Supporting Information for Smith et al. 2015. *A mammoth amount of methane: exploring the influence of ancient and historic megaherbivore extirpations on the global methane budget.*

Includes:

SI Materials and Methods

I. Computations of methane emissions for mammals.

We provide additional information and data tables for our analyses. For the Rinderpest epidemic, our total herbivore input included all extant wildlife (with removal of American Bison see below) including introduced populations and the time specific domestic animal estimate (Table S1). For the American Bison reduction (Table S2), our total herbivore input included all extant wildlife (non-introduced populations), the time specific domestic animal estimate, historic animals that went extinct after 1870, and an increased bison population of 30 million individuals corresponding to what used by Kelliher and Clark (S1). For the End-Pleistocene, our total herbivore input included all extant wildlife (non-introduced populations), all historical species, and the allometric American Bison estimate (Table S1). Because this predated domestication of wildlife, no livestock were included. For both the modern and 1800s, we included the corresponding domestic animal estimates, extant wildlife and introduced species.

II. Analysis of methane fluctuations over the late Quaternary

Atmospheric methane concentration has fluctuated considerably over the late Quaternary. If the extinction of the megafauna contributed to the observed drop in atmospheric methane just prior to the Younger Dryas cold episode (YD), we would expect to see a difference between this event and previous methane drops as recorded in the ice core record. To evaluate this prediction, we used a moving window analysis and compared the slopes of the relationship between atmospheric methane concentration and time over 1000 year intervals across the entire extent of each ice core record. We constrained our analyses to a 1000-yr window, which is the approximate length of both the YD and the extinction event. Note that using a standardized temporal window is essential in the comparison because process rates are not independent of measured time interval; the shorter the time interval between the values, the higher the perceived rate. Indeed, Smith et al. (S26) found a highly significant relationship between the computed rate of change in atmospheric methane and the temporal duration of the analysis (R^2=0.516, P<0.000, df=306), demonstrating that unconstrained temporal comparisons are statistically unsound. The solution to the non-independence of rates and temporal interval is to employ standardized time intervals for comparisons, as we have done in our manuscript. Here, we employ four different ice cores, which vary in geographic location and in the length and resolution of methane data available: 1) the high resolution NEEM core from Greenland (S27), which extends from 107.7 to 9.5 ka; 2) the GISP2 core from Greenland (S28), which extends from 109.6 – 9 ka; 3) the EPICA Dome 3 core from Antarctica (S29, S30), which extends from 800-2.8 ka; and 4) the highly resolved 2015 WAIS core (S39-41). The window was set to the starting age of the core and an ordinary least squares regression between CH_4 concentration and age was calculated. Time was incremented by 100 years and the relationship calculated for the next 1000-yr interval. This process was repeated across the entire temporal span of the core to capture all fluctuations in methane. Because we were interested in determining if the drop in methane just prior to the YD was significantly different from other drops in methane, we focused on decreases in methane concentration. We only include intervals that contain at least 5 measurements within the 1000-yr bin, which allows us to compute a statistically justified slope. However, our results are unchanged even when relaxing this restriction and using as few as 3 values to characterize the regression line. The mean slope for each core was statistically compared to the slopes for the EX/YD using Mann-Whitney U tests.

We identified intervals during the time period of interest, which begins with the approximate start of the extinction of the megafauna (EX, ~13.4 ka) and the YD (duration 12.8-11.5 ka). We compared the slopes of the methane decrease during the EX/YD to all other drops in the ice core record over the late Quaternary (Table S3). In all cases, the slopes during the EX/YD interval were *significantly higher* (~4-10 times) than all other drops (Table S3; Figs. S1-S4). For the EPICA Dome 3 core (S29, S30), the slopes within the EX/YD interval (13-11.5ka) averaged 0.21, which was significantly higher than the average slope of 0.03 for all other drops (Table S3; Fig. S3). The NEEM core (S27) had an average EX/YD (13.3-11.9) slope of 0.21, which was also significantly higher than the slope of 0.03 for all other time periods (Table S3; Fig. S1). The GISP2 core (S28) had an average EX/YD slope (13.2-12 ka) of 0.21, which was again statistically higher (~4 times) than the slope of 0.05 for all other intervals (Table S3; Fig. S2). The WAIS core (S39) had an average EX/YD slope (13.5-12 ka) of 0.24, which was statistically higher than the slope of 0.02 for all other intervals (Table S3; Fig. S4). The slight differences in the definition of EX/YD for each core were a function of sampling intensity; if insufficient samples existed to compute a slope (N<3, or N<5; see above), a time interval was necessarily excluded. The strong concordance from four different cores varying in their resolution, duration and geographic location suggests that there was indeed something unique underlying the rapidity of the drop in atmospheric methane concentration immediately following the extinction of the megafauna.

Finally, although using two adjacent values to calculate the largest changes in methane is a less robust way of characterizing trends in atmospheric concentration over time, we can use this simplistic technique with the WAIS 2015 core because it is reported in standardized 2 year intervals for the time period from ~10-36 ka. Thus, for all adjacent time periods, we calculate a simple rate and examine these over time; none are as high as those found during the Younger Dryas interval (Fig. S5).

