

Supplementary Note 1:

The taxonomic scheme in this manuscript follows:

Superfamily Hominoidea (hominoids)

Family Proconsulidae

Genus *Proconsul*

Genus *Ekembo*

Family Pliobatidae

Genus *Pliobates*

Family Hylobatidae (hylobatids)

Genus *Hylobates*

Family Hominidae (hominids)

Subfamily Dryopithecinae

Genus *Dryopithecus*

Genus *Hispanopithecus*

Subfamily Ponginae (pongines)

Genus *Pongo*

Genus *Sivapithecus*

Subfamily Homininae (hominines)

Tribe Gorillini (gorillins)

Genus *Gorilla*

Tribe Panini (panins)

Genus *Pan*

Tribe Hominini (hominins)

Genus *Orrorin**

Genus *Sahelanthropus**

Genus *Ardipithecus**

Genus *Australopithecus*

Genus *Paranthropus*

Genus *Homo*

* putative basal hominin

Supplementary Table 1: Estimated body mass averages, first appearance dates, sample sizes, and references for fossil taxa included in this analysis, along with comparative data for modern humans, *Pan troglodytes*, and *Pan paniscus*.

Species	Average Body Mass (kg)	First Appearance Date (Ma)	Sample size	Family	Reference for Mass	Reference for Age
<i>Orrorin tugenensis</i> ^α	35.8/46.5	6.00	2	Hominidae	Grabowski et al. 2015 ¹ / Almécija et al. 2015 ²	Almécija et al. 2013 ¹⁶
<i>Ar. ramidus</i> ^α	32.1/50.8	4.40	1	Hominidae	Grabowski et al. 2015 ¹ / Almécija et al. 2015 ²	White et al. 2009 ¹⁸
<i>Au. anamensis</i>	46.30	4.17	1	Hominidae	Grabowski et al. 2015 ¹	Leakey et al. 1998 ¹⁸
<i>Au. afarensis</i>	39.10	3.77	12	Hominidae	Grabowski et al. 2015 ¹	Leakey et al. 1976 ¹⁹
<i>Au. africanus</i>	30.50	3.03	5	Hominidae	Grabowski et al. 2015 ¹	Herries et al. 2013 ²⁰
<i>Au. sediba</i>	26.70	1.95	2	Hominidae	Grabowski et al. 2015 ¹	Pickering et al. 2011 ²¹
<i>P. boisei</i> ^β	35.30	2.30	8	Hominidae	Grabowski et al. 2015 ¹	Feibel et al. 1989 ²²
<i>P. robustus</i>	30.10	2.00	4	Hominidae	Grabowski et al. 2015 ¹	Herries et al. 2009 ²³
<i>H. habilis</i>	32.60	2.33	2	Hominidae	Grabowski et al. 2015 ¹	Kimbel et al. 1997 ²⁴
<i>H. erectus</i>	51.00	1.90	7	Hominidae	Grabowski et al. 2015 ¹	Kimbel and Villmoare, 2016 ²⁵
<i>H. floresiensis</i>	27.50	0.10	1	Hominidae	Grabowski et al. 2015 ¹	Sutikna et al. 2016 ²⁶
<i>H. heidelbergensis</i>	69.10	0.61	5	Hominidae	Arsuaga et al. 2015 ³	Wagner et al. 2010 ²⁷
<i>H. neanderthalensis</i>	75.40	0.13	14	Hominidae	Arsuaga et al. 2015 ³	Rink et al. 1995 ²⁸
Modern Humans	58.20	0.20	51 ^ε	Hominidae	Ruff et al. 1997 ⁴	McDougall et al. 1995 ²⁹
<i>Proconsul africanus</i> ^δ	35.00	22.50	-	Proconsulidae ^φ	Harrison 2010 ⁵	McNulty et al. 2015 ³⁰
<i>Proconsul major</i> ^δ	75.00	22.50	-	Proconsulidae ^φ	Harrison 2010 ⁵	McNulty et al. 2015 ³⁰
<i>Ekembo heseloni</i> ^δ	15.00	18.50	-	Proconsulidae ^φ	Harrison 2010 ⁵	McNulty et al. 2015 ³⁰
<i>Ekembo nyanzae</i> ^δ	35.00	18.50	-	Proconsulidae ^ν	Harrison 2010 ⁵	McNulty et al. 2015 ³⁰
<i>Dryopithecus fontani</i>	43.60	11.80	1	Hominidae ^φ	Moya-Sola et al. 2009 ⁶	Moya-Sola et al. 2009 ⁶
<i>Hispanopithecus laietanus</i>	32.00	9.60	2	Hominidae ^φ	Alba et al. 2012 ⁷	Alba et al. 2012 ⁷
<i>Sivapithecus indicus</i>	30.50	12.70	6	Hominidae ^φ	Morgan et al. 2015 ⁸	Morgan et al. 2015 ⁸
<i>Pliobates cataloniae</i>	4.50	11.60	1	Pliobatidae	Alba et al. 2015 ⁹	Alba et al. 2015 ⁹

