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SUPPLEMENTARY ONLINE MATERIAL FOR

**Mass estimation of Santacrucian sloths from the Early Miocene Santa Cruz  
Formation of Patagonia, Argentina**

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**Supplementary Online Material**

**Contents**

**SOM 1a.** List of specimens of extant mammals used in this work.

**SOM 1b.** R scripts used in the analysis.

**References**

**SOM 2.** Database with the mean by genera for each variable (including body mass) used to calculate the prediction equations. Measurements in millimeters and body mass in kilograms.

**SOM 1a. List of specimens of extant mammals used in this work.**

	<b>Taxon</b>	<b>Catalogue number</b>	<b>Substrate preference</b>
<b>XENARTHRA</b>			
Bradypodidae	<i>Bradypus</i> sp.	AMNH 42454; 42838; 74136; 74137; 97315; 133437; 135474; 209940; 211663; 261304	arboreal
Megalonychidae	<i>Choloepus</i> sp.	AMNH 16873; 35483; 70440; 90269; 139772; 139773; 209941; 265952	arboreal
Myrmecophagidae	<i>Myrmecophaga</i> sp.	AMNH 1020; 100068; 100139; FMNH 15966	ground-dwelling
Myrmecophagidae	<i>Tamandua</i> sp.	AMNH 23432; 23436; 23437; 23565; 23567; 96258; 211659; 21660	semi-arboreal
Cyclopidae	<i>Cyclopes</i> sp.	AMNH 4780; 167845; 171297; 204662; 213188; FMNH 61853	arboreal
Dasypodidae	<i>Priodontes</i> sp.	AMNH 130387; 208104; FMNH 25271; 72913	ground-dwelling
<b>CARNIVORA</b>			
Ailuridae	<i>Ailurus</i> sp.	AMNH 35433; 119474; 146682; 146778; 185346	arboreal
Felidae	<i>Panthera</i> sp.	AMNH 85396; 113743; 113744; 113748; 135846	ground-dwelling
Felidae	<i>Acynonyx</i> sp.	AMNH 36426; 119654; 119655; 119656; 119657	ground-dwelling
Mustelidae	<i>Gulo</i> sp.	AMNH 35054; 35081; 149692; 165766	ground-dwelling
Ursidae	<i>Ailuropoda</i> sp.	AMNH 87242; 89028; 110453; 110454; 147746	ground-dwelling
Viverridae	<i>Arctictis</i> sp.	AMNH 181; 22906; 35469; 80163; 119600	semi-arboreal
<b>MARSUPIALIA</b>			
Dasyuridae	<i>Sarcophilus</i> sp.	AMNH 65670; 65672; 65673; 70406; 150211	ground-dwelling
Thylacinidae	<i>Thylacinus</i> sp.	AMNH 35244; 35504; 35866; 42259	ground-dwelling
Phascolarctidae	<i>Phascolarctos</i> sp.	AMNH 65607; 65608; 65609; 65610; 107805	arboreal
Vombatidae	<i>Vombatus</i> sp.	AMNH 42997; 65619; 65622; 70209; 146850	ground-dwelling
<b>PHOLIDOTA</b>			
Manidae	<i>Manis gigantea</i>	AMNH 53847; 53851; 53857; 53858	ground-dwelling
Manidae	<i>Manis pentadactyla</i>	AMNH 60004; 60006; 60007; 172147; 184959	semi-arboreal
<b>PRIMATES</b>			
Cercopithecidae	<i>Papio</i> sp.	AMNH 80771; 80774; 120388; 216247; 216251	semi-arboreal
Hominidae	<i>Gorilla</i> sp.	AMNH 54089; 54090; 54091; 54092	semi-arboreal
Hylobatidae	<i>Hylobates</i> sp.	AMNH 90268; 102463; 106581; 106584	arboreal
Lemuridae	<i>Lemur</i> sp.	AMNH 22912; 35396; 150039; 170739; 170740	arboreal
<b>RODENTIA</b>			
Erethizontidae	<i>Coendou</i> sp.	AMNH 80045; 100097; 100119; 134073; 212611	arboreal
Hystriidae	<i>Hystrix</i> sp.	AMNH 51735; 87220; 87222; 119506	ground-dwelling
Sciuridae	<i>Marmota</i> sp.	AMNH 70338; 97386; 179934; 180314; 235648	ground-dwelling
<b>TUBULIDENTATA</b>			
Orycteropodidae	<i>Orycteropus</i> sp.	AMNH 51370; 51374; 51905; 51909; 65540	ground-dwelling

## SOM 1b. R scripts used in the analysis

*MASS* and *car* packages were used

### Regression equation

```
"equation" <- lm("body mass"~"variable 1"+"variable 2"+..., weights=pond,
  data="data")#obtaining the regression equation
"model equation"<-stepAIC("equation", direction='both', criterion='AIC'
  #obtaining a new equation by removing redundant variables using a
  stepwise procedure based on the Akaike Criterion.
```

Where “data” is a dataframe object that contains all of the information from the extant mammals database (e.g., taxon, body mass, measurements, etc.); “equation” is a list R object that stores the output of a multiple linear model regression using “body mass” as the dependant variable. “Variable 1”... represents the variables (see Fig. 2 and 3 in Toledo et al. 2014 ) of each element (scapula, humerus, etc.). “pond” is a column that contains the taxonomic weighting factor for each taxon. “model equation” is a list R object containing the output of the stepwise procedure.

