SUPPLEMENTAL DATA

A new carcharodontosaurian (Dinosauria, Theropoda) from the Lusitanian Basin: evidence of allosauroid sympatry in the European Late Jurassic

ELISABETE MALAFAIA, PEDRO MOCHO, FERNANDO ESCASO and FRANCISCO ORTEGA

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APPENDIX S1. Data matrix used for the phylogenetic analysis of *Lusovenator* *santosi* gen. et sp. nov., which is based on Carrano, Benson, and Sampson (2012) with the modifications proposed by Coria and Currie (2016) and Zanno and Makovicky (2013)

#NEXUS

begin data;

dimensions ntax=65 nchar=358;

format missing=? symbols="0~9";

matrix

Acrocanthosaurus 020?1100?0000001111000000211111100010?000000211101211100020212011?1121111020110?02??11012100000100110100012011111?111002100101020010?11111?000100010000010011012?00110011?00?0012110001000110001211110?0021000000101?1?110110120012001110?001011110000113110111111000????010?10??1110110201201?120?201111000220111011110000110010302?1010?1110?1??01210111001?1??1?0?0

Aerosteon ????????????????????????????????????????????????????????01?000?111??????????10000200??????????????????????????????????????????????????????????0????????????110121???????11?01001?1?00010001011100111?????2?110??01????????0101100121????????????????????????????????02011010010221110110201201?120???0??????????????????????1001?402????01112021110????????????10?111?

Afrovenator ?????????0010101100000100120011000?????0?000201001?011001011000?????????00?001111001?????????????????????????????????????????????????????0000000001?????10?11001?0?011000010001101100001?001?000001???????100000???1?01010??????????0111?????00?0?????0?31001111?100001?10?01101011?011?2012?1?00?001011100011101100001100001000020?11010110???111011?011100??100000?0

Allosaurus 00101{01}000001000101000000021111110001101100002{01}2{01}0010110000000101111100011020000002001101100011010010010201201111111112000100110201111111110000100011020010011001100110010{01}100001011000100001000101111000011?0000000101?11011012001200111010110000100011131001111110000111010010211110110201201?1100200111000{12}101110111100001100102022101011110211101210111001010000000

Angaturama 11???201?1121?11???0?????????????0?????????????????????????????????????????????????????????????????????????????????????1?0??????????????????110111101311??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????

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Baryonyx 111?0201011210110?0000???02???1??01????0?001202011?0??????0??0?1111100??????0?11011010001011?01??010210?011??????????001101010?{12}101???1??0100101100013001011100{12}?1001001001000110111110100011000101010?0???000?00??1??1?00??0?1?0100011111100010011010????????????10?0?11010?101?1110110{01}0?2?1?0????0011000????1????00110100????????110?0?????????????0????????0000000

Carcharodontosaurus ??????0??000000111100001001101110101111000?02?1?0??111100??21211211?211????0????????110121?0??0100??01121121???1???????2?10??????????????1000020000?????10?110?2?????0??01?0?00101?0???1????0??????????????100?0???1???1??????????????????????????????????????????????????1??1???????11?????0?????0??11?????22??1101111??01?100???????010??????????????????????????0?0

Ceratosaurus 0210100010000000000000000010100010120?00000020200110000000100001111110001010010010001010100000000110100001110000?100010000001??1000000100100010000010100100011021?0100010000000021100000010100001010211??10000210?0100001101011110100100110000????0??1??1?01?00010?010?11100?0000111011110110100001{01}0001001100110{01}001102100010100200211101001021??1?0001??10???00000?0

Chilantaisaurus ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0110110000????????????????????11??????10????2110????????????????????????22??111???1000?1100??40221????1?????????2101??0????????0?0

Chuandongocoelurus ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0????????????????????0?????????????0?????????0????????????????????????????????????????????????????????00???0011101011???1?0?????0?????????????00?101000100000?1000040?2121011???21110?100??100??????????

Coelophysis\_bauri 00101211000010????0?011010100?0000000?0000101??0000000000000000?0?00000110110100000?0000000?0?2??1????0??1?0?0?0?00??00110?0?0000?00?0000000010000?0000000001100?100011000?000001011000000?0000000001000000000011?1100?01?000001002000001000000?0{01}?00101110100000000100100011000011011110100?10000001000010000110{01}00?00?000?010001000021000000101111000110000000000000

Coelophysis\_rhodesiensis 00???211000010???00?01101100?00000000?020010100001{01}00000000?000100000000?0110?0000000000000000200100?000?10000000001000100000000000000000100000000100000000011011?0001100000000010110000000?0000000010000?0000?11?1100001?000001002000001000?0010{01}000110110100000000100100011000111011110000?1000?011100010000111{01}001102000?0100?1000021000000101111000110100000000000