<i>Komba robustus</i>	0.30	20.00	-	Galagidae	Steiper and Seiffert, 2012 ¹⁰	Harrison, 2010 ⁵
<i>Nycticeboides simpsoni</i>	0.27	9.00	-	Lorisidae	Steiper and Seiffert, 2012 ¹⁰	Harrison, 2010 ⁵
<i>Epipliothecus vindobonensi</i>	11.50	15.50	1	Pliopithecidae	Alba et al. 2015 ⁹	Begun, 2002 ³¹
<i>Carlocebus carmenensis</i>	3.37	17.50	-	Pitheciidae	Steiper and Seiffert, 2012 ¹⁰	Fleagle, 2013 ³²
<i>Branisella boliviana</i>	0.48	26.00	-	incertae sedis	Steiper and Seiffert, 2012 ¹⁰	Takai et al. 2000 ³³
<i>Karanisia clarki</i>	0.27	41.00	1	Galagidae	Seiffert et al. 2003 ¹¹	Harrison, 2010 ⁵
<i>Victoriapithecus macinnesi</i>	3.75 ³	15.00	-	Cercopithecidae	Harrison, 1989 ¹²	Gonzales et al. 2015 ³⁴
<i>Archicebus achilles</i>	0.03	55.80	1	Archicebidae	Ni et al. 2013 ¹³	Ni et al. 2013 ¹³
<i>Eosimias sinensis</i>	0.14	45.00	1	Eosimiidae	Egi et al. 2004 ¹⁴	Beard and Wang. 2004 ³⁵
<i>Pan troglodytes</i>	45.00	2.33	60	Hominidae	Smith and Jungers 1997 ¹⁵	10K Trees ³⁶
<i>Pan paniscus</i>	39.10	2.33	13	Hominidae	Smith and Jungers 1997 ¹⁵	10K Trees ³⁶

α From ¹/Based on chimpanzee training sample from ²

β Based on "Possible *P. boisei*" following ¹

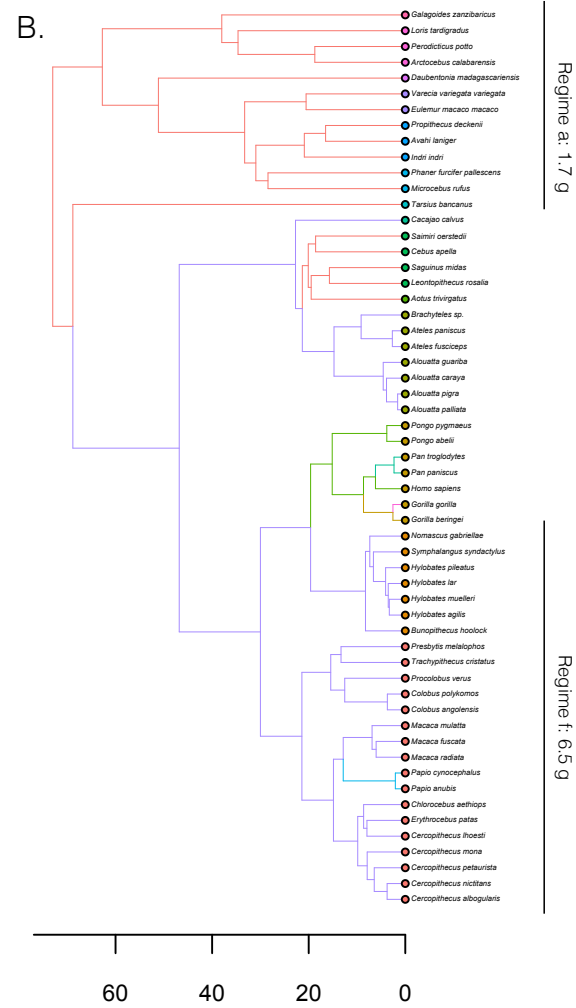
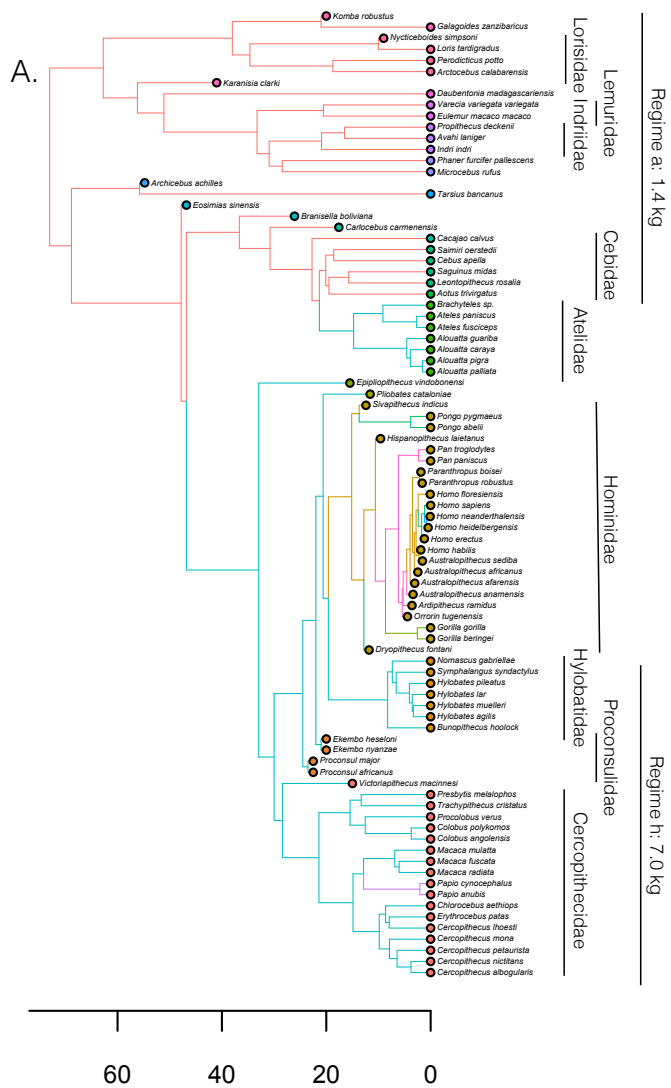
δ Midpoint of range compiled in ⁵