### RE calculation

```
pred<-mean(10^(as.vector(fitted("model equation")))) #obtaining the mean
fitted values and removing the log-transformation
obs<-mean(10^(as.vector("data" $"body mass"))) #obtaining the mean observed
values and removing the log-transformation
RE<-obs/pred #obtaining the Ratio Estimator (see Material and methods
  section in Toledo et al. 2014)
```

### %PE calculation

```
PE<-mean(abs(((as.vector((residuals("model
  equation"))))))/((as.vector((fitted("model equation"))))*100))
#obtaining the Percent Prediction Error (adapting to R the Smith 1984
formula)
```

### QMLE calculation

```
ANOVA<-anova("model equation")#obtaining the sum of squares for each
equation
ResMsqr<-ANOVA[3][ ( length(ANOVA[3][,1]),) #storing only the residual mean
squares of the equation
QMLE<-exp(ResMsqr/2)#obtaining the Quasi Maximum Likelihood Estimator of
Fergusson (1986)
```

### SE calculation

```
SE<-sum(exp(residuals("model equation"))/length(residuals("model
equation"))#obtaining the Smearing Estimator of Duan (1983)
```

### Body mass prediction

```
"BM output"<-(as.vector(10^(predict("model equation",
  newdata=data.frame("variable 1"="data fossils"[,c("variable 1")],
  "variable 2"="data fossils"[,c("variable 2")])))))*RE
```

Where “BM output” is a vector R object containing the estimates for each fossil specimen; “model equation” (see above); “data fossils” is a data frame R object that contains measurements (“variable 1”...) from the fossil sloths database; “RE” is the Ratio Estimator (see above) used to restore dimensionality.

## References

- Duan, N. 1983. Smearing Estimate: A Nonparametric Retransformation Method. *Journal of the American Statistical Association* 78: 605–610.
- Ferguson, R.L. 1986. River loads underestimated by rating curves. *Water Resources Research* 22 (1): 74–76.
- Smith, R.J. 1984. Allometric scaling in comparative biology: problems of concept and method. *American Journal of Physiology: Regulatory Integrative and Comparative Physiology* 246: R152–R160.
- Toledo, N., Cassini, G.H., Vizcaíno, S.F., and Bargo, M.S. 2014. Mass estimation of Santacrucian sloths from the Early Miocene Santa Cruz Formation of Patagonia, Argentina. *Acta Palaeontologica Polonica* 59 (2): 267–280.

**SOM 2.** Mean values for each variable (including body mass) used to calculate the prediction equations. Measurements in millimeters and body mass in kilograms.

Part I. SL, Scapular Length - supraglenoid tubercle to dorso-posterior border of scapula at end of spine; SGL, Scapular Glenoid fossa Length - supraglenoid apophysis to ventral border of glenoid fossa; SGW, Scapular Glenoid fossa Width - maximum transverse width of glenoid fossa; TDH, Transverse Diameter of Humerus - at midshaft; HL, Humerus Length - between head and trochlea; APDH, Antero-Posterior Diameter of Humerus - at midshaft; HHL, Humerus Head Length; HDASW, Humerus Distal Articular Surface Width; HTVL, Humeral Trochlear Valley Length; HTD, Humeral Trochlea Depth.

Taxon	Taxonomic Weighting	SL	SGL	SGW	TDH	HL	APDH	HHL	HDASW	HTVL	HTD
<i>Choloepus</i>	0.500	57.255	15.995	10.346	9.427	147.840	10.249	17.500	19.770	7.593	11.303
<i>Bradypus</i>	0.500	52.364	15.407	9.541	8.642	165.755	9.079	17.424	20.759	6.581	8.773
<i>Tamandua</i>	0.330	60.286	15.835	10.662	20.107	88.296	9.692	16.014	16.796	5.914	10.031
<i>Myrmecophaga</i>	0.330	137.473	33.939	21.122	43.697	181.248	21.087	33.703	36.961	16.298	22.529
<i>Cyclopes</i>	0.330	23.823	5.174	4.112	6.467	28.757	3.876	6.551	6.256	2.291	3.998
<i>Priodontes</i>	1.000	127.889	27.605	19.972	27.298	131.019	20.871	29.623	36.401	8.345	16.298
<i>Ailurus</i>	0.170	64.737	14.507	10.685	8.042	114.037	10.191	16.554	15.092	6.660	8.299
<i>Acynonix</i>	0.170	164.259	28.112	25.320	17.488	237.948	22.140	30.301	30.807	15.080	24.089
<i>Panthera</i>	0.170	260.299	50.103	41.051	30.162	329.052	37.859	57.900	58.328	24.041	54.450
<i>Gulo</i>	0.170	92.198	22.943	13.013	10.808	135.703	13.435	21.843	27.768	11.270	14.220
<i>Ailuropoda</i>	0.170	190.110	47.288	32.947	27.156	286.113	32.120	46.515	56.973	19.572	24.421
<i>Arctictis</i>	0.170	80.674	20.066	14.358	10.323	144.259	11.569	21.677	22.356	7.806	12.049
<i>Sarcophilus</i>	0.500	84.246	15.520	11.389	7.766	100.628	10.912	16.100	17.528	7.044	12.146
<i>Thylacynus</i>	0.500	141.331	22.664	16.602	12.850	168.884	15.715	24.564	24.039	10.928	18.912
<i>Phascolarctos</i>	0.500	80.204	17.155	10.284	11.356	119.653	11.588	17.792	23.468	7.034	9.190
<i>Vombatus</i>	0.500	109.128	23.928	17.246	21.692	115.066	23.118	20.076	31.202	8.550	14.680
<i>Manis gigantea</i>	0.500	104.264	27.308	17.356	18.630	117.427	20.712	26.372	34.197	8.820	14.178
<i>Manis pentadactyla</i>	0.500	55.980	14.546	9.357	9.095	65.642	13.006	15.509	17.643	5.812	8.196
<i>Papio</i>	0.250	131.223	28.436	17.814	15.946	233.308	17.219	26.178	30.776	14.353	15.732
<i>Gorilla</i>	0.250	161.406	58.479	34.007	30.739	398.865	29.923	59.186	66.843	19.891	37.321
<i>Hylobates</i>	0.250	72.917	16.067	13.600	10.868	275.800	11.208	22.655	23.698	10.133	12.510
<i>Lemur</i>	0.250	46.991	9.568	6.262	6.416	89.879	6.632	12.038	13.454	5.099	6.784
<i>Coendou</i>	0.330	53.551	12.532	8.645	7.063	83.032	8.704	14.664	14.705	7.198	9.357
<i>Hystrix</i>	0.330	110.676	20.348	16.304	13.157	112.413	19.707	20.705	21.263	10.181	15.096
<i>Marmota</i>	0.330	58.215	11.234	7.185	6.328	70.835	8.306	12.988	12.994	5.782	8.773
<i>Orycteropus</i>	1.000	150.279	31.026	19.301	20.884	163.692	22.416	29.031	38.014	15.550	19.544