III. Assessing the consequences of the LP extinction and methane decrease on climate

Ice core records reveal atmospheric methane concentrations have fluctuated from 10-30 ppbv per 1°C rise in global mean temperature (mean ~20 ppbv; S35). Thus, empirically, the 185-245 ppbv CH_4 drop just prior to the Younger Dryas (S5) is associated with a temperature shift of 9-12°C. However, the potential role of methane in these temperature shifts is unclear. Changes in global average methane concentration can be related at an approximate level to the downward steps in emission. However, because the influence of methane on climate is non-linear, precise estimates of radiative forcing are dependent on the concentration and atmospheric chemical state over which the computation is conducted. Further, methane has non-linear indirect effects on other important greenhouse gases (including water vapor), leading IPCC to recommend that the "*contributions of individual gases must not be judged on the basis of concentration alone*" (IPCC Chapter 2. Radiative forcing of climate). Thus, there is not a simple connection between a change in atmospheric CH_4 concentration and climate. Ideally, we would run simulations using a well-characterized earth system model to assess the effect of the loss of megafauna on climate during the late Pleistocene. Because this is not a viable option, we construct the following thought experiment based on simplistic atmospheric budgeting. However, our results should be considered a minimum estimate of the effect of the loss of megafauna on climate during the late Pleistocene and interpreted with some caution.

Our computation is based on atmospheric budgeting by Warneck (S31) and Seinfeld and Pandis (S32). While the overall tropospheric carbon cycle is enormously complex, methane exists in a state of intermediate atmospheric stability. With a residence time of about a decade, CH_4 is sufficiently long lived to mix between the hemispheres, but simultaneously it is removed rapidly enough that useful steady states may be computed. Oxidation rates are controlled by gas phase chemical feedback loops such that they are fairly well buffered over the late Holocene (levels of the detergent hydroxyl radical, *OH*, are roughly constant; S33). A single differential equation can be used to describe time dependent global behaviors.

(1) $$dM/dt = P - (1/\tau)M$$

This represents a global average, or else nearly identical situations north and south of the equator with a 1-yr exchange time operating between them. A global solution is

(2) $$M = M_o e^{-t/\tau} + (P\tau)\left(1 - e^{-t/\tau}\right)$$

where *M* is the atmospheric mass CH_4 burden in Tg; *P* is the surface integrated production in Tg yr^{-1}; and τ is the oxidation or removal lifetime in years. Decay of some initial mass value and grow-in of the new steady state are both quite apparent in this form. Since τ = ~12 years, a few decades suffice to reestablish steady state and the target value is

(3) $$dM/dt = 0 \; or \; M = P\tau$$

Relative importance of megafauna to climate can be assessed through back of the envelope arguments. Working from the atmospheric chemical balance we can relate burden to concentration to changes in the mole fraction. The parameter, *c*, represents the constant conversion factor from total mass M to atmospheric mole fraction *x*. For a step function in P, followed by rapid equilibration, the change in mole fraction can be computed as follows:

(4) $$x = \; cP\tau; \text{ thus, } \Delta x = c\Delta P\tau; with \; \Delta x/x = \Delta P/P; thus \; \Delta x = (\Delta P/P)\, x$$

Note that mass and time units cancel. Finally, we scale to the CO_2 greenhouse effect and its net forcing (S32). Paleoclimate studies suggest that a doubling of CO_2 leads to a global average of 5°C warming (up to 6.8 °C) in earth surface temperature (S34), somewhat higher than predicted for modern anthropogenic changes. Using late Pleistocene values of CO_2 of ~190 ppmv, a doubling from 190 to 380 ppmv leads to:

(5) $$2[CO_2] = +5^o\text{C}, or \; 0.026^o\text{C} \; ppmv \; {CO_2}^{-1}$$

Using a range for the standard global warming potential (GWP) of methane relative to carbon dioxide from the IPCC (S36) of 34 for 100-yr and 86 for 20-yr time horizons, adjusting units to mole fractions from kg and making the simplifying assumption that temperature changes are proportional to forcing (S34), we can define the relationship, *r*, between temperature and atmospheric methane mole fraction as follows:

(6) $$r = (0.026^o\text{C}\, ppmv^{-1})_{CO_2} \times GWP\left(\frac{(1^o\text{C}\, ppmv^{-1})_{CH_4}}{(1^o\text{C}\, ppmv^{-1})_{CO_2}}\right) = 0.33 \; to \; 0.82^o\text{C}\, ppmv \; {CH_4}^{-1}$$

This assumes linearization of results from global radiative steady state models. For the late Pleistocene (LP) extinction event, using values from Table 2, equation (4) and the 100-yr GWP, we estimate the temperature drop associated with the reduction in enteric emissions as:

(7) $$\Delta T = \; r\left(\frac{\Delta P}{P} x_{LP}\right) = 0.33^o\text{C}\, ppmv \; {CH_4}^{-1}\left(\frac{-69.6 \; Tg \; CH_4 yr^{-1}}{200 \; Tg \; CH_4 yr^{-1}}\right)(0.70 \; ppmv \; CH_4) = \; -0.08^o\text{C}$$

the 20 yr-based GWP yields:

(8) $$\Delta T = r\left(\frac{\Delta P}{P} x_{LP}\right) = 0.0.82^{o}\text{C}\, ppmv\, {CH_4}^{-1}\left(\frac{-69.6\, Tg\, CH_4 yr^{-1}}{200\, Tg\, CH_4 yr^{-1}}\right)(0.70\, ppmv\, CH_4) = -0.20^{o}\text{C}$$

These estimates of temperature decrease are global; regional values may have been considerably higher, particularly in northern latitudes (S37).

