**Supplementary Table S1**. Growth records and models derived for humeri of a) *Dactylosaurus*, b) *Anarosaurus*, c) aff. *Neusticosaurus pusillus* from the Germanic Basin, and *N. pusillus* from the Alpine Triassic, d) *Neusticosaurus edwardsii*, and e) *Serpianosaurus*. Abbreviations: #vis. gms = number of visible growth marks; #res. gms = number of resorbed growth marks in the inner cortex as reconstructed by the Sander and Klein (2005) method; N = #visible gms or #visible gms + 1 (if the number of resorbed growth marks is estimated), sample size used in growth curve modelling; LM = linear model (test for quasi-linear phase of growth, Klein et al. 2015, Klein and Griebeler 2016), please note that for none of the specimens a hyperbolic (test for asymptotic phase of growth) or exponential model (test for exponential phase of growth) passed the $\Delta AIC \leq 10$ criterion (Burnham and Anderson 2002); vBGM = von Bertalanffy growth model; GGM = Gompertz growth model; LGM = logistic growth model; please note that the Chapman-Richards growth model was not successfully fitted to any of the bones; #miss. gms = number of missing (resorbed) growth marks in the inner cortex as predicted by the growth model; $L_0$ = offset humerus length of the model, estimated humerus length at the specimen's birth ($L_{birth}$) equals $L(0)_*$.lin, $L_{max}$ = maximum humerus; only for the vBGM the estimated asymptotic humerus of the specimen (AL) equals $L_{max*}$.lin, whereas under the GGM and LGM it is $(L_0 + L_{max})_*$.lin ; .lin = conditional linear parameter (Ritz and Streibig 2008), this technical parameter is additionally estimated by the fitting algorithm "plinear" provided in the *nls* package to minimise residuals (see Supplementary information 2); g = growth parameter; i = location of the inflection point on the age axis, directly estimated during fitting of this growth model; res. s.e. = residual standard error of the model with respective degrees of freedom (df); AIC = AIC value of the model (corrected for small sample sizes) with respective degrees of freedom (df); ΔAIC = difference in the AIC value of this model and that of the best model for a specimen (Burnham and Anderson 2002); w(ΔAIC) = Akaike weight (normalised relative model likelihood, the lower the AIC the higher is this likelihood, Burnham and Anderson 2002); ΔAIC(LM) = difference between the linear model and this model, only growth models are reported with $\Delta AIC(LM) \geq 10$, except for *N. edwardsii* for which all models did not pass this threshold (the growth record covers only the quasi-linear phase of growth); n.a. = not applicable to this specimen; p-values of estimated model parameter values * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. For equations of growth models refer to the paper. Please note that model parameter i is only defined in the GGM and LGM. Bold = models shown in Figure 4 of the paper for the respective specimen, these models have a considerable higher w(ΔAIC) than all others (at least 1.5 times higher w(ΔAIC) than the next model

within the ΔAIC ≤ 10). Best models on specimens are ordered based on their AIC values. For details on growth curve fitting refer to Supplementary information 2.

Institutional abbreviations: MfN (MB.R.) = Museum of Natural History, Leibniz-Institute for Research on Evolution and Biodiversity at the Humboldt University Berlin, Germany; NMNHL RGM (Wijk) = National Museum of Natural History Naturalis, Leiden, The Netherlands; SMNS = Stuttgart State Museum of Natural History, Germany; PIMUZ (T, phz) = Paleontological Institute and Museum of the University of Zurich, Switzerland.