Part II. HEMP, Humeral Entepicondyle Medial Protrusion; HDEW, Humeral Distal Epiphysis Width; HGT, Humeral Greater Tuberosity length; HLT, Humeral Lesser Tuberosity Length; WTub, Width across Tuberosities; UL, Ulnar Length; THU, Transverse Height of Ulna - at midshaft; THUn, Transverse Height of Ulna at notch level; OTL, Olecranon - Trochlea notch length; UNL, Ulnar pre-Notch Length; UTNL, Ulnar Trochlear Notch Length.

Taxon	HEMP	HDEW	HGT	HLT	WTub	UL	THU	THUn	OTL	UNL	UTNL
<i>Choloepus</i>	11.021	33.388	12.171	10.244	21.802	184.625	6.178	7.685	10.396	174.371	11.778
<i>Bradypus</i>	7.535	29.978	12.302	7.781	20.143	160.342	5.405	8.249	8.687	152.158	11.252
<i>Tamandua</i>	16.600	38.185	13.641	9.704	23.857	99.332	7.189	9.435	23.120	77.091	11.109
<i>Myrmecophaga</i>	29.501	75.323	26.039	19.431	43.058	239.374	20.834	24.140	53.579	189.943	19.936
<i>Cyclopes</i>	5.373	13.914	6.026	2.902	8.316	29.613	3.013	3.418	6.970	22.920	5.015
<i>Priodontes</i>	19.382	56.280	20.423	16.050	37.737	134.718	25.572	23.286	60.163	77.070	19.745
<i>Ailurus</i>	8.077	24.687	11.225	4.645	15.899	105.972	6.965	7.581	14.538	91.363	10.150
<i>Acynonix</i>	11.528	39.604	24.282	19.007	42.181	276.715	13.434	19.640	43.055	239.011	23.806
<i>Panthera</i>	21.741	80.913	43.082	22.045	64.711	349.245	28.906	36.341	71.116	295.116	40.659
<i>Gulo</i>	10.640	37.195	16.723	10.248	25.423	131.905	9.935	10.823	19.690	113.240	16.288
<i>Ailuropoda</i>	22.614	75.829	38.498	13.606	51.994	266.550	21.881	27.654	46.922	225.481	25.714
<i>Arctictis</i>	9.693	31.409	15.714	7.673	22.675	141.546	10.565	10.661	22.706	119.040	13.737
<i>Sarcophilus</i>	5.690	23.414	13.897	9.179	21.713	119.924	7.242	9.574	19.364	100.856	11.010
<i>Thylacynus</i>	6.686	30.296	18.411	13.051	31.414	196.164	11.624	14.913	37.980	161.986	17.225
<i>Phascolarctos</i>	9.135	34.086	12.970	11.184	23.745	151.477	8.943	11.158	20.369	132.306	11.984
<i>Vombatus</i>	15.136	48.994	20.818	17.638	37.704	140.548	12.778	17.722	37.836	105.366	16.030
<i>Manis gigantea</i>	21.184	55.826	16.607	17.751	33.686	106.938	13.065	15.321	28.026	81.901	14.710
<i>Manis pentadactyla</i>	12.850	31.614	12.190	8.076	19.766	65.530	8.547	9.295	22.226	45.478	8.339
<i>Papio</i>	13.895	40.761	15.507	13.657	29.413	268.949	9.605	16.486	25.067	246.405	19.512
<i>Gorilla</i>	32.749	98.459	30.316	5.360	35.709	335.734	20.224	27.696	27.959	321.180	28.712
<i>Hylobates</i>	7.538	31.665	10.778	5.390	15.325	303.463	9.180	7.543	10.568	292.985	14.443
<i>Lemur</i>	5.466	18.971	6.577	6.196	12.539	108.751	5.158	5.960	11.232	99.796	8.091
<i>Coendou</i>	5.387	20.105	8.689	5.907	14.449	84.680	5.912	5.726	11.897	73.087	9.177
<i>Hystrix</i>	10.468	32.808	13.734	10.207	24.155	115.148	11.180	10.477	30.673	86.245	14.255
<i>Marmota</i>	7.488	21.057	10.482	6.648	16.398	74.262	6.231	5.869	15.055	59.237	8.562
<i>Orycteropus</i>	17.773	60.738	28.836	11.674	39.109	166.028	21.951	21.921	54.791	112.618	23.439

Part III. TDU, Transverse Diameter of Ulna - at midshaft; UTNW, Ulnar Trochlea Notch Width - at posterior border; RL, Radius Length; RD, Radius Diameter - at midshaft; RDFL, Radial Distal Facet Length; RHL, Radial Head Length; RHW, Radial Head Width; RDEW, Radial Distal Epiphysis Width; PL, Pelvis total Length; ILL, Ilium Length- to acetabulum anterior-most border.