ε Average of 51 worldwide populations

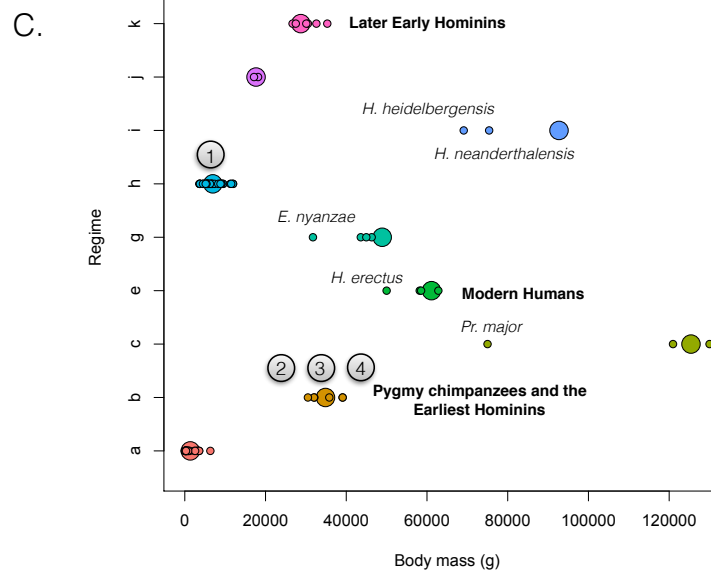
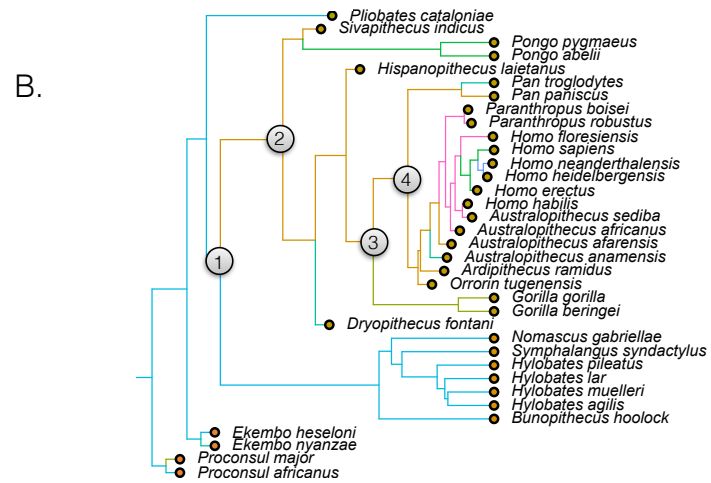
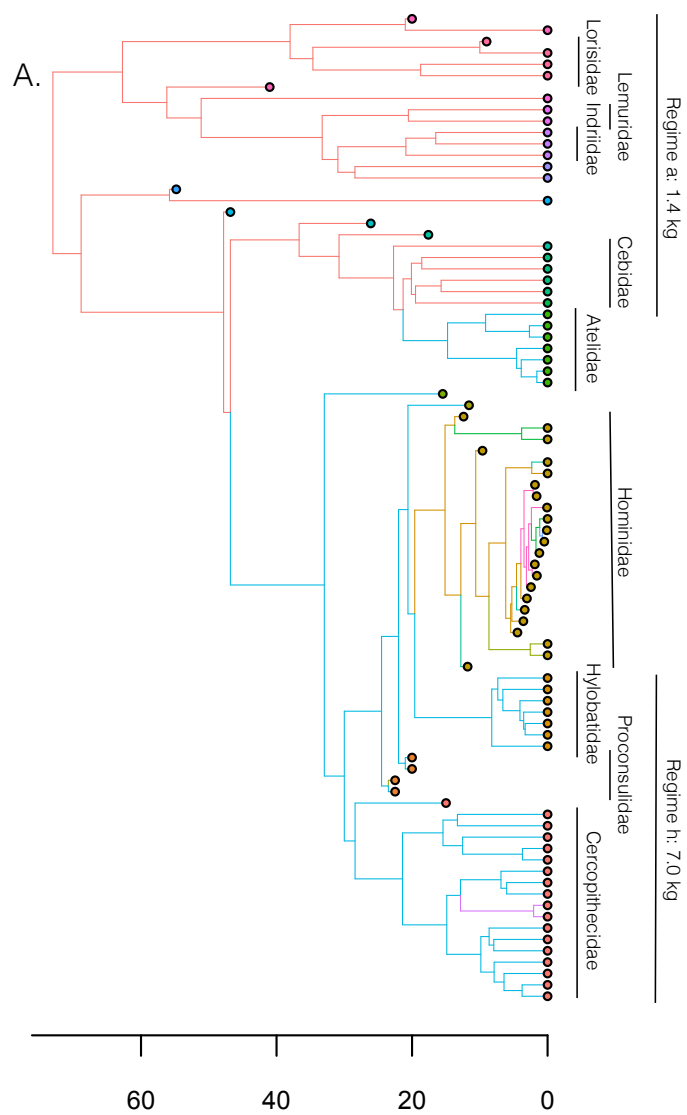
ϕ Following ⁶

