡪1), 44 (0🡪1), 101 (1🡪0), 109 (1🡪3), 120 (1🡪2), 134 (2🡪3), 136 (1🡪0), 154 (0🡪1), 201 (0🡪1), 202 (0🡪1), 206 (0🡪1); **Node 33, Diplodocinae.** 126 (0🡪1), 129 (0🡪1), 194 (0🡪1), 195 (0🡪1), 196 (0🡪1), 204 (0🡪1), 208 (0🡪2), 209 (0🡪1), 213 (2🡪3); **Node 34, Macronaria.** 161 (1🡪0), 186 (0🡪1), 236 (0🡪1); **Node 35, Camarasauromorpha.** 116 (1🡪2), 136 (1🡪0), 143 (0🡪1), 162 (0🡪1), 238 (0🡪1), 288 (0🡪1), 293 (0🡪1), 317 (1🡪0); **Node 36.** 73 (0🡪1), 74 (0🡪1), 211 (0🡪1), 260 (0🡪1), 282 (0🡪1), 284 (0🡪1), 343 (0🡪1), 345 (1🡪0), 360 (0🡪1); **Node 37, Titanosauriformes.** 19 (0🡪1), 93 (1🡪2), 95 (1🡪2), 100 (1🡪0), 108 (0🡪1), 112 (0🡪1), 120 (1🡪2), 126 (0🡪1), 139 (1🡪2), 176 (0🡪1), 180 (0🡪1), 193 (0🡪1), 256 (1🡪0), 302 (0🡪1); **Node 38**. 139 (2🡪3), 147 (0🡪1), 150 (0🡪1), 157 (0🡪1), 161 (0🡪1), 203 (1🡪0), 369 (0🡪1); **Node 39.** 127 (1🡪0), 231 (0🡪1), 247 (0🡪1), 266 (0🡪1); **Node 40, Titanosauria.** 116 (2🡪3), 128 (1🡪0), 240 (0🡪1), 258 (1🡪0); **Node 41.** 195 (0🡪1), 196 (0🡪1); **Node 42.** 237 (0🡪1); **Node 43.** 103 (1🡪2), 238 (1🡪0); Node 44. 148 (1🡪2), 210 (0🡪2), 217 (0🡪1), 256 (0🡪1); **Node 45.** 165 (0🡪1), 216 (1🡪0); **Node 46.** 157 (1🡪2), 193 (1🡪3), 210 (2🡪3), 360 (1🡪0); **Node 47, Lithostrotia.** 149 (1🡪2), 151 (0🡪1), 152 (0🡪2), 311 (0🡪1); **Node 48.** 103 (2🡪3), 141 (1🡪0), 173 (0🡪1), 257 (0🡪1); **Node 48.** 108 (1🡪2); **Node 49.** 30 (0🡪1), 61 (0🡪1), 70 (1🡪0), 77 (0🡪1); **Node 50.** 148 (2🡪1), 157 (2🡪0); **Node 51.** 150 (1🡪2), 360 (0🡪1); **Node 52.** 126 (1🡪0), 356 (0🡪1); **Node 53.** 140 (1🡪0), 195 (0🡪1), 244 (1🡪0), 246 (0🡪1), 256 (1🡪2), 264 (0🡪1), 362 (0🡪1); **Node 54.** 136 (0🡪1), 150 (2🡪1), 218 (0🡪1), 241 (1🡪0), 366 (1🡪0). Note: This map of synapomorphies was obtained from the topology of consensus strictus.



Figure S1. Phylogenetic hypothesis obtained in the analysis I based on Carballido et al. (2015) data matrix with internal nodes numbered for list of synapomorphies.

**Synapomorphies for the nodes of phylogenetic hypothesis obtained in the analysis II from Mannion et al. (2017) data matrix.**