Taxon	TDU	UTNW	RL	RD	RDFL	RHL	RHW	RDEW	PL	ILL
<i>Choloepus</i>	4.482	7.213	171.362	11.088	13.865	12.367	11.218	8.460	102.081	63.976
<i>Bradypus</i>	4.623	6.649	152.125	6.379	12.264	11.269	10.384	8.386	85.125	48.963
<i>Tamandua</i>	5.610	4.522	73.207	7.201	14.282	10.826	8.257	8.689	97.974	51.818
<i>Myrmecophaga</i>	13.422	12.525	195.566	19.622	27.112	19.497	17.517	15.989	223.239	120.951
<i>Cyclopes</i>	1.786	2.295	21.754	3.456	5.409	4.463	2.970	3.970	35.188	20.931
<i>Priodontes</i>	15.167	25.956	70.801	10.729	23.361	25.168	14.220	13.589	257.400	136.545
<i>Ailurus</i>	5.107	6.713	86.116	5.561	11.329	10.173	7.554	7.183	94.307	55.052
<i>Acynonix</i>	8.743	14.522	237.718	17.690	28.897	24.338	18.148	17.416	212.234	105.543
<i>Panthera</i>	21.703	27.994	276.510	27.463	47.131	37.388	26.918	27.039	327.261	168.727
<i>Gulo</i>	7.458	10.150	108.298	8.038	15.913	13.933	9.633	9.995	129.010	71.561
<i>Ailuropoda</i>	20.210	23.922	219.113	19.104	33.975	34.064	24.047	20.947	321.263	181.627
<i>Arctictis</i>	6.316	11.468	114.507	7.700	15.257	13.223	10.557	9.941	113.730	60.118
<i>Sarcophilus</i>	5.157	9.880	99.000	5.885	9.729	9.183	8.403	6.249	109.589	66.063
<i>Thylacynus</i>	11.359	15.113	159.928	9.234	16.222	13.856	10.359	11.275	173.495	87.908
<i>Phascolarctos</i>	6.345	10.020	130.955	8.017	12.617	11.757	10.338	8.179	114.267	72.187
<i>Vombatus</i>	10.854	14.168	106.148	10.210	18.496	14.468	12.470	12.430	201.684	120.391
<i>Manis gigantea</i>	9.004	18.351	75.987	15.180	18.158	18.206	13.239	16.230	157.494	79.267
<i>Manis pentadactyla</i>	6.238	8.488	43.383	8.279	11.216	11.946	7.344	7.703	78.129	36.607
<i>Papio</i>	11.184	13.820	243.436	14.396	21.278	19.132	17.561	14.459	201.144	123.781
<i>Gorilla</i>	22.043	27.471	331.436	20.133	36.568	31.221	30.054	21.582	300.044	190.437
<i>Hylobates</i>	7.378	12.500	318.520	7.478	17.268	14.720	14.313	10.140	141.937	94.461
<i>Lemur</i>	4.099	6.873	95.170	4.789	8.094	7.119	6.780	4.936	84.643	53.292
<i>Coendou</i>	4.145	7.217	69.380	5.621	8.728	9.576	7.167	6.064	97.298	54.331
<i>Hystrix</i>	8.324	12.431	80.546	6.308	11.614	14.397	8.782	9.433	160.374	89.416
<i>Marmota</i>	4.178	6.659	56.603	4.350	8.242	8.787	5.816	5.661	83.621	47.510
<i>Orycteropus</i>	14.659	21.222	114.118	11.447	32.985	19.553	16.042	16.868	263.714	174.319

Part IV. ISL, Ischium Length - from acetabulum to posterior-most border; TDF, Transverse Diameter of Femur - at midshaft; FHW, Femoral Head Width; WTroc, Width across Trochanters; FL, Femoral Length - between head and medial condyle; APDF, Antero-Posterior Diameter of Femur - at midshaft; FHL, Femoral Head Length; FCW, Femoral maximum Condylar Width; FMDEW, Femoral Distal Epiphysis Width; ICFW, Inter-Condylar Femoral Width; LCL, Lateral Condyle Length; MCL, Medial Condyle Length.