Compsognathus 00???100000100????0?010002100?1??0000?0000000??00000?000?00?00????1?00????????0??0????0??00?????0??0?0??????1?1????1?0000?00??0??100??10100?0000?0??0000100?100{12}???????100?001??001100?000????0000??1??0??000?0?00?1?0?0111?011100?0?????0???0???0??01?1310011????0?000??010?11??110011?20?201?011?11?10??002???111?????????1?0???????01011???????01??0?11?01010000?00

Concavenator ?????0???????0??????001002??0?1?00?1111?10102010000?110??10??2????1?????????????????????????????????????????????????????????????????????????1020?0??????{01}0??100?????????????????{12}?1??10????1???0211?1?1??{01}100?000????1?111110?10?1??0?0??10??0?1010001??????????????0?0?0?10?11??111011020????????02011???1?22??1100???????????????2??0?0?1?1?????0???0?1?00????00?000

Condorraptor ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0010001????????01001????????0000?00101?00001000?2001?011101001?0002???01??101???????????????????????????????????????????0?1??01?01010????????0????0???00001100????????0??01000001?00??01????????????????1?01???0???0?000??

Cryolophosaurus ???????????????????00?????????1??00?1001?01010?000?0111??0?00{01}0?1?10000?10??000000??10001000001??1?0010????0??????1??0????????????10?000000000?0?01??????0?01000????????00?0?000?0?1000??001000??010?0?????000200????0?01??????????????????????0?10001??????????????00???00???0?????011??0????0???0?0??10011001?0?00110100000000?2??????01001011??0????????????0000???

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D\_sinensis ?0?0?000?0010???????000202??0?1??0??101300100??000?00?00?01?000???1??0?????1?0?????????????????????????????????????????00??0?00???1?????????0??0?0??????10?0100{12}?1?00??00010000?001000000100?000001??000?1000020??01?010??010001?000111111000000010001???1010111?000000?0101?0000111011?{01}002010000?200010111001110000101000?1000021001010?0????0???110011100??1???????

Dilophosaurus 01?1121100001000000{01}001000100000000?100200100??00?200100001?0001001000?1101101000000000?000000200101000001??0??0?????201100010000?1000000{01}1000000010000010101101??00011100100000101100000000000010101000010000201??10000100000010010010010000001010001?1110110001000100100011000011001100000?10000010001?00100110{01}000000000001000201002100001010110100011000?0?01000?0

Dubreuillosaurus 01???100?0010101?000001001{12}0001??0??0??0??002??001?0????1011?001011?000000??????????10??2011100?0??110010??0??????010?0110111??201???????0000000?0100000100?1001?????????0?????????0?00??0?1??????1???????1??000?10????0110?????0???????????????????????????????????????????????????????????????????????????????11????0?0???????????1?01????????????????1??????0???0??

Duriavenator 00???100??0101011000?0?0?120?1???0?????????????????????????????????????????????????????????????????????????????????????110101????????????0000010?0??0?00100??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0

Elaphrosaurus ???????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0110{12}????????00100000?011000001?0000000002111?0000011??010???????0???11?01100100001000???????????????????000111000000?111111100?{12}??????0?0?00001100110?00110??00010000200??21?0??????111?001???1????0?000?0

Eocarcharia ?????????00000011100101002111111?0??????????????????????01?00201111???1??????????????????????????????????????????????????????????????????1000010?01?????10?????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0?0

Eustreptospondylus ?1???20000011?01100000010120?1???0???????100200001??????10?10001?1??00000???0111100010??1001000100?11000012??????????00110111????????????00000?0?010000010011001???01101001000110110000010011000101?100??1?0000????1????????111?0???0111210?00???????????????????????00110101100011?011300?2?1?000001010100?1111110000110000100002011101?110102111??1001??000??00000?0

Fukuiraptor ???????????????????0?0?0????????????????????????????????????????????????????????????????????????????????????????????????0????????????????1000010?0110????00110?{12}????????1??????????0????0????????11??????????????????????????????12001111101?001?1010??????????????11??????0????????????????????????????????21012101?1100011??01??02????01112121??012?1???0????????0?0

Giganotosaurus 02???000??0?00?11?100001001101???10?1110100021110????????2021211??11211??0??1?00020?110121???00100?0011211?1??????111??201010?????1?1111110?0020000??00010011012?01?0??111001?01?1?00?100?11001?21?2?????2?00000???1?10?10??0???01?0????????????????????????????????01?11010010211110110201201?120020111100022011101??1?0???1001?30221010?10???????????????????10110?0

Irritator ?????2????12?0???????01100200?100010??0000010?201110010000??00011?11000????0?0???11?10??10?10010001021000?101?10?????0????????????10?11?0???1101?1???????1???????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1?????????????????????????????????????????????????0??