a) *Dactylosaurus*

| Bone spec. no. | #vis. gms (years) | #res. gms (years) | N | model | #miss. gms (years) | $L_0$ (mm) | $L_{max}$ (mm) | g ($year^{-1}$) | i (year) | .lin | Res. s.e. | df | AIC | df | ΔAIC | w(ΔAIC) | ΔAIC (LM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB.R. 786 | 10 | 0 | 10 | **LGM** | | -1.668*** | | 0.466*** | | 1.644*** | 0.087 | 7 | -15.939 | 4 | 0 | **0.437** | 31.813 |
| | | | | **GGM** | | | | 0.590*** | 1.628*** | 0.824*** | 0.091 | 7 | -15.133 | 4 | 0.806 | **0.292** | 31.007 |
| | | | | **GGM** | | -0.967*** | | 0.407*** | | 1.325*** | 0.093 | 7 | -14.640 | 4 | 1.299 | **0.228** | 30.514 |
| | | | | vBGM | | 0.756*** | | 0.278*** | | 1.085*** | 0.123 | 7 | -9.130 | 4 | 6.809 | 0.015 | 25.004 |
| | | | | vBGM | | | 5.277*** | 0.278*** | | 0.905*** | 0.123 | 7 | -9.130 | 4 | 6.809 | 0.015 | 25.004 |
| | | | | vBGM | | | | 0.265*** | | 1.087*** | 0.135 | 8 | -7.968 | 4 | 7.971 | 0.008 | 23.842 |
| | | | | LGM | | | | 0.891*** | 2.271*** | 0.804*** | 0.137 | 7 | -6.986 | 4 | 8.953 | 0.005 | 22.860 |
| MB.R. 776.2 | 6 | 0 | 6 | **GGM** | | 0.980* | | 0.418** | 3.249** | 1.142** | 0.022 | 2 | -25.504 | 5 | 0 | **0.937** | 23.702 |
| | | | | GGM | | | | 0.500*** | 3.010*** | 0.984*** | 0.034 | 3 | -19.831 | 4 | 5.673 | 0.055 | 18.029 |
| | | | | LGM | | | | 0.879*** | 3.212*** | 0.865*** | 0.046 | 3 | -15.960 | 4 | 9.544 | 0.008 | 14.158 |

b) *Anarosaurus*

| Bone spec. no. | #vis. gms (years) | #res. gms (years) | N | model | #miss. gms (years) | $L_0$ (mm) | $L_{max}$ (mm) | g ($year^{-1}$) | i (year) | .lin | Res. s.e. | df | AIC | df | ΔAIC | w(ΔAIC) | ΔAIC (LM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wijk 09-472 | 7 | 0 | 7 | **LGM** | | -0.806*** | | 0.755*** | | 1.245*** | 0.034 | 4 | -23.310 | 4 | 0 | **0.466** | 34.149 |
| | | | | **LGM** | | | -9.192*** | 0.755*** | | -0.589*** | 0.034 | 4 | -23.310 | 4 | 0 | **0.466** | 34.149 |
| | | | | GGM | | | | 0.825*** | 0.736*** | 0.711*** | 0.094 | 4 | -19.429 | 4 | 3.881 | 0.067 | 30.268 |
| Wijk 07-70 | 6 | 0 | 6 | **LGM** | | | | 1.184** | 1.681*** | 0.741*** | 0.114 | 3 | -5.222 | 4 | n.a. | n.a. | 12.371 |
| Wijk 09-58 | 6 | 0 | 6 | **LGM** | | | | 1.388** | 2.077*** | 0.781*** | 0.161 | 3 | -1.049 | 4 | 0 | **0.778** | 10.248 |
| | | | | GGM | | 2.002* | | 1.094* | 1.826** | 0.730** | 0.136 | 2 | -3.553 | 5 | 2.504 | 0.222 | 12.752 |

c) aff. *Neusticosaurus pusillus* from the Germanic Basin (SMNS 92125, SMNS 50372c) and *N. pusillus* from the Alpine Triassic (T 4178, T 4211)