We recognize that our computation is overly simplistic in several major ways. Generally speaking, the balance of energy in the climate system is expressed as:

(9) $$\left(\frac{1}{4}\right) S(1-\propto) = G\sigma T^4$$

where the one quarter derives from the surface to cross section ratio of the planet, S is the solar constant input from space (taken as 1350 Wm^{-2}), α is the average albedo of the surface, T represents global average surface temperature (K), and G is a grey body term, which adjusts the overall outgoing Planckian behavior of the planetary surface for atmospheric absorption plus re-radiation (related to emissivity; S32). The albedo can be thought of as a fixed description of ice, low cloud and land reflectivity. The grey term summarizes infrared trapping including high clouds by gathering all greenhouse effects together. The ratio of methane heat trapping to that of carbon dioxide will depend somewhat on the average CO_2 level, since this defines infrared band saturation. Our computations assume linearity and ignore important teleconnections and feedbacks in the Earth climate system.

Many feedbacks are indirectly associated with the megafauna extinction. For example, the decline of mammoths in northern latitudes at around 15 ka, appears to have led to a major shift in vegetation and a corresponding change of surface albedo, which may have reduced global climate by 0.2°C and regionally by up to 1°C (S37). But this study may have been conservative because it focused on the influence of a single species (mammoth) in a particular biome. Land surfaces cover half the Northern Hemisphere, which in turn constitutes half the area of the globe. If the extinction of megafauna led to more widespread vegetation shifts as is likely (S38), albedo may have been altered even more. Thus, we underscore that the radiation effects of the reduction in enteric emissions are not the only means, and perhaps not the major means, by which megafauna likely influence(d) climate. Further, the loss of large megaherbivores may have had transformative effects on fire, which also may have contributed to climate shifts (S38). Clearly, this is an area that would benefit from more investigation.

Table S1. Information about species used in analysis. These values are before adjustment for degree of habitat loss (urbanization; see methods in text). List of species and continent extracted from MOM v4.0 (S2), digestion type (foregut FG or hindgut HG) with reference, body mass (S2), species-specific per capita methane production is based on equations presented in text (S3), animal density is original equation from Damuth (S4), geographic range is from Smith et al. (S5), methane production per year and susceptibility to rinderpest from (S6, S7). Species in black text are extant, those in blue text are extinct, species in green are historic extinctions during the 1800s and species in red are introduced populations starting around 1875. Macropodidae produce much less methane for their size given their digestive microfauna; their methane outputs were reduced by 70% (S8, S9). *Bison bison* have two sets of values; those estimated from our allometric scaling approach (see below) and those population estimates directly observed during their eradication (S1) (Table S2). Rinderpest susceptibility was taken from (S8) and updated with (S9) for *Gazella thomsonii, Tragelaphus angasii*, *Tragelaphus buxtoni*, *and Giraffa camelopardalis*. For species not directly listed in (S8), we assign the lowest susceptibility within the genus and or family. Domestic animal masses are taken from the University of Michigan's Museum of Zoology (S10); rinderpest susceptibilities are from the World Organization for Animal Health (S11). We used the proportion of world domestic animals found in Africa from 1961-1981 to generate estimates for the numbers of individuals in Africa from our hind-casted domestic estimates for the epidemic. For the late Pleistocene, we also used an upper quantile regression on Damuth's data (S4) to provide a 'correction' for human impacts on animal densities (see main text for equations). While this relationship still includes post-human effects, it gives more weight to those ecosystems with higher densities, and presumably lower anthropogenic impacts. Here, we report estimates based on the original equation, which was used for all time periods but the LP.

Area	Order Family Genus Species	Digestion type and citation	Mean log Body Mass (kg)	per Capita Methane ($kgCH_4$ $N^{-1}yr^{-1}$)	Density ($N.km^{-2}$)	Range (km^2)	Methane Emission per year ($TgCh4yr^{-1}$)	Rinderpest suscept. (v)
AF	*Artiodactyla Bovidae Addax nasomaculatus*	FG S12	1.85	9.36	3.95	2.49E+06	0.09	0.25
AF	*Artiodactyla Bovidae Aepyceros melampus*	FG S12	1.72	6.92	4.90	2.35E+06	0.08	0.5
AF	*Artiodactyla Bovidae Alcelaphus buselaphus*	FG S12	2.23	24.42	2.02	3.01E+06	0.15	0.25
AF	*Artiodactyla Bovidae Ammodorcas clarkei*	FG S13	1.45	3.64	7.84	2.06E+06	0.06	0.25

