# Late Pliocene terrestrial mammals from La Serra, a new Early Villafranchian fauna with well-documented stratigraphy near Montopoli (Tuscany, central Italy)

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# Supplementary Online Material

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## SOM-1

COMPARATIVE MATERIALS

In the Materials and Methods section of the paper, reference is made to a series of comparative collections, which were examined to facilitate a more accurate anatomical identification and taxonomic determination of the fossils from the studied locality. Below, the consulted specimens of both fossil and extant species are listed.

*Proboscidean taxa (teeth)* - *Anancus arvernensis* from Dorbola (Aulla, Massa): P548, P549; *A. arvernensis* from known localities of Lower Valdarno: MSNUP I-12576, MSNUP I-12598, MSNUP I-2607, MSNUP I-12608 (2 samples), MSNUP I-2651, MSNUP I-2655, MCMV no code (3 samples), MGCC 9265, NMB P.L.31; *A. arvernensis* from unknown localities (probably Lower Valdarno): MSNUP I-12588, MSNUP I-12599, MSNUP I-12610, MSNUP I-12621, MSNUP I-12712, MSNUP I-14649, MSNUP I-14650; *A. arvernensis* from known localities of Upper Valdarno: MPM 2360, MPM 2361, MPM 2362, MPM 2364, NMB V.A.1658 (3 samples), NMB V.A.2274; *A. arvernensis* from Val di Chiana (Southeastern Tuscany): NMB V.A.2061; *A. arvernensis* from Montefollonico (Torrita di Siena, Siena): MUSNAF 132, MUSNAF 133, MUSNAF 134, MUSNAF 143, MUSNAF 150; *A. arvernensis* from Petroio (Trequanda, Siena): Inventario proboscidati Capellini n°22, MGGC 9279, MGGC 9280; *A.*

*arvernensis* from Cetona (Siena): Cetona no code (2 samples); *A. arvernensis* from different Piedomont localities: MGGC 8443 (more samples), MRSN PU 11916, MRSN PU 14830/3, MRSN PU 14830/4, MRSN PU 14832/3, MRSN PU 14834/1, MRSN PU 14834/2, MRSN PU 14834/3, MRSN PU 14836, MRSN PU 14838, MRSN PU 14839/1, MRSN PU 14839/2, MRSN PU 14840/2, MRSN PU 14843, MRSN PU 14844, MRSN PU 14845, MRSN PU 14846, MRSN PU 14847, MRSN PU 14849/3, MRSN PU 14849/4, MRSN PU 14851, MRSN PU 14853, MRSN PU 14856, MRSN PU 14857/1, MRSN PU 14857/2, MRSN PU 14863/1, MRSN PU 14863/2, MRSN PU 14864, MRSN PU 14865, MRSN PU 14868, MRSN PU 14872/2, MRSN PU 14872/3, MRSN PU 14874/1, MRSN PU 14874/2, MRSN PU 14875/1, MRSN PU 14875/2, MRSN PU 14876/1, MRSN PU 14876/2, MRSN PU 14878, MRSN PU 14880/1, MRSN PU 14880/1, MRSN PU 14887, MRSN PU 14889, MRSN PU 14890, MRSN PU 14892, MRSN PU 14893, MRSN PU 14894, MRSN PU 14895, MRSN PU 14896/1, NMB no code (3 samples), NMB F.P.22, NMB F.P.23, NMB n.N.433, NMB n.N.435, NMB n.N.436, NMB V.J.299 (2 samples), NMB V.J.301 (4 samples), NMB V.J.302, NMB V.J.303; *A. arvernensis* from Treviso: NMB T.J.307; *A. arvernensis* from Spoleto: NMB T.J.460; *A. arvernensis* from Montpellier (France): NMB M.P.825, NMB M.P. 826, NMB M.P.988; *Mammut borsoni* from Upper Valdarno: NMB V.A.1913; *M. borsoni* from different Piedomont localities: MRSN PU 14896, MRSN PU 14897, MRSN PU 14898; *M. borsoni* from Viallette (France): NMB V.T.122, NMB V.T.144; *Mammuthus* sp. from Lajatico (Pisa): MSNUP I-14661 (2 samples); *Mammuthus meridionalis* from different localities of Upper Valdarno: MSNUP I-12606, MSNUP I-4656, NMB V.A.20, NMB V.A.38, NMB V.A.71, NMB V.A.708, NMB V.A.2277c, NMB V.A.2469; *Mammuthus meridionalis* from Valdarno: MSNUP I-12577, MGGC 7912; *M. meridionalis* from Val di Chiana (Southeastern Tuscany): MGGC 9281; *M. meridionalis* from Chiusi (Siena): MUSNAF 139,