| Bone spec. no. | #vis. gms (years) | #res. gms (years) | N | Model | #miss. gms (years) | $L_0$ (mm) | $L_{max}$ (mm) | g ($year^{-1}$) | i (year) | .lin | Res. s.e. | df | AIC | df | ΔAIC | w(ΔAIC) | ΔAIC (LM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SMNS 92125 | 7 | 0 | 7 | **LGM** | | -0.449* | | 1.000* | | 1.237*** | 0.086 | 4 | -10.438 | 4 | 0 | **0.626** | 12.195 |
| | | | | GGM | | | | 1.211* | 0.516* | 0.710*** | 0.092 | 4 | -9.408 | 4 | 1.030 | 0.374 | 11.165 |
| SMNS 50372c | 8 | 0 | 8 | **vBGM** | | | | 0.320* | | 1.073*** | 0.058 | 6 | -19.091 | 3 | 0 | **0.566** | 13.865 |
| | | | | vBGM | | 0.473*** | | 0.319** | | 1.070*** | 0.063 | 5 | -17.176 | 4 | 1.915 | 0.217 | 11.950 |
| | | | | vBGM | | | 1.671*** | 0.319** | | 1.098*** | 0.063 | 5 | -17.176 | 4 | 1.915 | 0.217 | 11.950 |
| T 4178 | 8 | 0 | 8 | **GGM** | | | | 0.553*** | 0.747*** | 0.694*** | 0.021 | 5 | -34.317 | 4 | 0 | **0.514** | 25.337 |
| | | | | **LGM** | | -0.125* | | 0.544*** | | 1.100*** | 0.022 | 5 | -34.152 | 4 | 0.165 | **0.474** | 25.172 |
| | | | | LGM | | | | 0.782*** | 1.382*** | 0.680*** | 0.035 | 5 | -26.777 | 4 | 7.540 | 0.012 | 17.797 |
| T 4211 | 7 | 1-2 | 8 | **vBGM** | 2 | | | 0.404*** | | 1.007*** | 0.034 | 6 | -27.889 | 3 | 0 | **0.335** | 15.208 |
| | | | 8 | vBGM | 2 | 0.326*** | | 0.405*** | | 1.007*** | 0.037 | 5 | -25.904 | 4 | 1.985 | 0.124 | 13.223 |
| | | | 8 | vBGM | 2 | | 1.668*** | 0.405*** | | 0.996*** | 0.037 | 5 | -25.904 | 4 | 1.985 | 0.124 | 13.223 |
| | | | 8 | GGM | 2 | -0.338*** | | 0.559*** | | 1.232*** | 0.039 | 5 | -24.967 | 4 | 2.922 | 0.078 | 12.286 |
| | | | 8 | GGM | 3 | | | 0.578*** | 1.923*** | 0.817*** | 0.040 | 5 | -24.562 | 4 | 3.327 | 0.063 | 11.881 |
| | | | 8 | LGM | 2 | -0.609*** | | 0.632*** | | 1.541*** | 0.041 | 5 | -24.170 | 4 | 3.719 | 0.052 | 11.489 |
| | | | 8 | GGM | 2 | | | 0.507*** | 1.178** | 0.708*** | 0.041 | 5 | -24.074 | 4 | 3.842 | 0.049 | 11.366 |
| | | | 8 | LGM | 3 | -0.625*** | | 0.427*** | | 1.631*** | 0.041 | 5 | -24.019 | 4 | 3.870 | 0.044 | 11.338 |
| | | | 8 | vBGM | 3 | | | 0.256*** | | 1.071*** | 0.043 | 6 | -23.858 | 3 | 4.031 | 0.045 | 11.177 |
| | | | 8 | GGM | 3 | -0.359*** | | 0.373*** | | 1.312*** | 0.040 | 5 | -23.827 | 4 | 4.062 | 0.044 | 11.146 |
| | | | 8 | LGM | 2 | -0.280*** | | 0.457*** | | 1.214*** | 0.043 | 5 | -23.487 | 4 | 4.402 | 0.037 | 10.806 |