Taxon	ISL	TDF	FHW	WTroc	FL	APDF	FHL	FCW	FMDEW	ICFW	LCL	MCL
<i>Choloepus</i>	19.958	11.353	18.397	27.428	143.371	9.894	17.674	22.245	25.245	5.893	15.729	17.168
<i>Bradypus</i>	20.016	10.221	14.917	24.202	97.573	7.396	14.827	19.560	21.870	3.933	13.256	13.587
<i>Tamandua</i>	29.708	11.253	14.649	19.764	90.008	7.312	14.333	19.840	21.301	4.551	15.272	17.194
<i>Myrmecophaga</i>	70.516	28.845	28.859	45.469	239.268	17.875	30.091	42.011	44.500	7.824	36.147	41.916
<i>Cyclopes</i>	7.854	5.423	5.821	7.440	41.517	3.537	6.312	8.035	8.802	2.575	5.290	5.419
<i>Priodontes</i>	90.419	43.215	27.427	62.784	166.154	20.154	27.558	46.615	50.800	18.282	33.265	35.041
<i>Ailurus</i>	26.627	8.480	11.616	21.363	116.670	7.736	11.774	19.300	19.461	4.140	15.637	16.439
<i>Acynonix</i>	85.480	18.854	23.923	45.092	272.565	20.240	25.009	45.670	43.339	12.921	43.806	44.903
<i>Panthera</i>	117.895	29.230	39.813	73.392	386.055	27.763	41.009	70.279	72.182	18.454	71.969	73.285
<i>Gulo</i>	38.174	10.682	15.348	27.095	143.130	9.890	16.659	26.565	26.676	7.099	23.152	23.747
<i>Ailuropoda</i>	88.308	27.534	39.105	62.372	289.959	21.666	40.171	61.213	59.256	14.372	47.258	52.252
<i>Arctictis</i>	35.663	11.399	16.347	25.080	143.192	10.253	16.866	26.090	27.143	8.264	20.457	22.137
<i>Sarcophilus</i>	27.899	8.440	13.053	25.284	108.310	9.060	13.496	19.029	20.588	3.991	15.622	15.715
<i>Thylacynus</i>	62.702	14.557	19.935	39.773	205.007	14.431	21.237	27.741	30.902	5.684	27.841	28.156
<i>Phascolarctos</i>	24.431	10.459	17.045	28.751	145.313	10.776	18.195	19.763	22.513	5.451	16.525	15.852
<i>Vombatus</i>	56.155	13.763	20.215	36.558	148.509	13.086	16.930	34.326	36.202	8.616	26.212	31.887
<i>Manis gigantea</i>	53.778	22.444	25.548	46.881	144.205	14.511	27.069	38.266	43.708	7.379	30.545	36.441
<i>Manis pentadactyla</i>	28.142	11.160	13.551	23.510	76.816	7.295	13.407	20.279	22.496	4.455	14.811	18.097
<i>Papio</i>	51.343	16.782	24.866	48.836	264.474	16.151	24.665	37.809	38.179	12.288	33.096	33.597
<i>Gorilla</i>	62.385	35.604	47.067	82.806	367.543	30.406	48.106	77.608	84.305	21.734	52.057	64.371
<i>Hylobates</i>	25.000	11.514	20.387	28.699	223.305	10.861	20.820	29.147	28.967	10.801	22.380	23.019
<i>Lemur</i>	19.028	7.675	10.976	21.535	132.674	8.848	11.194	16.586	17.773	5.443	17.750	16.971
<i>Coendou</i>	26.911	11.575	13.796	23.971	95.301	7.550	14.146	21.578	21.397	6.432	15.709	18.141
<i>Hystrix</i>	53.537	14.407	17.255	36.899	126.608	11.338	18.731	27.381	27.944	6.491	24.767	30.578
<i>Marmota</i>	24.843	7.374	9.470	19.662	82.541	6.298	9.409	15.182	16.329	3.361	15.334	15.397
<i>Orycteropus</i>	125.765	39.456	31.017	65.589	201.726	24.467	32.697	57.445	59.462	14.206	49.734	58.183



Part V. PGW, Patellar Groove Width; TL, Tibial Length- from interfacet eminence to tibial malleolus; TDT, Transverse Diameter of Tibia - at midshaft; TPEL, Tibial Proximal Epiphysis Length; APDT, Antero-Posterior Diameter of Tibia - at midshaft; TML, Tibial Mortise Length; TMW, Tibial Mortise Width; LTFW, Lateral Tibial Facet Width; MFL, Medial Tibial Facet Length; LTFL, Lateral Tibial Facet Length; TPEW, Tibial Proximal Epiphysis Width .