Leshansaurus ???????????1?1?1?001??1?0{01}???1????????????????????????????????????10000?????????????000000010021001??00????0??????????????????????????????00???0????????{01}0?1100?1?0010??0110000121?0000??0????000001100??????????????????????????????????????????????1????????????0?0??????0110?0111011?{12}0????????0??0??????{01}????100001???1?10???201110?0??????????????????0??????????

Lourinhanosaurus ???????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1100?????????00100001?1?000?000???00??01?1?00?1100000?????0?011??????????????????????????????????????????00?01010?10?1111011?2?????1???0?001?00??11011101?????????001?2022101????????????2????????????00??0

Magnosaurus ?????????????????????????????????0?????????????????????????????????????????????????????????????????????????????????????110?11????????????0000000?0????????0???0??????????????????????????????0?????????????00????????????????????????????????????????????????????????0???01??1?????????????????0??0?????????1???????0?110?001000?20?????0?11??????????????????????????

Majungasaurus 0210100010000001000000010010000011120?10020000?101200000020212012?11110110110000100010100?00000010?01101?101000001010110010100110010001001010000000100001000110210011001001100012110000001010000001021?1111001201?01000011?1011?10?011002000010??????0????????????0??0011100000001111111??????0???1??1??????0????100110?100010100200211111111021111?0001??1101?00?0000

Mapusaurus ??????0???00000111100001001101?101011110100021110??1111102?2121121????????201?000?0??????????????????????????????????00201010?01001??????1000020000?0???10011012???01???1??0?0010??0001??01?00102012?????210000?????????1?11012?0????1???10?10???????0????1????????001???0?0?102?1110110{12}1????????0?011?100022??1101111?00?1100??30221010110??2111012101??0010?1?11000

Marshosaurus 000??0000000010010001102011001?000010?000??????????0?1001?10000????1000000?10?0?01?0100020000001001?0?00?1?0???????????10001??0???1?011??00100100010000010011001?0111110001000012110000000012001101?1??????????????10???????0?1????????????1????????????????????????00?110100101011?0110010201?0000?00111000?????1??????????????????21???????0??????????????????000???

Masiakasaurus 0?????0???00100100000100001000???0?????????10???????????0??20101?10?????????0?001??00????000?0001??00???010??????????1110100001190??00?000100000000???0020001102?00110010011000111?000000101000000002011110001011?0100001?01011111001100100001????????????????????001001?1000000011?111111120100001001001??10011010011021000101002002?1111112021111?0011??1101?0??0000

Megalosaurus ?????????0000?01101100?00110?1?000?????????????????1?111???????????????????????????????????????????????????????????????000101?????0?011000010010?01??00?100???01????????0??????1?????0?1????10002011100001?0000???010?????01110?000001112110?000010000??????????????00101010110101110113?00{12}??????0?10??1?0011101100001?000010000211??0?0?1????1????1001??00???01000?0

Megaraptor ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????2????????11012????????11?0100121?0????????1??????????????110?0?1?????1?111011?0121????????????0101011?2?01011111110??????????????????????2????????????????????????????????????????????????????????2?11???????????111

Metriacanthosaurus ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1001?????????0??0??1?1?00011?00?00012111?????1?000?0???1????1???????????????????????????????????????????00??10100101111?011??012?1?0?00?101?01?111??110?11110001??0???11?????????????????????????????????0

Monolophosaurus 001?1000?00100??????000002000?100011101300100?00012{01}11000110010?11110001?021000000??1000100000010?????0????01?1??????001000010020100?0???00?0010?0??0000101110010?0010010010?0010110000000?10000101?10?0?1?000?00?010???????????????????????????????????????????????0011000101010111011?00?{12}0100???0001000?0???????????????????????????????????????????????????00000?0

Neovenator 00???1000001000101010000021001???10110110????????????????????????????????????????????????????????????????????1?????????110000????????????1000010001?020010011012?1?????11110100121100010001101100110?0???2100001???1?10?10?1011?0120????????????????????????????????01?11010010221110110201201?1200000101011020?1101111000111001130221010?10???1????210111?010?1000000

Ornitholestes 000??000?00000??????000002100?1?00001000001010?0012?11000001000?1??10001?020?00??0??1000?00???0????0??0??????????????00000?0??0?0?0?0100111?000000??00001001100{12}?????????0100101?0?000?0001000000010100??1?00010??010??11??????????00101100000000???01??11??111??1??00?0001011121111011020????????010010000021??211??0100001???????2??0?0???????????2001??0????00000?0

Piatnitzkysaurus ??????????000?01000010020110?1???0????????????????????????????????1???0?????????????10?0100000010?1101000?10???????????2010?1????????????0010010?01?????00001001?001111000100001211000010001200?1011100001?000?0??010?????01011?112001111101100??100?1??????????????001?10100101011?011?0002?10000000011000011?11100001000001000021121010?10???1????1001??0????0?0?0?0

Piveteausaurus ????????????????????????????????????????????????????????????????011?000?????????????1000?0?1002100??1002?110??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????