**Node 1.** No synapomorphies; **Node 2.** 26 (0🡪1), 27 (0🡪2), 177 (0🡪1), 199 (0🡪1); **Node 3.** 9 (0🡪1), 11 (0🡪1), 48 (0🡪1), 78 (0🡪1), 82 (0🡪1), 87 (0🡪1), 115 (0🡪1), 118 (0🡪1), 121 (0🡪1), 141 (0🡪1), 144 (0🡪1), 148 (0🡪1), 200 (0🡪1), 217 (0🡪1), 237 (0🡪1), 244 (0🡪1), 255 (0🡪1), 259 (0🡪1), 265 (0🡪1), 277 (0🡪1), 296 (0🡪1), 329 (0🡪1), 339 (0🡪1), 363 (0🡪1), 368 (0🡪1), 397 (0🡪1), 399 (0🡪1); **Node 4, Turiasauria.** 11 (1🡪0), 43 (1🡪0), 49 (0🡪1), 112 (0🡪1), 365 (0🡪1), 369 (0🡪1), 402 (0🡪1), 412 (0🡪1); **Node 5.** 224 (0🡪1), 413 (0🡪1); **Node 6, Diplodocoidea.** 11 (1🡪2), 31 (0🡪1), 75 (1🡪0), 76 (0🡪1), 88 (0🡪1), 99 (0🡪1), 104 (0🡪3), 105 (0🡪2), 106 (0🡪1), 107 (0🡪1), 108 (0🡪1), 109 (0🡪1), 110 (0🡪1), 122 (1🡪2), 130 (0🡪1), 139 (1🡪0), 165 (0🡪1), 167 (0🡪1), 186 (0🡪1), 197 (0🡪1), 198 (0🡪1), 214 (0🡪1), 255 (1🡪0), 266 (0🡪1), 285 (0🡪1), 286 (0🡪2), 287 (0🡪2), 288 (0🡪1), 292 (0🡪1), 301 (0🡪1), 310 (0🡪1), 312 (0🡪1), 320 (0🡪1), 342 (0🡪1), 366 (0🡪1); **Node 7, Diplodocidae.** 2 (0🡪1), 15 (0🡪1), 22 (0🡪1), 33 (0🡪1), 37 (0🡪1), 89 (0🡪1), 101 (0🡪1), 119 (0🡪1), 132 (0🡪1), 147 (1🡪0), 155 (0🡪1), 161 (0🡪1), 181 (0🡪1), 182 (0🡪1), 196 (1🡪0), 212 (0🡪1), 291 (0🡪1), 314 (0🡪1), 334 (0🡪1), 361 (0🡪1), 407 (0🡪1); **Node 8, Macronaria.** 10 (1🡪0), 52 (0🡪1), 55 (0🡪1), 108 (0🡪1), 120 (0🡪1), 122 (1🡪2), 146 (0🡪1), 147 (1🡪2), 148 (1🡪0), 155 (0🡪1), 162 (0🡪1), 171 (0🡪1), 183 (0🡪1), 208 (1🡪0), 266 (0🡪1), 267 (0🡪1), 272 (1🡪0), 286 (0🡪1), 287 (0🡪1), 314 (0🡪1), 335 (0🡪1), 361 (0🡪1), 403 (0🡪1), 407 (0🡪1); **Node 9.** 46 (0🡪1), 49 (0🡪1), 388 (0🡪1); **Node 10.** 50 (0🡪1), 233 (0🡪1), 234 (0🡪1), 283 (0🡪1), 370 (1🡪0); **Node 11.** 32 (0🡪1), 40 (0🡪1), 65 (0🡪1), 210 (0🡪1), 239 (0🡪1), 283 (0🡪1); **Node 12.** 28 (0🡪1), 192 (0🡪1), 205 (1🡪2), 365 (0🡪1); **Node 13, Titanosauriformes.** 141 (1🡪2), 148 (0🡪1), 183 (1🡪0); **Node 14, Brachiosauridae.** 61 (0🡪1), 62 (0🡪1), 113 (1🡪0), 154 (0🡪1), 158 (0🡪1), 163 (0🡪1), 165 (0🡪1), 220 (1🡪0), 258 (0🡪1), 405 (0🡪1); **Node 15.** 389 (0🡪1), 406 (0🡪1); **Node 16.** 40 (2🡪3), 346 (0🡪1); **Node 17.** 26 (0🡪1), 155 (1🡪0), 178 (0🡪1), 206 (0🡪1), 224 (0🡪1); **Node 18, Somphospondyli.** 261 (0🡪1), 264 (0🡪1), 387 (0🡪1); **Node 19.** 213 (0🡪1), 262 (0🡪1), 269 (0🡪1), 385 (80🡪1); **Node 20, Euhelopodidae.** 19 (0🡪1), 24 (0🡪1), 30 (0🡪1), 35 (0🡪1), 71 (0🡪1), 128 (0🡪1), 131 (0🡪1), 132 (0🡪1), 138 (0🡪1), 156 (0🡪1), 350 (0🡪1), 389 (0🡪1); **Node 21.** 15 (1🡪2), 16 (1🡪0), 17 (0🡪1), 65 (1🡪0), 121 (1🡪0), 124 (0🡪1), 323 (0🡪1); **Node 22.** 263 (0🡪1), 392 (0🡪1), 393 (0🡪1); **Node 23.