Taxon	PGW	TL	TDT	TPEL	APDT	TML	TMW	LTFW	MFL	LTFL	TPEW
<i>Choloepus</i>	9.237	139.071	7.280	17.187	6.647	9.163	6.984	10.495	14.290	15.401	24.500
<i>Bradypus</i>	8.595	88.791	6.361	15.759	6.082	7.385	5.820	9.592	10.473	11.145	20.631
<i>Tamandua</i>	8.020	88.410	6.339	15.718	7.303	8.772	14.800	8.753	11.873	11.209	20.671
<i>Myrmecophaga</i>	19.171	205.465	15.061	37.099	17.038	15.836	27.049	18.405	24.164	25.237	45.300
<i>Cyclopes</i>	4.236	41.385	2.531	7.844	3.156	2.226	5.285	3.628	5.646	6.043	8.797
<i>Priodontes</i>	21.585	142.141	13.082	45.389	20.518	16.937	31.898	20.209	26.769	23.959	48.663
<i>Ailurus</i>	7.965	110.194	5.956	17.693	7.647	8.993	9.299	9.963	10.571	9.429	20.379
<i>Acynonix</i>	17.098	267.439	18.887	65.587	21.252	17.736	22.558	23.508	26.299	26.208	50.071
<i>Panthera</i>	27.821	324.960	28.263	70.080	31.399	32.671	38.390	37.478	28.300	34.287	77.367
<i>Gulo</i>	9.841	136.636	9.304	29.408	11.181	12.653	14.184	12.090	15.118	12.823	26.782
<i>Ailuropoda</i>	26.347	213.734	19.900	58.413	21.363	24.849	31.876	28.550	39.473	30.437	67.502
<i>Arctictis</i>	10.483	126.713	8.446	29.256	9.728	12.258	12.506	12.302	14.069	15.532	27.713
<i>Sarcophilus</i>	9.653	106.022	5.886	19.105	7.091	9.146	7.817	8.958	11.584	9.587	19.797
<i>Thylacynus</i>	11.860	192.560	9.429	35.845	14.663	11.438	11.322	11.682	14.962	14.540	28.834
<i>Phascolarctos</i>	11.448	113.234	6.292	21.688	8.834	10.759	9.057	8.737	11.605	9.748	20.614
<i>Vombatus</i>	16.299	116.203	8.628	26.253	13.177	14.171	9.879	11.545	13.234	12.706	29.117
<i>Manis gigantea</i>	16.053	122.980	14.049	28.521	16.248	14.840	23.383	16.100	22.380	16.996	39.419
<i>Manis pentadactyla</i>	9.455	70.992	5.699	16.703	8.395	7.356	10.689	9.269	10.201	9.481	21.714
<i>Papio</i>	17.190	229.118	12.840	35.861	18.482	17.695	20.449	17.765	23.620	21.587	40.346
<i>Gorilla</i>	32.871	277.823	20.731	60.293	25.904	24.318	32.841	31.056	44.813	34.949	78.541
<i>Hylobates</i>	11.792	189.472	7.868	22.804	11.647	11.543	13.836	11.295	15.689	15.047	28.592
<i>Lemur</i>	5.830	128.539	6.030	17.436	8.266	7.945	8.273	7.351	9.200	9.251	18.100
<i>Coendou</i>	6.595	82.809	6.740	19.333	7.832	9.368	11.241	8.379	12.103	11.639	21.651
<i>Hystrix</i>	10.140	111.736	10.385	29.680	13.834	13.218	15.100	12.521	17.873	15.934	30.247
<i>Marmota</i>	6.313	75.302	5.400	15.661	6.390	7.207	7.933	6.582	9.148	8.470	16.520
<i>Orycteropus</i>	20.007	194.221	17.739	54.594	23.948	22.706	22.340	21.905	30.145	25.055	59.851

Part VI. FiL, Fibular total Length; EFFL, Ectal Fibular facet Length; ATMW, Astragalar Trochlear Maximum Width; AL, Astragalar Length- from head to posterior-most border; AEFL, Astragalar Ectal Facet Length; AMFL, Astragalar Medial Facet Length; AHW, Astragalar Head Width; CTL, Calcaneum total Length; FCL, Functional Calcaneum Length- from ectal facet to tuber; CMTW, Calcaneum maximum Tuber Width; BM, average body mass in kg.

Taxon	FiL	EFFL	ATMW	AL	AEFL	AMFL	AHW	CTL	FCL	CMTW	BM
<i>Choloepus</i>	136.577	7.861	7.359	18.988	11.532	10.977	8.130	20.859	16.164	10.749	6.250
<i>Bradypus</i>	82.262	7.499	7.991	16.341	10.348	9.485	7.164	36.593	28.191	16.649	4.225
<i>Tamandua</i>	79.044	7.125	12.091	14.626	9.741	7.377	8.377	29.548	19.695	6.422	4.500
<i>Myrmecophaga</i>	185.582	13.104	25.706	23.751	17.821	14.431	17.228	51.664	32.116	11.640	28.500
<i>Cyclopes</i>	38.511	2.372	5.102	4.719	4.107	2.361	2.812	8.662	7.272	3.300	0.275
<i>Priodontes</i>	136.271	8.562	31.562	33.700	24.608	20.265	18.337	53.725	43.420	22.032	25.500
<i>Ailurus</i>	101.794	5.285	7.817	17.014	8.117	7.839	8.982	26.979	17.769	9.225	4.500
<i>Acynonix</i>	254.803	11.108	20.731	32.980	22.914	20.495	17.352	78.769	56.253	18.882	46.500
<i>Panthera</i>	296.947	17.149	33.837	51.923	32.877	33.541	31.357	104.747	76.610	30.210	190.768
<i>Gulo</i>	123.671	8.175	11.765	25.430	16.013	12.831	12.350	38.559	29.264	12.776	19.500
<i>Ailuropoda</i>	168.203	16.196	26.685	47.085	26.304	22.471	22.366	63.727	51.889	25.885	117.500
<i>Arctictis</i>	116.090	8.544	12.640	22.332	11.714	11.347	10.929	36.582	25.981	10.147	11.500
<i>Sarcophilus</i>	101.472	7.769	8.105	11.870	7.432	6.551	6.957	21.576	17.229	8.795	7.120
<i>Thylacynus</i>	185.076	9.313	11.776	19.360	11.281	10.942	9.537	38.238	31.377	12.351	22.500
<i>Phascolarctos</i>	110.164	11.106	11.407	18.808	10.062	11.257	9.565	27.461	23.796	7.590	10.220
<i>Vombatus</i>	112.184	11.787	10.131	19.427	11.454	12.173	11.049	29.335	26.254	10.483	25.000
<i>Manis gigantea</i>	110.140	13.361	22.626	21.179	16.685	8.151	19.561	43.096	32.239	17.058	33.000
<i>Manis pentadactyla</i>	70.565	5.173	10.597	13.262	8.235	3.521	8.207	23.404	18.226	7.101	17.750
<i>Papio</i>	211.196	8.148	16.405	32.071	19.424	13.955	16.819	51.442	33.287	16.685	25.600
<i>Gorilla</i>	246.835	22.791	36.051	52.958	28.528	26.121	32.050	80.663	61.025	39.355	155.000
<i>Hylobates</i>	172.247	7.594	11.942	23.360	13.431	11.212	11.063	30.409	19.403	11.991	10.500
<i>Lemur</i>	118.382	6.327	7.250	17.136	8.136	6.866	7.482	23.603	13.642	6.788	3.000
<i>Coendou</i>	79.774	5.391	11.315	13.951	9.756	8.652	7.667	23.262	16.569	6.742	2.950
<i>Hystrix</i>	101.490	8.964	14.695	19.911	14.792	12.172	10.770	36.404	28.871	13.072	20.000
<i>Marmota</i>	69.575	3.402	7.464	10.863	7.407	6.257	6.230	19.380	13.133	5.556	5.250
<i>Orycteropus</i>	178.182	15.278	23.597	36.750	28.387	24.582	18.296	78.734	61.272	21.208	60.000