AF	*Artiodactyla Bovidae Ammotragus lervia*	FG S13	1.68	6.31	5.24	2.30E+06	0.08	0.05
AF	*Artiodactyla Bovidae Antidorcas marsupialis*	FG S12	1.50	4.09	7.18	2.11E+06	0.06	0.5
AF	*Artiodactyla Bovidae Bos taurus*	FG S12	2.95	156.40	0.58	4.26E+06	0.39	0.95
AF	*Artiodactyla Bovidae Capra ibex*	FG S12	2.00	13.83	3.00	2.69E+06	0.11	0.05
AF	*Artiodactyla Bovidae Capra nubiana*	FG S13	1.90	10.64	3.60	2.56E+06	0.10	0.05
AF	*Artiodactyla Bovidae Capra walie*	FG S13	2.00	13.68	3.02	2.69E+06	0.11	0.05
AF	*Artiodactyla Bovidae Cephalophus adersi*	FG S13	0.97	1.22	18.01	1.63E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus callipygus*	FG S13	1.26	2.36	10.82	1.88E+06	0.05	0.25
AF	*Artiodactyla Bovidae Cephalophus dorsalis*	FG S13	1.30	2.59	10.10	1.92E+06	0.05	0.25
AF	*Artiodactyla Bovidae Cephalophus harveyi*	FG S13	1.16	1.89	12.85	1.79E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus jentinki*	FG S13	1.85	9.36	3.95	2.49E+06	0.09	0.25
AF	*Artiodactyla Bovidae Cephalophus leucogaster*	FG S13	1.10	1.66	14.20	1.74E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus maxwellii*	FG S13	1.08	1.57	14.81	1.72E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus monticola*	FG S12	0.80	0.85	24.16	1.50E+06	0.03	0.25
AF	*Artiodactyla Bovidae Cephalophus natalensis*	FG S12	1.08	1.57	14.81	1.72E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus niger*	FG S13	1.31	2.64	9.95	1.92E+06	0.05	0.25
AF	*Artiodactyla Bovidae Cephalophus nigrifrons*	FG S13	1.14	1.81	13.27	1.77E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus ogilbyi*	FG S13	1.30	2.59	10.10	1.92E+06	0.05	0.25
AF	*Artiodactyla Bovidae Cephalophus rubidus*	FG S13	1.18	1.95	12.53	1.80E+06	0.04	0.25

AF	*Artiodactyla Bovidae Cephalophus rufilatus*	FG S13	1.08	1.57	14.81	1.72E+06	0.04	0.25
AF	*Artiodactyla Bovidae Cephalophus silvicultor*	FG S13	1.86	9.72	3.84	2.51E+06	0.09	0.25
AF	*Artiodactyla Bovidae Cephalophus spadix*	FG S13	1.75	7.41	4.67	2.38E+06	0.08	0.25
AF	*Artiodactyla Bovidae Cephalophus weynsi*	FG S13	1.23	2.20	11.41	1.85E+06	0.05	0.25
AF	*Artiodactyla Bovidae Cephalophus zebra*	FG S13	1.24	2.27	11.16	1.86E+06	0.05	0.25
AF	*Artiodactyla Bovidae Connochaetes gnou*	FG S12	2.26	25.83	1.94	3.04E+06	0.15	0.95
AF	*Artiodactyla Bovidae Connochaetes taurinus*	FG S13	2.26	25.83	1.94	3.04E+06	0.15	0.95
AF	*Artiodactyla Bovidae Damaliscus hunteri*	FG S13	1.90	10.78	3.57	2.56E+06	0.10	0.5
AF	*Artiodactyla Bovidae Damaliscus lunatus*	FG S13	2.13	19.04	2.40	2.86E+06	0.13	0.5
AF	*Artiodactyla Bovidae Damaliscus pygargus*	FG S12	2.01	13.97	2.98	2.70E+06	0.11	0.5
AF	*Artiodactyla Bovidae Dorcatragus megalotis*	FG S12	1.01	1.35	16.67	1.66E+06	0.04	0.25
AF	*Artiodactyla Bovidae Gazella cuvieri*	FG S13	1.40	3.24	8.54	2.01E+06	0.06	0.25
AF	*Artiodactyla Bovidae Gazella dama*	FG S12	1.86	9.79	3.82	2.51E+06	0.09	0.25
AF	*Artiodactyla Bovidae Gazella dorcas*	FG S12	1.36	2.98	9.09	1.97E+06	0.05	0.25
AF	*Artiodactyla Bovidae Gazella gazella*	FG S13	1.35	2.91	9.24	1.96E+06	0.05	0.25
AF	*Artiodactyla Bovidae Gazella granti*	FG S13	1.74	7.27	4.73	2.37E+06	0.08	0.25
AF	*Artiodactyla Bovidae Gazella leptoceros*	FG S13	1.35	2.87	9.34	1.96E+06	0.05	0.25
AF	*Artiodactyla Bovidae Gazella rufifrons*	FG S13	1.43	3.50	8.06	2.04E+06	0.06	0.25
AF	*Artiodactyla Bovidae Gazella soemmerringii*	FG S13	1.60	5.22	6.00	2.22E+06	0.07	0.25
AF	*Artiodactyla Bovidae Gazella spekei*	FG S13	1.30	2.59	10.10	1.92E+06	0.05	0.25
AF	*Artiodactyla Bovidae Gazella thomsonii*	FG S13	1.31	2.65	9.91	1.93E+06	0.05	0.75
AF	*Artiodactyla Bovidae Hippotragus equinus*	FG S12	2.43	40.33	1.43	3.31E+06	0.19	0.5