d) *Neusticosaurus edwardsii*

| Bone spec. no. | #vis. gms (years) | #res. gms (years) | N | Model | #miss. gms (years) | $L_0$ (mm) | $L_{max}$ (mm) | g ($year^{-1}$) | i (year) | .lin | Res. s.e. | df | AIC | df | ΔAIC | w(ΔAIC) | ΔAIC (LM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T 4758 | 6 | 0 | 6 | **LGM** | | -0.720* | | 0.829* | | 1.304** | 0.148 | 3 | -2.244 | 4 | n.a. | n.a. | 6.809 |
| phz 153 | 9 | 0 | 9 | **vBGM** | | 0.486** | | 0.087** | | 1.784** | 0.095 | 6 | -12.417 | 4 | 0 | **0.337** | 6.293 |
| | | | | **vBGM** | | | 7.013** | 0.087* | | 1.010*** | 0.095 | 6 | -12.417 | 4 | 0 | **0.337** | 6.293 |
| | | | | GGM | | -0.978*** | | 0.178** | | 1.851*** | 0.102 | 6 | -11.121 | 4 | 1.296 | 0.176 | 4.997 |
| | | | | LGM | | -1.579*** | | 0.216** | | 2.212*** | 0.104 | 6 | -10.808 | 4 | 1.609 | 0.151 | 4.684 |