Supplementary Table 2: AIC_c results and comparison between models for different evolutionary hypotheses including Brownian-motion (BM), a single regime OU model (OU1), a chimpanzee sized ancestor of all hominoids (*Anc_Pan*), and the best supported model (Surface fit) for different subsets of body mass data. Also shown is half-life ($t_{1/2}$) for each data set for the best-supported model.

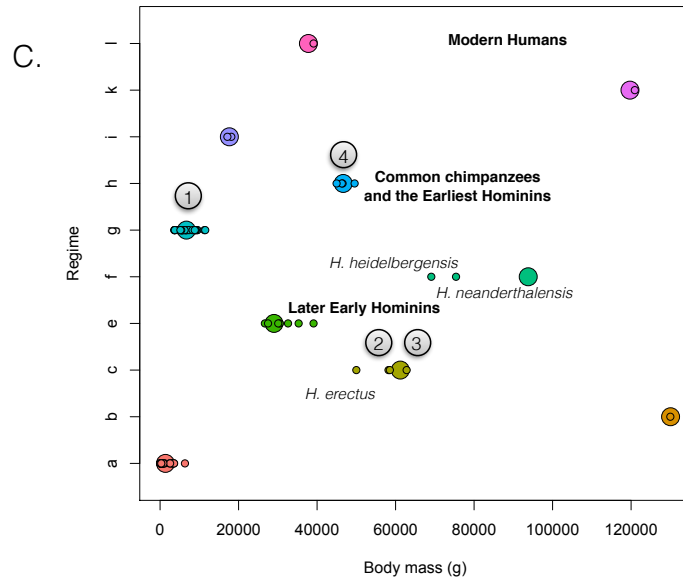
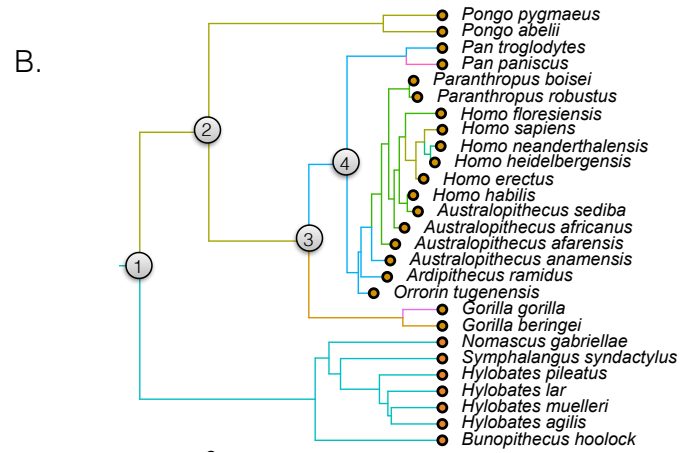
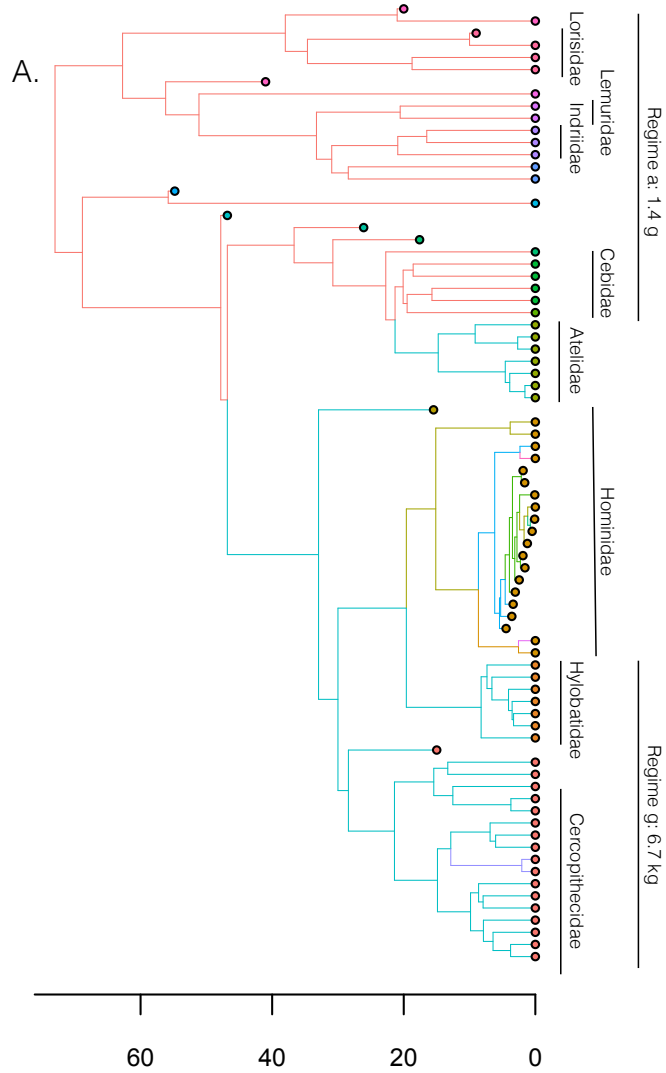
Data Set	Evolutionary Model	AIC _c	Change AIC _c	$t_{1/2}$
Complete Data Set with Smaller <i>Ardipithecus</i> and Orrorin Estimates (n=87)	BM	1999.38	330.12	
	OU1	1969.42	300.16	
	<i>Anc_Pan</i>	1680.79	11.52	
	Surface fit	1669.27	0.00	0.82
Without Miocene Apes (n=79)	BM	1759.10	263.06	
	OU1	1753.11	257.07	
	<i>Anc_Pan</i>	1500.62	4.59	
	Surface fit	1496.04	0.00	0.85
Female Data Only - Well Sampled Early Hominins with other Fossil Primates (n=78)	BM	1711.95	258.52	
	OU1	1700.86	247.43	
	<i>Anc_Pan</i>	1502.52	49.10	
	Surface fit	1453.42	0.00	6.52
Female Data Only - Extant Primates (n=57)	BM	1233.95	177.33	
	OU1	1232.95	176.33	
	<i>Anc_Pan</i>	1068.79	12.18	
	Surface fit	1056.62	0.00	10.10