AF	*Artiodactyla Bovidae Hippotragus niger*	FG S12	2.36	33.39	1.63	3.19E+06	0.17	0.5
AF	*Artiodactyla Bovidae Kobus ellipsiprymnus*	FG S12	2.32	30.58	1.73	3.14E+06	0.17	0.5
AF	*Artiodactyla Bovidae Kobus kob*	FG S13	1.89	10.57	3.62	2.55E+06	0.10	0.75
AF	*Artiodactyla Bovidae Kobus leche*	FG S12	2.04	15.26	2.80	2.74E+06	0.12	0.5
AF	*Artiodactyla Bovidae Kobus megaceros*	FG S13	1.94	11.86	3.34	2.61E+06	0.10	0.5
AF	*Artiodactyla Bovidae Kobus vardonii*	FG S13	1.85	9.58	3.88	2.50E+06	0.09	0.5
AF	*Artiodactyla Bovidae Litocranius walleri*	FG S12	1.58	4.95	6.24	2.19E+06	0.07	0.05
AF	*Artiodactyla Bovidae Madoqua guentheri*	FG S13	0.88	1.01	21.07	1.56E+06	0.03	0.25
AF	*Artiodactyla Bovidae Madoqua kirkii*	FG S12	0.72	0.73	27.34	1.45E+06	0.03	0.25
AF	*Artiodactyla Bovidae Neotragus moschatus*	FG S13	0.81	0.88	23.46	1.51E+06	0.03	0.25
AF	*Artiodactyla Bovidae Oreotragus oreotragus*	FG S12	1.11	1.70	13.95	1.75E+06	0.04	0.25
AF	*Artiodactyla Bovidae Oryx dammah*	FG S12	2.30	28.98	1.80	3.11E+06	0.16	0.25
AF	*Artiodactyla Bovidae Oryx gazella*	FG S12	2.23	24.11	2.04	3.00E+06	0.15	0.5
AF	*Artiodactyla Bovidae Ourebia ourebi*	FG S13	1.24	2.24	11.28	1.86E+06	0.05	0.5
AF	*Artiodactyla Bovidae Pelea capreolus*	FG S13	1.30	2.59	10.10	1.92E+06	0.05	0.5
AF	*Artiodactyla Bovidae Raphicerus campestris*	FG S13	1.02	1.38	16.37	1.67E+06	0.04	0.25
AF	*Artiodactyla Bovidae Raphicerus melanotis*	FG S13	1.01	1.35	16.67	1.66E+06	0.04	0.25
AF	*Artiodactyla Bovidae Raphicerus sharpei*	FG S13	0.98	1.26	17.65	1.64E+06	0.04	0.25
AF	*Artiodactyla Bovidae Redunca arundinum*	FG S13	1.76	7.68	4.54	2.40E+06	0.08	0.5
AF	*Artiodactyla Bovidae Redunca fulvorufula*	FG S13	1.47	3.83	7.54	2.08E+06	0.06	0.5
AF	*Artiodactyla Bovidae Redunca redunca*	FG S12	1.64	5.77	5.59	2.26E+06	0.07	0.5
AF	*Artiodactyla Bovidae Sigmoceros lichtensteinii*	FG S13	2.23	24.50	2.02	3.01E+06	0.15	0.75
AF	*Artiodactyla Bovidae Sylvicapra grimmia*	FG S13	1.29	2.52	10.29	1.91E+06	0.05	0.25
AF	*Artiodactyla Bovidae Syncerus caffer*	FG S12	2.76	94.89	0.81	3.88E+06	0.30	0.95

AF	*Artiodactyla Bovidae Taurotragus derbianus*	FG S13	2.83	113.63	0.72	4.02E+06	0.33	0.95
AF	*Artiodactyla Bovidae Taurotragus oryx*	FG S13	2.76	93.04	0.82	3.87E+06	0.29	0.95
AF	*Artiodactyla Bovidae Tragelaphus angasii*	FG S12	1.94	11.73	3.36	2.61E+06	0.10	0.95
AF	*Artiodactyla Bovidae Tragelaphus buxtoni*	FG S13	2.33	31.38	1.70	3.15E+06	0.17	0.95
AF	*Artiodactyla Bovidae Tragelaphus eurycerus*	FG S12	2.52	50.23	1.24	3.45E+06	0.21	0.75
AF	*Artiodactyla Bovidae Tragelaphus imberbis*	FG S12	1.91	11.01	3.52	2.57E+06	0.10	0.95
AF	*Artiodactyla Bovidae Tragelaphus scriptus*	FG S13	1.64	5.66	5.66	2.25E+06	0.07	0.75
AF	*Artiodactyla Bovidae Tragelaphus spekii*	FG S12	1.89	10.50	3.64	2.55E+06	0.10	0.75
AF	*Artiodactyla Bovidae Tragelaphus strepsiceros*	FG S12	2.33	31.14	1.71	3.15E+06	0.17	0.95
AF	*Artiodactyla Cervidae Cervus elaphus*	FG S12	2.19	22.14	2.16	2.95E+06	0.14	0
AF	*Artiodactyla Giraffidae Giraffa camelopardalis*	FG S12	2.95	156.40	0.58	4.26E+06	0.39	0.95
AF	*Artiodactyla Giraffidae Okapia johnstoni*	FG S12	2.36	33.79	1.62	3.20E+06	0.17	0.95
AF	*Artiodactyla Hippopotamidae Hexaprotodon liberiensis*	FG S12	2.37	34.60	1.59	3.21E+06	0.18	0.05
AF	*Artiodactyla Hippopotamidae Hippopotamus amphibius*	FG S12	3.15	263.74	0.41	4.69E+06	0.51	0.05
AF	*Artiodactyla Suidae Hylochoerus meinertzhageni*	FG S14	2.28	27.16	1.88	3.07E+06	0.16	0.75
AF	*Artiodactyla Suidae Phacochoerus aethiopicus*	HG S12	1.85	1.43	3.90	2.50E+06	0.01	0.95
AF	*Artiodactyla Suidae Phacochoerus africanus*	HG S15	1.92	1.80	3.49	2.58E+06	0.02	0.95
AF	*Artiodactyla Suidae Potamochoerus larvatus*	FG S14	1.99	13.31	3.08	2.67E+06	0.11	0.75
AF	*Artiodactyla Suidae Potamochoerus porcus*	FG S14	1.85	9.36	3.95	2.49E+06	0.09	0.75