MUSNAF 141; *Mammuthus* cf. *rumanus* from different localities of Lazio: MSNUP I-12669, MSNUP I-12696; *Mammuthus trogontherii* from Upper Valdaerno: NMB V.A.2070; *M. trogontherii* from Lazio: MSNUP I-12702; *Mammuthus primigenius* from Camerino (Macerata): MSNUP I-13997; *Mammuthus primigenius* from unknown localities: MSNUP I-12591b; *Palaeoloxodon antiquus* from Lazio: MSNUP I-12639, MSNUP I-12701.

*Proboscidean taxa (postcranial bones)* - *Anancus arvernensis* from Cetona (Siena): Cetona no code (5 samples); *A. arvernensis* from different Piedmont sites: MSNUP I-14629, MGGC 8443 (9 samples), MRSN PU 14830/3, MRSN PU 14830/4, MRSN PU 14936, MRSN PU 14831/7, MRSN PU 14831/8, MRSN PU 14831/9, MRSN PU 14831/10, MRSN PU 14831/11, MRSN PU 14831/12, MRSN PU 14834/8, MRSN PU 14952; *A. arvernensis* from Chilhac (France): NMB P.P.90.

*Suid taxa (teeth)* - *Eumaoiocherous etruscus* from Montebomboli: MSNUP I-13310, MSNUP I-13312, MSNUP I-13323, MSNUP I-13329, MSNUP I-13332, MSNUP I-13333, MSNUP I-13334, MSNUP I-13339, MSNUP I-13340, MSNUP I-13428, MSNUP I-13439, MSNUP I-13440, MSNUP I-13347, MSNUP-MB 28, MUSNAF 2033, MUSNAF 2035, MUSNAF 2036, MUSNAF 2037, MUSNAF 2038, MUSNAF 2040, MUSNAF 2041, MUSNAF 2042a, b, MUSNAF 2043, MUSNAF 2044, MUSNAF 2045, MUSNAF 2046, MUSNAF 2047, MUSNAF 2048, MUSNAF 2049, MUSNAF 2051, MUSNAF 2053, MUSNAF 2054, MUSNAF 2119, MUSNAF 2039; *Propotamochoerus provincialis* from Montpellier: NMB M.P.7–9, NMB M.P.133, NMB M.P.510, NMB M.P.651, NMB M.P.736, NMB M.P.737, NMB M.P.854; *Sus arvernensis* from Val di MRSN Pugna (Siena): MUSNAF 4947, MUSNAF no code; *Sus arvernensis* from Villafranca d'Asti: NMB V.J.1–4, NMB V.J.8, NMB V.J.9, NMB V.J.14, NMB V.J.15, NMB V.J.17, NMB V.J.18, NMB V.J.20, NMB V.J.144–147, NMB V.J.149, NMB V.J.151,

NMB V.J.152–156, NMB V.J.169, NMB V.J.171, NMB V.J.184; *S. arvernensis* from Bra (Piedmont): NMB T.J. 449; *Sus scrofa* from Monti Pisani (Grotta Cucigliana): MSNUP I-14092, MSNUP I-14148, MSNUP I-14163, MSNUP I-14169, MSNUP I-15493, MSNUP I-15497.

*Cervid taxa (antler)* - *Cervus rusciniensis* from Roussillon (France) – UM-PEZ-4088; *Paracervulus perpignanensis* from Roussillon (France) – UM-4083; *Procapreolus pyrenaicus* from Celleneuve marls (Montpellier, France) – UM-4052; UM-4073; UM-4076; UM-4100; UM-4106; *Procapreolus* cf. *pyrenaicus* from Le Riège (Montpellier, France) – UM-PEZ-4323; UM-PEZ-4351; *Paracervulus australis* from Montpellier (France) – NMB M.P.970; Cervidae indet. from Dusino (Asti, Piedomnt): NMB F.P.25, NMB F.P.26; Cervidae indet. from Villafranca d'Asti (Piedomnt): NMB V.J.58–60, NMB V.J.65, NMB V.J.66, NMB V.J.67, NMB V.J.106, NMB no code (6 samples), NMB V.I.N.N. (3 samples); Cervidae indet. from Le Riège (Montpellier, France) – UM-PEZ-4300; *Eucladoceros* cf. *giulii* from Le Riège (Montpellier, France): UM-PEZ-4282, UM-PEZ-4284, UM-PEZ-4301-4302, UM-PEZ-4318, UM-PEZ-4322, UM-PEZ-4335, UM-PEZ-4344, UM-PEZ-4355, UM-PEZ-4363; UM-PEZ-4356; *Arvernoceros ardei* from Etouaires (France) – NMB Prr.341, NMB Prr.396; *Praemegaceros pliotarantoides* from unknon locality – MRSN PU 44292.