** 380 (1🡪0); **Node 24.** 59 (1🡪0), 64 (0🡪1), 251 (0🡪1); **Node 25.** 37 (0🡪1), 136 (0🡪1), 140 (0🡪1), 159 (0🡪1), 169 (0🡪1), 215 (0🡪1), 228 (0🡪1), 232 (0🡪1), 263 (0🡪1), 330 (0🡪1); **Node 26.** 15 (1🡪2), 123 (0🡪1), 134 (0🡪1), 135 (0🡪1); **Node 27.** 51 (0🡪1), 66 (0🡪1), 111 (0🡪1), 168 (0🡪1), 225 (0🡪1), 391 (1🡪0), 403 (1🡪0); **Node 28.** 21 (0🡪1), 25 (1🡪0), 148 (1🡪2); **Node 29.** 144 (1🡪0), 145 (1🡪0); **Node 30.** 42 (1🡪0), 64 (0🡪1), 70 (0🡪1), 73 (0🡪1), 281 (0🡪1), 336 (0🡪1) 393 (0🡪1); **Node 31.** 31 (1🡪0), 47 (1🡪0), 65 (1🡪0), 151 (1🡪0), 206 (0🡪1); **Node 32.** 46 (0🡪1); 232 (1🡪0); **Node 33, Titanosauria.** 26 (0🡪1), 29 (0🡪1), 49 (0🡪1), 155 (0🡪1), 173 (1🡪0), 181 (0🡪1), 341 (0🡪1), 388 (1🡪0); **Node 34.** 26 (1🡪0), 149 (0🡪1), 151 (1🡪0), 164 (0🡪1), 190 (0🡪1), 348 (0🡪1), 355 (0🡪1); **Node 35.** 132 (0🡪1), 344 (0🡪1); **Node 36.** 21 (0🡪1), 169 (1🡪0); **Node 37.** 45 (0🡪1), 251 (0🡪1), 333 (0🡪1), 343 (0🡪1); **Node 38.** 334 (0🡪1), 340 (1🡪0), 386 (0🡪1); **Node 39.** 27 (0🡪2), 122 (1&2🡪0), 176 (0🡪1), 177 (0🡪2), 179 (0🡪1); **Node 40.** 205 (2🡪1), 208 (0🡪1), 259 (1&2🡪0); **Node 41, Lithostrotia.** 15 (1🡪2), 148 (1🡪2), 151 (0🡪1), 279 (0🡪1), 327 (0🡪1); **Node 42.** 26 (0🡪1), 68 (1🡪0), 127 (1🡪0), 184 (0🡪1), 197 (0🡪1), 345 (0🡪1), 388 (0🡪1); **Node 43.** 67 (0🡪1), 70 (1🡪0), 176 (1🡪0), 182 (1🡪0), 236 (1🡪0), 281 (0🡪1), 282 (0🡪1), 366 (0🡪1), 379 (0🡪1); **Node 44.** no synapomorphies; **Node 45.** 36 (1🡪0), 47 (1🡪0), 92 (0🡪1), 157 (0🡪1), 189 (1🡪0), 215 (1🡪0), 229 (0🡪1), 255 (1🡪0), 273 (0🡪1), 325 (0🡪1), 347 (0🡪1), 360 (0🡪1), 378 (0🡪1), 390 (0🡪1), 393 (1🡪0); **Node 46.** 15 (2🡪0), 41 (1🡪0), 45 (0🡪1), 57 (1🡪0), 125 (0🡪1), 144 (1🡪0), 226 (0🡪1), 230 (0🡪1), 231 (1🡪0), 353 (0🡪1), 357 (0🡪1), 364 (0🡪1), 371 (0🡪1); **Node 47.** 29 (1🡪0), 47 (0🡪1), 59 (0🡪1), 69 (1🡪0), 151 (1🡪0), 152 (0🡪1), 160 (1🡪0), 201 (0🡪1), 349 (0🡪1), 369 (0🡪1); **Node 48.** 25 (1🡪0), 28 (1🡪0), 33 (1🡪0), 36 (0🡪1).

Note: This map of synapomorphies was obtained from the topology of consensus strictus.



Figure 2S. Phylogenetic hypothesis obtained in analysis II based on Mannion et al. (2017) data matrix with internal nodes numbered for list of synapomorphies.

**References**

Carballido, J.L., D. Pol, M.L. Parra Ruge, S. Padilla Bernal, M.E. Páramo-Fonseca, F. Etayo-Serna. 2015. A new Early Cretaceous brachiosaurid (Dinosauria, Neosauropoda) from northwestern Gondwana (Villa de Leiva, Colombia). Journal of Vertebrate Paleontology 35:e980505.

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