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Proceratosaurus 000??000?00100??????000002100?1??0????????0???????201100000????????????1??20??0??0????????????????????0??????????????00{02}00?0??0???00??1?1?110000?0??0000000????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0??

Saurophaganax ?????????????????????????????????????????????????????????0??????????????????????0??????????????????????????????????????????????????????????????????????????1100?1??????????0?001?1?000?0??0??????11????????00??0????????10??????????011?0101100???????????????????00001?1010010?????????20?{12}01?1?00??01?????210?110??01???011001?20??????????????????00????????0?1????

Shaochilong ??????????000??11?10100100110111?00???1???????????????????????????1?011?????0?00020011???1?0000100?0011??120?????????????????????????????1????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????

Shidaisaurus ???????????????????????????????????????????????????????????????0??11000?????????????110?0??????????0????????????????????????????????????????0??0?00???????????0??0110000???????1????001?00????012110100001?00???????0???????????????????????????????????????????????00??0?1??1???111011020?{12}0??00??20??0??0?????????????????????????????????????????????????????00?0??

Siamotyrannus ??????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0{12}?????????????????????????????0???1101000?0?000????010???????????????????????????????????????????????002010100102?11101122012110000??101101??????????????????????????????????????????????????????010??0

Sinraptor\_dongi 00001000000000000000010002111111000110100000211000011100010001001?110000112001000200110110001001001001120100111?11111000000110020011111000000010?0?100001001100110110001001000012110001100011001211010?0?1?000?000010???1?01011100??????????????????????2???????11?000201010010101110112201211100002101101011101110111100001100002112101011010211101210111001010000000

Spinosaurus 110?1201011210????0??0000020??1??0?????0?????????????????????????????????????????????????????????????????????????????00110?0??011????????010110111?01311?101100{12}??????????1000??21?0100?00???0?02010?00????000?0??0????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????0???0?0

Streptospondylus ???????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1100{12}????????0??0?01??1?0000010?1?0???010???????000?0??0?0?????????????????????????????????????????????????????????????????????0??1?000????????0??????????01000?01????2???????110102111???????????????????0

Suchomimus 111102010112101?0?00000100200?1??0?????0??????????????????????????1???????????110110???????????????????????????????????110??????1????????0100101100013001011100{12}???????100?0001121?1110100011000201?10?0???00000???1001?0001011?0100011111100010011010????????????100011?010?1000111011000?{12}?0?00?000011?00?11??110100110100100??40211010?102021??0?1??????????0??????

S\_zigongensis ????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????00?0??1?????00?1100{12}?????0010??000012110001000?1?00?011?1??0??000?100?????????01011?0???010021001000010001??2?00111111??00001010?10??1110110101{12}0?100?020011011111?1??0??110?000?00??201{12}10?0??010?????????????????000????

Torvosaurus 00???100?0010??110110001012000??00????00?101200001?011111011000?{01}??????????001111?01???????????????????????????????????010?0?????????????00000100010010010011011010210010010001121100001100110001011100001110000??010?101001110000000111211000000100?0{12}???001101101000001010110101110113000{12}?1000002001010001110?1000011000010000202110101101021110?1001??0????00000?0

Tyrannotitan ?????????????????????????????????1?????????????????1111????????????????????????????????????????????????????????????????20?010?0??????????1??0?20?0????????01101?1???????1???1001?1?00??00?1?001?2?1???????000??0??????????11????01??????????????????????????????????????????????????0????0?201?????20?????0?220?1?01111?0?01???????2???????????????????????010?1?0?0??

Xuanhanosaurus ???????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????????1100?????????0??????1??????000?0??00??11???????1???????????????0?1???1?200?1111?01000010001102?001101?100??????????????????????????????????????????????????????????????????????????????????????????????????

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FIGURE S1. **A**, geographic context of the specimens assigned to *Lusovanator santosi* gen. et sp. nov. (in red) and other possible carcharodontosaur specimens (in blue); **B**, chronolithostratigraphic distribution of the specimens. Nomenclature proposed for the Turcifal sub-basin based on Manuppella et al. (1999) and Hill (1988); **C**, strict consensus cladogram from 5,832 MPT’s recovered by the analysis of the data matrix of Carrano et al. (2012) with the modifications proposed by Coria and Currie (2016) and Zanno and Makovicky (2013).

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