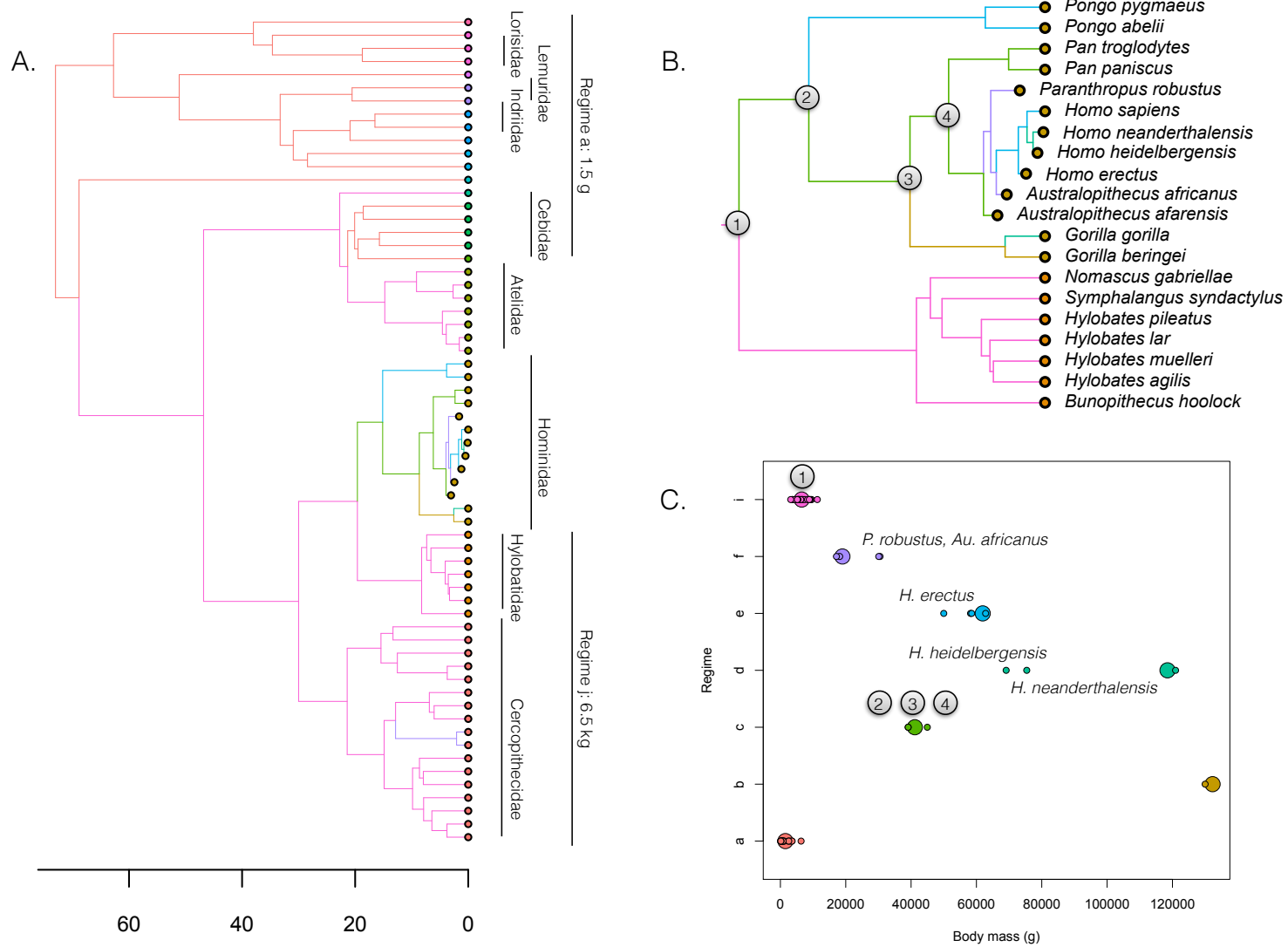
Supplementary Figure 1: A) Same as Figure 1:A except with species names; B) Same as Figure 1:A except using only extant primate data.