AF	*Artiodactyla Tragulidae Hyemoschus aquaticus*	FG S14	1.04	1.43	15.97	1.68E+06	0.04	0.05
AF	*Perissodactyla Equidae Equus asinus*	HG S12	2.22	4.89	2.07	2.98E+06	0.03	0
AF	*Perissodactyla Equidae Equus burchellii*	HG S12	2.44	9.92	1.41	3.32E+06	0.05	0
AF	*Perissodactyla Equidae Equus caballus*	HG S5	2.40	8.68	1.52	3.26E+06	0.04	0
AF	*Perissodactyla Equidae Equus grevyi*	HG S12	2.61	16.68	1.05	3.61E+06	0.06	0
AF	*Perissodactyla Equidae Equus zebra*	HG S13	2.46	10.46	1.37	3.35E+06	0.05	0
AF	*Perissodactyla Rhinocerotidae Ceratotherium simum*	HG S12	3.47	192.37	0.24	5.47E+06	0.25	0
AF	*Perissodactyla Rhinocerotidae Diceros bicornis*	HG S12	3.07	64.23	0.47	4.51E+06	0.14	0
AF	*Proboscidea Elephantidae Loxodonta africana*	HG S12	3.60	269.12	0.19	5.81E+06	0.30	0
AF	*Rodentia Hystricidae Hystrix africaeaustralis*	HG S12	1.17	0.11	12.57	1.80E+06	0.00	0
AF	*Rodentia Hystricidae Hystrix cristata*	HG S12	1.30	0.18	10.10	1.92E+06	0.00	0
AUS	*Diprotodontia Macropodidae Dendrolagus bennettianus*	FG S14	1.04	1.44	15.86	1.69E+06	0.04	0
AUS	*Diprotodontia Macropodidae Dendrolagus lumholtzi*	FG S14	0.83	0.91	22.80	1.52E+06	0.03	0
AUS	*Diprotodontia Macropodidae Macropus agilis*	FG S12	1.18	1.95	12.53	1.80E+06	0.04	0
AUS	*Diprotodontia Macropodidae Macropus antilopinus*	FG S14	1.44	3.53	8.01	2.04E+06	0.06	0
AUS	*Diprotodontia Macropodidae Macropus bernardus*	FG S14	1.23	2.20	11.41	1.85E+06	0.05	0
AUS	*Diprotodontia Macropodidae Macropus dorsalis*	FG S14	1.05	1.48	15.55	1.70E+06	0.04	0
AUS	*Diprotodontia Macropodidae Macropus eugenii*	FG S14	0.81	0.88	23.46	1.51E+06	0.03	0
AUS	*Diprotodontia Macropodidae Macropus fuliginosus*	FG S12	1.34	2.85	9.40	1.95E+06	0.05	0

AUS	*Diprotodontia Macropodidae Macropus giganteus*	FG S12	1.41	3.35	8.32	2.02E+06	0.06	0
AUS	*Diprotodontia Macropodidae Macropus irma*	FG S14	0.90	1.07	20.08	1.58E+06	0.03	0
AUS	*Diprotodontia Macropodidae Macropus parryi*	FG S14	1.13	1.76	13.56	1.76E+06	0.04	0
AUS	*Diprotodontia Macropodidae Macropus robustus*	FG S14	1.33	2.75	9.64	1.94E+06	0.05	0
AUS	*Diprotodontia Macropodidae Macropus rufogriseus*	FG S12	1.23	2.19	11.48	1.85E+06	0.05	0
AUS	*Diprotodontia Macropodidae Macropus rufus*	FG S12	1.67	6.07	5.38	2.28E+06	0.07	0
AUS	*Diprotodontia Macropodidae Onychogalea fraenata*	FG S14	0.74	0.76	26.59	1.46E+06	0.03	0
AUS	*Diprotodontia Macropodidae Onychogalea unguifera*	FG S14	0.82	0.90	23.06	1.52E+06	0.03	0
AUS	*Diprotodontia Macropodidae Petrogale penicillata*	FG S14	0.85	0.96	21.96	1.54E+06	0.03	0
AUS	*Diprotodontia Macropodidae Petrogale persephone*	FG S14	0.79	0.84	24.31	1.50E+06	0.03	0
AUS	*Diprotodontia Macropodidae Petrogale xanthopus*	FG S14	0.93	1.13	19.18	1.60E+06	0.03	0
AUS	*Diprotodontia Macropodidae Thylogale billardierii*	FG S14	0.74	0.75	26.77	1.46E+06	0.03	0
AUS	*Diprotodontia Macropodidae Thylogale thetis*	FG S14	0.73	0.75	26.96	1.45E+06	0.03	0
AUS	*Diprotodontia Macropodidae Wallabia bicolor*	FG S14	1.18	1.95	12.53	1.80E+06	0.04	0
AUS	*Diprotodontia Phalangeridae Spilocuscus maculatus*	HG S14	0.81	0.02	23.73	1.51E+06	0.00	0
AUS	*Diprotodontia Phascolarctidae Phascolarctos cinereus*	HG S12	1.01	0.05	16.67	1.66E+06	0.00	0