Measurement values (in mm) of the Santacrucian sloths analyzed here.

Family	Taxon	Museum	Coll. Number	SL	SGL	TDH	APDH	HDASW	HTVL	HEMP	TDU	RHL	RDEW	TDF	WTuB	FIL	FHL
indet.	Folivora indet.	MPM-PV	3458								10.000						
indet.	Folivora indet.	MPM-PV	3462	93.176	20.747												
Megalonychidae	<i>Eucholoeops fronto</i>	MPM-PV	3403	126.735	33.835	32.538	28.648	42.231	14.321		15.294		17.167	42.780	66.340		32.020
Megalonychidae	<i>Eucholoeops ingens</i>	FMNH	13280			21.055	20.022	32.453	11.395	22.739							
Megalonychidae	<i>Eucholoeops ingens</i>	MPM-PV	3451									25.378	15.479				
Megalonychidae	<i>Eucholoeops</i> sp.	MPM-PV	3402	130.760	38.500												
Megalonychidae	<i>Eucholoeops</i> sp.	MPM-PV	3651	148.456	33.871	31.362	30.079	43.166	13.782	27.117	15.962	24.899	12.042	53.118	81.591	214.960	41.778
Megalonychidae	Megalonychidae indet.	AMNH	9249			19.103	17.352	35.375	11.488	20.963		17.550	13.027	44.509	63.822	171.940	30.630
Megalonychidae	Megalonychidae indet.	AMNH	94754			25.746	21.120	34.353	11.089	20.077	7.728	20.000	12.700				
Megatheriidae	<i>Prepothierium potens</i>	YPM-VPPU	15345											82.864	128.017	292.736	57.458
Basal Megatherioidea	<i>Analcimorphus giganteus</i>	YPM-VPPU	15561											45.060	72.612	217.125	35.969
Basal Megatherioidea	cf. <i>Hapalops</i>	MPM-PV	3404			27.934	27.243	36.191	14.429	28.578		22.823	14.962				
Basal Megatherioidea	<i>Hapalops angustipalatus</i>	YPM-VPPU	15562		28.679			31.453	10.863	25.110	13.925	20.982	14.027	54.817	73.886	193.733	33.762
Basal Megatherioidea	<i>Hapalops elongatus</i>	FMNH	13133	121.228	23.519	22.506	20.221	35.760			10.133	21.560	17.860				
Basal Megatherioidea	<i>Hapalops elongatus</i>	YPM-VPPU	15155	103.890	27.081												
Basal Megatherioidea	<i>Hapalops indifferens</i>	YPM-VPPU	15110								13.345			50.742	68.965	199.537	35.210
Basal Megatherioidea	<i>Hapalops longiceps</i>	YPM-VPPU	15523			29.604	34.370	46.664	14.257	28.026	14.434	25.495	13.868	59.270	81.999	211.046	39.429
Basal Megatherioidea	<i>Hapalops platycephalus</i>	YPM-VPPU	15564			23.256	26.780	30.626	10.617	47.011				39.020	63.330	157.793	30.525
Basal Megatherioidea	<i>Hapalops rectangularis</i>	FMNH	13143	124.295	30.154	24.138	20.351	31.538	12.054	25.183	8.528	21.497					
Basal Megatherioidea	<i>Hapalops rectangularis</i>	AMNH	9222	99.213	21.549							15.766	10.994				
Basal Megatherioidea	<i>Hapalops ruetimeyeri</i>	FMNH	13128											44.346	59.386	169.312	16.959
Basal Megatherioidea	<i>Hapalops ruetimeyeri</i>	FMNH	13130			27.700	24.794	36.165	11.059	24.411	8.540	22.464	16.787	51.149			
Basal Megatherioidea	<i>Hapalops</i> sp.	MPM-PV	3400	128.509	34.320						13.997	26.031	17.268	52.728	76.516	221.366	42.617
Basal Megatherioidea	<i>Hapalops</i> sp.	MPM-PV	3412	136.535	32.827												
Basal Megatherioidea	<i>Hapalops</i> sp.	MPM-PV	3467			28.600	25.667	36.534	12.237	25.135	12.991	21.580		52.999	83.314	202.234	36.208
Basal Megatherioidea	<i>Hapalops</i> sp.	AMNH	9252	69.465	16.082												
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15005	113.152	24.572							17.917	16.632	38.305	61.006	158.105	30.765
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15045											51.983	68.048	164.179	30.438
Basal Megatherioidea	<i>Hapalops</i> sp.	FMNH	15103								8.326	18.048	10.859				
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15160			24.186	19.945	29.993	11.889	19.952	10.596						
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15183	138.258	30.522												
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15414	95.535	20.756												
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15520			28.067	25.967	44.122	14.364	23.569				59.677	88.383	211.505	41.050
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15597									16.462	12.262				
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15618			22.534	23.771	35.814	11.998	20.258							
Basal Megatherioidea	<i>Hapalops</i> sp.	YPM-VPPU	15836														
Basal Megatherioidea	<i>Hapalops</i> sp.	MLP	34-III-5-1								11.980		19.140				
Mylodontidae	<i>Analcitherium?</i> sp.	FMNH	13131			42.780	29.900	55.400	16.685	36.081							
Mylodontidae	<i>Nematherium angulatum</i>	FMNH	13129								17.560	22.520					