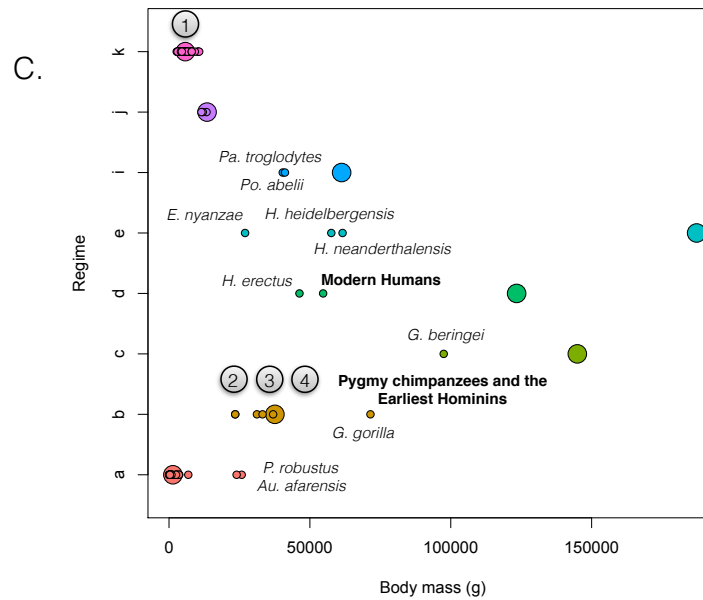
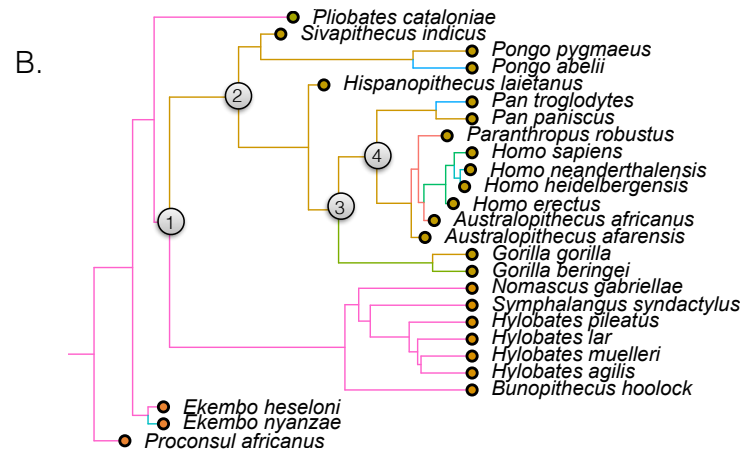
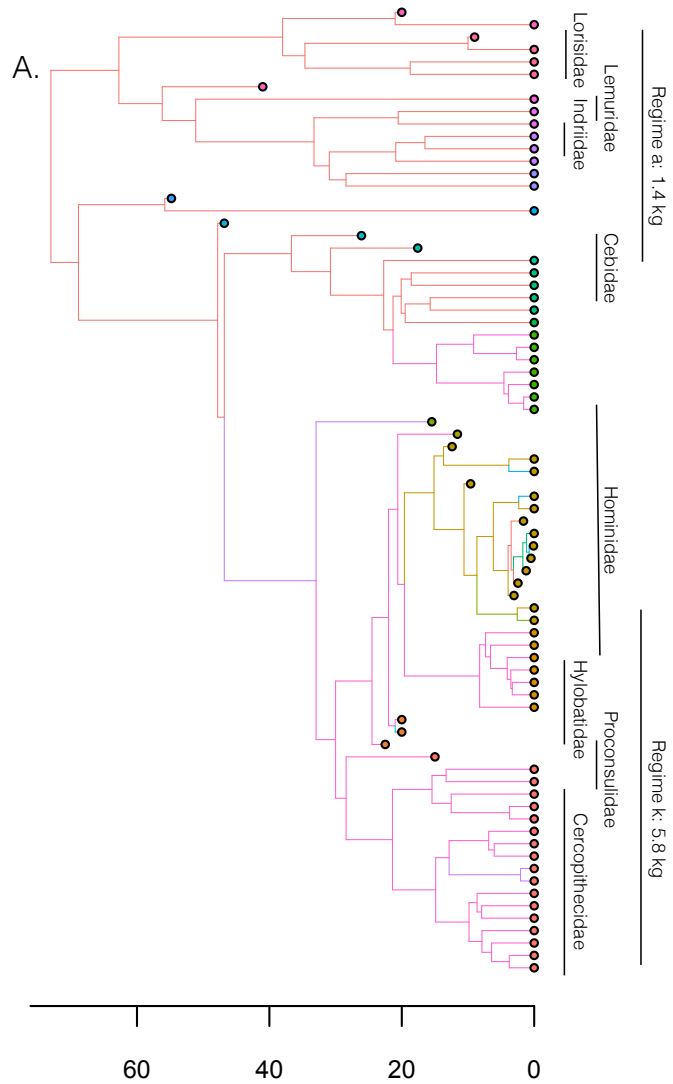
Supplementary Figure 2: Same as Figure 1 but using with smaller estimates of *Ardipithecus* and *Orrorin*.