AUS	*Diprotodontia Vombatidae Lasiorhinus latifrons*	HG S14	1.41	0.28	8.42	2.02E+06	0.00	0
AUS	*Diprotodontia Vombatidae Vombatus ursinus*	HG S12	1.41	0.29	8.29	2.02E+06	0.00	0
EA	*Artiodactyla Bovidae Antilope cervicapra*	FG S12	1.57	4.89	6.30	2.19E+06	0.07	0
EA	*Artiodactyla Bovidae Bison bonasus*	FG S12	2.70	80.25	0.90	3.77E+06	0.27	0
EA	*Artiodactyla Bovidae Bos frontalis*	FG S12	2.90	136.72	0.63	4.16E+06	0.36	0
EA	*Artiodactyla Bovidae Bos grunniens*	FG S5	2.52	50.91	1.23	3.46E+06	0.22	0
EA	*Artiodactyla Bovidae Bos javanicus*	FG S12	2.85	117.44	0.70	4.04E+06	0.33	0
EA	*Artiodactyla Bovidae Bos sauveli*	FG S13	2.90	136.72	0.63	4.16E+06	0.36	0
EA	*Artiodactyla Bovidae Bos taurus*	FG S12	2.95	156.40	0.58	4.26E+06	0.39	0
EA	*Artiodactyla Bovidae Boselaphus tragocamelus*	FG S12	2.23	24.11	2.04	3.00E+06	0.15	0
EA	*Artiodactyla Bovidae Bubalus bubalis*	FG S13	1.57	4.89	6.30	2.19E+06	0.07	0
EA	*Artiodactyla Bovidae Budorcas taxicolor*	FG S12	2.48	45.67	1.32	3.39E+06	0.20	0
EA	*Artiodactyla Bovidae Capra caucasica*	FG S13	1.74	7.27	4.73	2.37E+06	0.08	0
EA	*Artiodactyla Bovidae Capra cylindricornis*	FG S13	1.70	6.58	5.08	2.32E+06	0.08	0
EA	*Artiodactyla Bovidae Capra falconeri*	FG S12	1.61	5.36	5.89	2.23E+06	0.07	0
EA	*Artiodactyla Bovidae Capra hircus*	FG S12	1.88	10.07	3.75	2.53E+06	0.10	0
EA	*Artiodactyla Bovidae Capra ibex*	FG S12	1.84	9.27	3.97	2.49E+06	0.09	0
EA	*Artiodactyla Bovidae Capra nubiana*	FG S13	1.67	6.07	5.38	2.28E+06	0.07	0
EA	*Artiodactyla Bovidae Capra pyrenaica*	FG S13	1.70	6.58	5.08	2.32E+06	0.08	0
EA	*Artiodactyla Bovidae Capra sibirica*	FG S13	2.11	18.14	2.48	2.84E+06	0.13	0
EA	*Artiodactyla Bovidae Gazella bennettii*	FG S13	1.28	2.45	10.53	1.89E+06	0.05	0
EA	*Artiodactyla Bovidae Gazella dorcas*	FG S12	1.36	2.98	9.09	1.97E+06	0.05	0
EA	*Artiodactyla Bovidae Gazella gazella*	FG S13	1.36	2.98	9.09	1.97E+06	0.05	0
EA	*Artiodactyla Bovidae Gazella saudiya*	FG S13	1.20	2.08	11.94	1.83E+06	0.05	0
EA	*Artiodactyla Bovidae Gazella subgutturosa*	FG S12	1.45	3.69	7.74	2.06E+06	0.06	0

EA	*Artiodactyla Bovidae Hemitragus hylocrius*	FG S13	1.88	10.07	3.75	2.53E+06	0.10	0
EA	*Artiodactyla Bovidae Hemitragus jayakari*	FG S13	1.36	2.98	9.09	1.97E+06	0.05	0
EA	*Artiodactyla Bovidae Hemitragus jemlahicus*	FG S13	1.55	4.58	6.61	2.16E+06	0.07	0
EA	*Artiodactyla Bovidae Naemorhedus baileyi*	FG S13	1.44	3.56	7.96	2.05E+06	0.06	0
EA	*Artiodactyla Bovidae Naemorhedus caudatus*	FG S13	1.43	3.50	8.06	2.04E+06	0.06	0
EA	*Artiodactyla Bovidae Naemorhedus goral*	FG S12	1.45	3.69	7.74	2.06E+06	0.06	0
EA	*Artiodactyla Bovidae Naemorhedus sumatraensis*	FG S13	1.94	11.86	3.34	2.61E+06	0.10	0
EA	*Artiodactyla Bovidae Oryx dammah*	FG S12	2.30	28.98	1.80	3.11E+06	0.16	0
EA	*Artiodactyla Bovidae Oryx leucoryx*	FG S13	1.94	11.89	3.33	2.61E+06	0.10	0
EA	*Artiodactyla Bovidae Ovibos moschatus*	FG S5	2.49	47.43	1.28	3.41E+06	0.21	0
EA	*Artiodactyla Bovidae Ovis ammon*	FG S12	2.26	25.83	1.94	3.04E+06	0.15	0
EA	*Artiodactyla Bovidae Ovis aries*	FG S12	1.70	6.58	5.08	2.32E+06	0.08	0
EA	*Artiodactyla Bovidae Ovis nivicola*	FG S13	1.95	12.22	3.27	2.63E+06	0.10	0
EA	*Artiodactyla Bovidae Ovis vignei*	FG S13	1.78	7.96	4.43	2.41E+06	0.09	0
EA	*Artiodactyla Bovidae Pantholops hodgsonii*	FG S13	1.44	3.56	7.95	2.05E+06	0.06	0
EA	*Artiodactyla Bovidae Procapra gutturosa*	FG S13	1.44	3.60	7.90	2.05E+06	0.06	0
EA	*Artiodactyla Bovidae Procapra picticaudata*	FG S13	1.30	2.59	10.10	1.92E+06	0.05	0
EA	*Artiodactyla Bovidae Procapra przewalskii*	FG S13	1.44	3.56	7.95	2.05E+06	0.06	0
EA	*Artiodactyla Bovidae Pseudois nayaur*	FG S12	1.65	5.90	5.50	2.27E+06	0.07	0
EA	*Artiodactyla Bovidae Pseudois schaeferi*	FG S13	1.47	3.79	7.59	2.07E+06	0.06	0
EA	*Artiodactyla Bovidae Rupicapra pyrenaica*	FG S13	1.48	3.89	7.45	2.09E+06	0.06	0