e) *Serpianosaurus*

| Bone spec. no. | #vis. gms (years) | #res. gms (years) | N | Model | #miss. gms (years) | $L_0$ (mm) | $L_{max}$ (mm) | g ($year^{-1}$) | i (year) | .lin | Res. s.e. | df | AIC | df | ΔAIC | w(ΔAIC) | ΔAIC (LM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T 4510 | 12 | 1-2 | 13 | **vBGM** | 1 | 0.400*** | | 0.073*** | | 1.539*** | 0.062 | 10 | -30.993 | 4 | 0 | **0.128** | 13.698 |
| | | | | **vBGM** | 1 | | 4.728*** | 0.073*** | | 0.976*** | 0.062 | 10 | -30.993 | 4 | 0 | **0.128** | 13.698 |
| | | | | **vBGM** | 2 | 0.158*** | | 0.086*** | | 1.422*** | 0.062 | 10 | -30.806 | 4 | 0.187 | **0.117** | 13.511 |
| | | | | **vBGM** | 2 | | 3.980*** | 0.086*** | | 1.072** | 0.062 | 10 | -30.806 | 4 | 0.187 | **0.117** | 13.511 |
| | | | | vBGM | 2 | | | 0.067*** | | 1.447*** | 0.067 | 11 | -29.726 | 4 | 1.267 | 0.068 | 12.431 |
| | | | | vBGM | 2 | 0.227*** | | 0.061*** | | 1.696*** | 0.065 | 10 | -29.598 | 4 | 1.395 | 0.063 | 12.303 |
| | | | | vBGM | 2 | | 5.542*** | 0.061*** | | 0.918*** | 0.065 | 10 | -29.598 | 4 | 1.395 | 0.063 | 12.303 |
| | | | | GGM | 2 | -0.888*** | | 0.123*** | | 1.891*** | 0.067 | 10 | -28.614 | 4 | 2.379 | 0.039 | 11.319 |
| | | | | GGM | 3 | -1.018*** | | 0.107*** | | 2.139*** | 0.068 | 10 | -28.252 | 4 | 2.741 | 0.033 | 10.957 |
| | | | | GGM | 1 | -0.719*** | | 0.139*** | | 1.668*** | 0.069 | 10 | -28.187 | 4 | 2.806 | 0.032 | 10.892 |
| | | | | LGM | 2 | -1.318*** | | 0.148*** | | 2.267*** | 0.069 | 10 | -28.054 | 4 | 2.939 | 0.030 | 10.759 |
| | | | | LGM | 3 | -1.426*** | | 0.131*** | | 2.548*** | 0.069 | 10 | -27.979 | 4 | 3.014 | 0.028 | 10.684 |
| | | | | vBGM | 3 | 0.089** | | 0.051** | | 1.896*** | 0.069 | 10 | -27.954 | 4 | 3.039 | 0.028 | 10.659 |
| | | | | vBGM | 3 | | 7.040** | 0.051** | | 0.808* | 0.069 | 10 | -27.954 | 4 | 3.039 | 0.028 | 10.659 |
| | | | | vBGM | 1 | 0.365*** | | 0.100*** | | 1.328*** | 0.070 | 10 | -27.703 | 4 | 3.290 | 0.025 | 10.408 |
| | | | | vBGM | 1 | | 3.448*** | 0.100*** | | 1.155*** | 0.070 | 10 | -27.703 | 4 | 3.290 | 0.025 | 10.408 |
| | | | | vBGM | 1 | | | 0.103*** | | 1.284*** | 0.074 | 11 | -27.021 | 4 | 3.290 | 0.025 | 10.408 |
| | | | | LGM | 1 | -1.178*** | | 0.166*** | | 2.011*** | 0.071 | 10 | -27.386 | 4 | 3.607 | 0.021 | 10.091 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T 119 | 9 | 1-2 | 9 | **GGM** | 3 | | | 0.405*** | 4.722*** | 1.026*** | 0.058 | 7 | -24.249 | 4 | 0 | **0.165** | 17.969 |
| | | | | **GGM** | 2 | | | 0.410*** | 3.715*** | 1.022*** | 0.058 | 7 | -23.984 | 4 | 0.265 | **0.144** | 17.431 |
| | | | | **GGM** | 2 | 0.227* | | 0.434*** | 3.940*** | 0.959*** | 0.068 | 6 | -20.603 | 5 | 0.265 | **0.144** | 17.431 |
| | | | | LGM | 1 | -1.041*** | | 0.273*** | | 2.345*** | 0.060 | 7 | -23.559 | 4 | 0.690 | 0.117 | 17.006 |
| | | | | GGM | 1 | -0.756*** | | 0.229*** | | 1.936*** | 0.061 | 7 | -23.074 | 4 | 1.175 | 0.092 | 16.521 |
| | | | | GGM | 3 | | | 0.443*** | 4.968*** | 0.945*** | 0.063 | 7 | -22.483 | 4 | 1.766 | 0.068 | 15.930 |
| | | | | GGM | 1 | | | 0.454*** | 2.950*** | 0.938*** | 0.064 | 7 | -22.163 | 4 | 2.086 | 0.058 | 15.610 |
| | | | | GGM | 0 | -0.560*** | | 0.284*** | | 1.577*** | 0.057 | 6 | -21.530 | 4 | 2.719 | 0.042 | 14.977 |
| | | | | GGM | 1 | -0.719*** | | 0.139*** | | 1.668*** | 0.069 | 10 | -28.187 | 4 | 2.806 | 0.032 | 10.892 |
| | | | | GGM | 1 | | | 0.436*** | 2.695*** | 1.005*** | 0.086 | 7 | -20.916 | 4 | 3.333 | 0.031 | 14.363 |
| | | | | GGM | 3 | 0.238* | | 0.439*** | 4.954*** | 0.952*** | 0.068 | 6 | -20.479 | 4 | 3.770 | 0.025 | 13.926 |
| | | | | vBGM | 0 | 0.254*** | | 0.166** | | 1.328*** | 0.061 | 6 | -20.441 | 4 | 3.808 | 0.025 | 13.888 |
| | | | | vBGM | 0 | | 3.157*** | 0.166** | | 0.896*** | 0.061 | 6 | -20.441 | 4 | 3.808 | 0.025 | 13.888 |
| | | | | LGM | 3 | | | 0.640*** | 5.486*** | 0.963*** | 0.080 | 7 | -17.603 | 4 | 6.646 | 0.006 | 11.050 |
| | | | | LGM | 1 | -1.003*** | | 0.242*** | | 2.393*** | 0.081 | 7 | -17.338 | 4 | 6.911 | 0.005 | 10.785 |
| | | | | GGM | 1 | -0.710*** | | 0.199** | | 1.997*** | 0.083 | 7 | -16.930 | 4 | 7.319 | 0.004 | 10.377 |
| | | | | vBGM | 1 | | | 0.111** | | 1.569*** | 0.086 | 8 | -16.990 | 4 | 7.529 | 0.004 | 10.437 |
| | | | | GGM | 0 | | | 0.482*** | 2.133*** | 0.882*** | 0.076 | 6 | -16.560 | 4 | 7.689 | 0.004 | 10.007 |