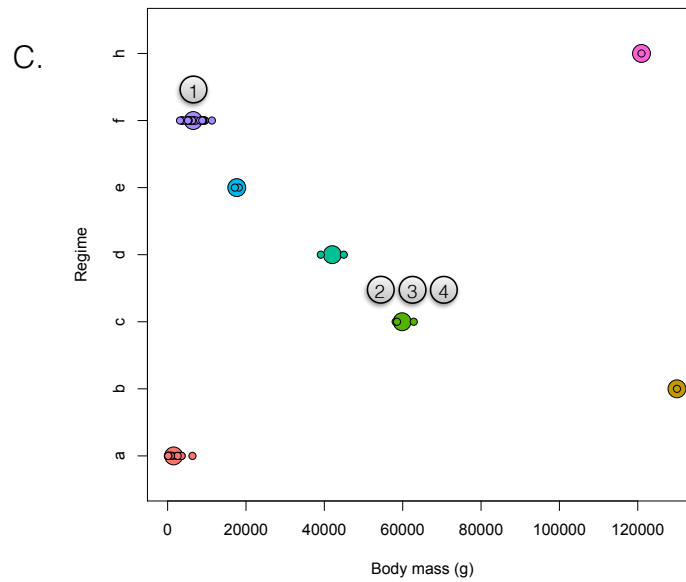
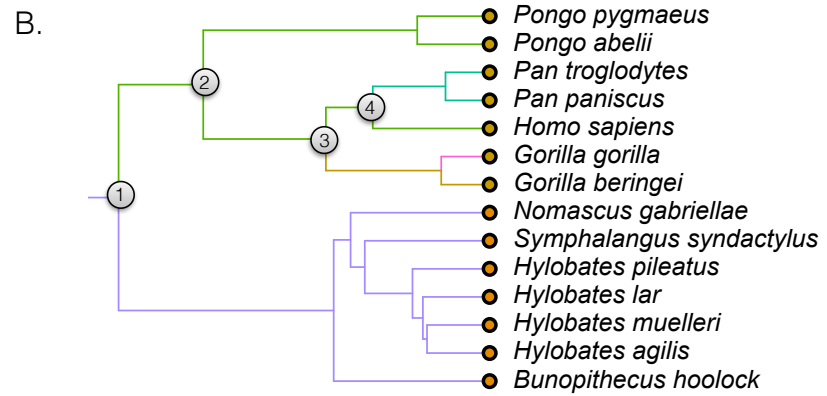
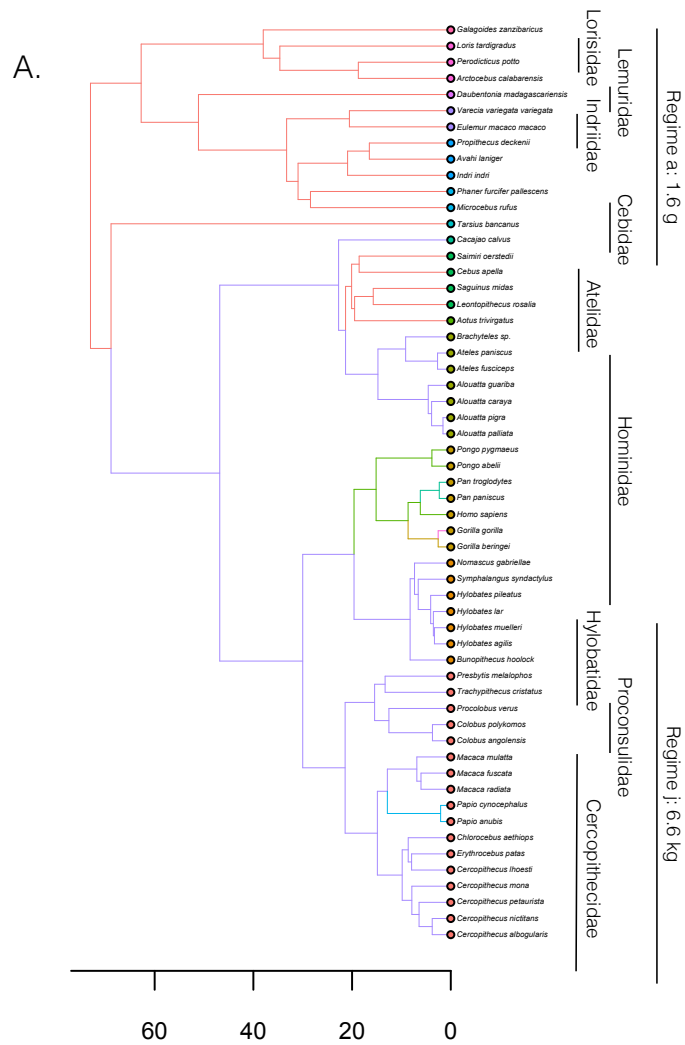
Supplementary Figure 3: Same as Figure 1 but without Miocene fossil apes.