*Cervid taxa (teeth)* - *Cervus elaphus* from Monti Pisani (Grotta Parignana): MSNUP I-15070A, MSNUP I-15070B, MSNUP I-15075, MSNUP I-15076D, MSNUP I-15077; *Capreolus capreolus* from Monti Pisani (Grotta Cucigliana): MSNUP I-14153, MSNUP I-15502, MSNUP I-15504, MSNUP I-15505; *Dama dama* from Monti Pisani (Grotta Cucigliana): MSNUP I-14144, MSNUP I-14149, MSNUP I-15457, MSNUP I-15507; Deer from Villafranca d'Asti (Piedomnt): NMB V.J.43, NMB V.J.44, NMB V.J.45, NMB V.J.46, NMB V.J.47, NMB V.J.48–51, NMB V.J.52–56, NMB V.J.249, NMB V.J.250, NMB V.J.263, NMB V.J.264, NMB V.J.266, NMB

V.J.267, NMB V.J.268, NMB V.J.269, NMB V.J.272, NMB no code (8 samples); *Cervus ramosus* from Saint Vallier (France): NMB St.V.170, NMB St.V.171, NMB St.V.494, NMB St.V.495, NMB St.V.497, NMB St.V.498, NMB St.V.915; *Eucladoceros* cf. *giulii* from Le Riège (Montpellier, France): UM-PEZ-4305, UM-PEZ-4309, UM-PEZ-4285-4319, UM-PEZ-4342, UM-PEZ-4343, UM-PEZ-4367(x2)-4368-no code, UM-PEZ-4368.

Cervid taxa (postcranial bones) - Cervidae indet. from Villafranca d'Asti (Piedomnt): NMB V.J.74 (11 samples), NMB V.J.80, NMB V.J.107, NMB V.J.279, NMB V.J.280, NMB V.J.281, NMB V.J.282 (2 samples), NMB V.J.284, NMB V.J.285, NMB V.J.287, NMB V.J.288, NMB V.I.N.N. (10 samples), NMB (7 samples); *Cervus ramosus* from Saint Vallier (France): NMB St.V.186, NMB St.V.549, NMB St.V.550, NMB St.V.933; *Cervus perrieri* from Etouaires (France) – NMB Prr.73, NMB Prr.74, NMB Prr.76, NMB Prr.115, NMB Prr.144 (2 samples), NMB Prr.458, NMB Prr.489; *Eucladoceros* cf. *giulii* from Le Riège (Montpellier, France): UM-PEZ-4281, UM-PEZ-4304.

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**SOM-2**

Tab. S1 - Tooth dimensions of artiodactyls from La Serra quarry (Pisa, Italy) and other taxa from Italian Neogene–Quaternary. Comparing dimensions of suid and cervid teeth and cervid atlers between samples from from La Serra quarry (Upper Pliocene, Pisa, Italy) and other samples from Neogene–Quaternary taxa. The dimensions are here reported from other works when the measurement methodology is clearly explained. However, in most cases, only the maximum width for a tooth is provided and also these values are included. Sheet 1= Biometric comparisons between suidae teeth - molars; Sheet 2= Biometric comparisons between cervid teeth - molars; Sheet 3= Biometric comparisons between cervidae teeth - antlers; Sheet 4= Biometric comparisons between suidae teeth - decidous premolars and canines; Sheet 5= Biometric comparisons between suidae teeth - second molars and premolars.

**SOM-3**

Fig. S1 - Results of the HHXRF analyses, detailing the major-element concentrations (wt%), of the coprolite GAMPS-905 from La Serra (Tuscany).