Family	Taxon	Museum	CToll. Number	FCW	MCL	PGW	APDT	TMW	LFW	LTFL	TPEW	PL	ILL	ATMW	AHW	FCL
indet.	Folivora indet.	MPM-PV	3458											30.420	26.680	72.800
indet.	Folivora indet.	MPM-PV	3454											28.040	24.040	
Megalonychidae	<i>Eucholoeops fronto</i>	MPM-PV	3403		49.820	25.560		28.180				262.619	136.166			
Megalonychidae	<i>Eucholoeops ingens</i>	FMNH	13280													
Megalonychidae	<i>Eucholoeops ingens</i>	MPM-PV	3451													
Megalonychidae	<i>Eucholoeops sp.</i>	MPM-PV	3402													
Megalonychidae	<i>Eucholoeops sp.</i>	MPM-PV	3651	66.683	50.025	29.375			25.183	34.485	57.792					67.180
Megalonychidae	Megalonychidae indet.	AMNH	9249	48.253	40.958	22.152										
Megatheriidae	Megatheriidae indet.	MPM-PV	3408											34.320	32.700	
Megatheriidae	<i>Prepotherium potens</i>	YPM-VPPU	15345	99.187	80.047	36.842	31.060	49.578	29.900	56.403	101.030					
Basal Megatherioidea	<i>Analcimorphus giganteus</i>	YPM-VPPU	15561	63.144	46.637	32.095	19.508	24.140	29.678	32.868	64.094	179.384	67.750	35.080	21.060	
Basal Megatherioidea	<i>Hapalops angustipalatus</i>	YPM-VPPU	15562	53.724	43.940	15.925	20.885	26.803	17.263	27.752	54.704					59.993
Basal Megatherioidea	<i>Hapalops elongatus</i>	FMNH	13123				20.501	20.811	22.657	29.208	49.124			22.134	17.456	55.167
Basal Megatherioidea	<i>Hapalops elongatus</i>	FMNH	13133													
Basal Megatherioidea	<i>Hapalops elongatus</i>	YPM-VPPU	15155											26.480		
Basal Megatherioidea	<i>Hapalops indifferens</i>	YPM-VPPU	15110	55.329	45.930	25.344										65.268
Basal Megatherioidea	<i>Hapalops longiceps</i>	YPM-VPPU	15523	63.927	47.177	27.215	24.931	17.524	28.976	28.936	57.604		134.613	31.809	22.507	68.288
Basal Megatherioidea	<i>Hapalops platycephalus</i>	YPM-VPPU	15564	47.088	38.557	15.760	16.894		19.440	23.561	48.393					
Basal Megatherioidea	<i>Hapalops rectangularis</i>	FMNH	13143				17.018	24.868	20.701	25.725	44.572					
Basal Megatherioidea	<i>Hapalops rectangularis</i>	AMNH	9222					22.200				185.212	84.468	21.541	18.995	49.148
Basal Megatherioidea	<i>Hapalops ruetimeyeri</i>	FMNH	13128	47.503	34.403	20.772	17.998	21.534	20.629	25.327	48.041					
Basal Megatherioidea	<i>Hapalops ruetimeyeri</i>	FMNH	13130	55.948	46.573	24.585	19.936	26.634	21.671	31.935	54.794					
Basal Megatherioidea	<i>Hapalops sp.</i>	MPM-PV	3400	60.367	48.056	29.494	20.378	32.612	21.852	34.779	55.139					71.071
Basal Megatherioidea	<i>Hapalops sp.</i>	MPM-PV	3412													
Basal Megatherioidea	<i>Hapalops sp.</i>	MPM-PV	3467	57.335	43.952	25.860	19.195	28.270	25.698	28.246	58.965					
Basal Megatherioidea	<i>Hapalops sp.</i>	AMNH	9252													
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15005	46.844	38.035	14.993	16.757		19.654	25.635	48.706					
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15045	49.537	36.015	21.562	17.512	27.344	20.381	26.741	49.181	213.850	121.974			
Basal Megatherioidea	<i>Hapalops sp.</i>	FMNH	15103													
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15160													
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15183													
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15414													
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15520	65.624	53.072	27.751			25.527	38.936	71.032					73.104
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15597				15.397	22.259	21.869	31.332	44.166					
Basal Megatherioidea	<i>Hapalops sp.</i>	YPM-VPPU	15836											28.172	21.969	
Basal Megatherioidea	<i>Hapalops sp.</i>	MLP	34-III-5-1													
Basal Megatherioidea	<i>Schismotherium fractum</i>	FMNH	13137											21.977	18.786	31.522
Mylodontidae	Mylodontidae indet.	MPM-PV	3406				31.260	39.720	31.100	31.400	74.820			35.480	30.580	88.420