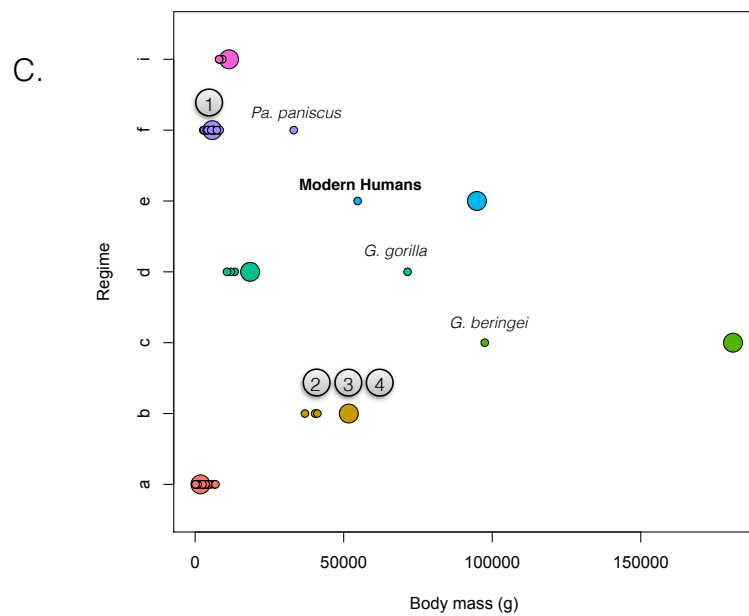
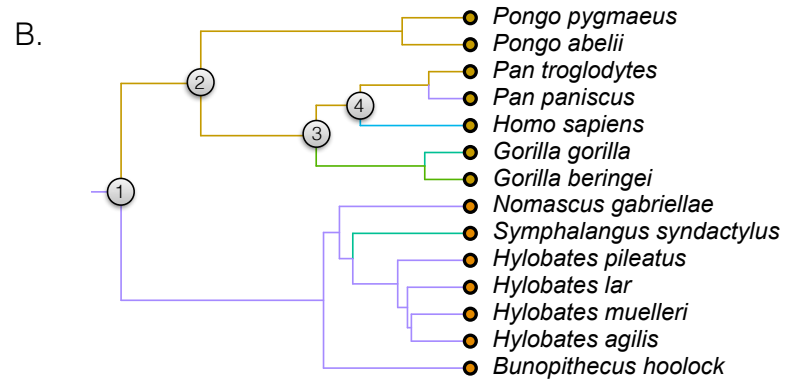
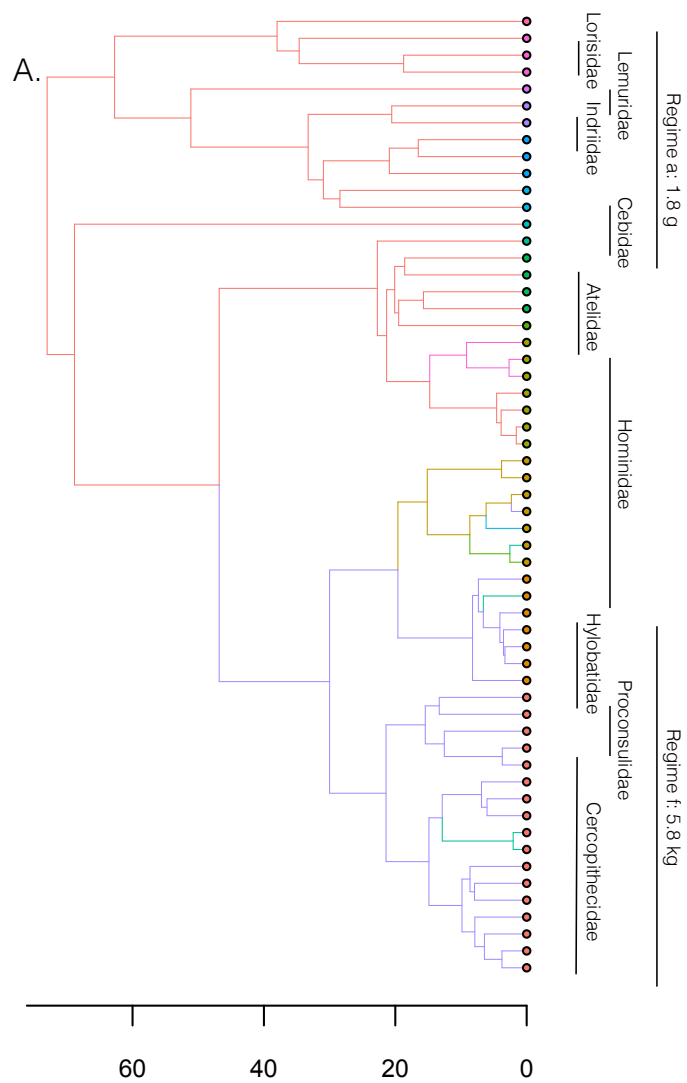
Supplementary Figure 4: Same as Figure 1 but with only well-sampled undisputed early hominins without other fossil primates.



Supplementary Figure 5: Same as Figure 1 but with only female averages including well-sampled reliably-attributed early hominins.



Supplementary Figure 6: Same as Figure 1 but with only extant primates.



Supplementary Figure 7: Same as Figure 1 but with only extant female primates.

Supplementary References

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