EA	*Artiodactyla Bovidae Rupicapra rupicapra*	FG S12	1.42	3.38	8.27	2.03E+06	0.06	0
EA	*Artiodactyla Bovidae Saiga tatarica*	FG S12	1.46	3.76	7.64	2.07E+06	0.06	0
EA	*Artiodactyla Bovidae Tetracerus quadricornis*	FG S13	1.28	2.46	10.49	1.89E+06	0.05	0
EA	*Artiodactyla Camelidae Camelus bactrianus*	FG S14	2.84	115.53	0.71	4.03E+06	0.33	0
EA	*Artiodactyla Camelidae Camelus dromedarius*	FG S12	2.60	62.82	1.06	3.60E+06	0.24	0
EA	*Artiodactyla Cervidae Alces alces*	FG S12	2.55	54.67	1.17	3.50E+06	0.22	0
EA	*Artiodactyla Cervidae Axis axis*	FG S12	1.85	9.36	3.95	2.49E+06	0.09	0
EA	*Artiodactyla Cervidae Axis porcinus*	FG S13	1.54	4.55	6.64	2.15E+06	0.07	0
EA	*Artiodactyla Cervidae Capreolus capreolus*	FG S12	1.35	2.91	9.24	1.96E+06	0.05	0
EA	*Artiodactyla Cervidae Capreolus pygargus*	FG S13	1.64	5.73	5.61	2.26E+06	0.07	0
EA	*Artiodactyla Cervidae Cervus albirostris*	FG S12	2.10	17.39	2.55	2.81E+06	0.12	0
EA	*Artiodactyla Cervidae Cervus duvaucelii*	FG S13	2.16	20.11	2.31	2.89E+06	0.13	0
EA	*Artiodactyla Cervidae Cervus elaphus*	FG S12	2.22	23.73	2.06	2.99E+06	0.15	0
EA	*Artiodactyla Cervidae Cervus eldii*	FG S12	1.86	9.79	3.82	2.51E+06	0.09	0
EA	*Artiodactyla Cervidae Cervus nippon*	FG S12	1.72	6.99	4.86	2.35E+06	0.08	0
EA	*Artiodactyla Cervidae Cervus unicolor*	FG S12	2.33	30.84	1.72	3.14E+06	0.17	0
EA	*Artiodactyla Cervidae Dama dama*	FG S12	1.75	7.44	4.65	2.38E+06	0.08	0
EA	*Artiodactyla Cervidae Dama mesopotamica*	FG S13	1.86	9.72	3.84	2.51E+06	0.09	0
EA	*Artiodactyla Cervidae Elaphodus cephalophus*	FG S12	1.53	4.35	6.86	2.13E+06	0.06	0
EA	*Artiodactyla Cervidae Elaphurus davidianus*	FG S13	2.17	21.02	2.24	2.92E+06	0.14	0
EA	*Artiodactyla Cervidae Hydropotes inermis*	FG S13	1.15	1.82	13.19	1.78E+06	0.04	0

EA	*Artiodactyla Cervidae Muntiacus crinifrons*	FG S13	1.56	4.71	6.48	2.17E+06	0.07	0
EA	*Artiodactyla Cervidae Muntiacus feae*	FG S13	1.34	2.85	9.40	1.95E+06	0.05	0
EA	*Artiodactyla Cervidae Muntiacus gongshanensis*	FG S13	1.30	2.58	10.13	1.91E+06	0.05	0
EA	*Artiodactyla Cervidae Muntiacus muntjak*	FG S12	1.15	1.82	13.19	1.78E+06	0.04	0
EA	*Artiodactyla Cervidae Muntiacus reevesi*	FG S12	1.13	1.76	13.56	1.76E+06	0.04	0
EA	*Artiodactyla Moschidae Moschus berezovskii*	FG S14	0.95	1.19	18.38	1.62E+06	0.04	0
EA	*Artiodactyla Moschidae Moschus chrysogaster*	FG S14	1.16	1.89	12.85	1.79E+06	0.04	0
EA	*Artiodactyla Moschidae Moschus moschiferus*	FG S14	1.11	1.70	13.95	1.75E+06	0.04	0
EA	*Artiodactyla Suidae Sus barbatus*	FG S14	1.99	13.19	3.10	2.67E+06	0.11	0
EA	*Artiodactyla Suidae Sus salvanius*	FG S14	0.89	1.03	20.62	1.57E+06	0.03	0
EA	*Artiodactyla Suidae Sus scrofa*	FG S14	2.07	16.23	2.68	2.78E+06	0.12	0
EA	*Artiodactyla Tragulidae Tragulus napu*	FG S14	0.77	0.81	25.23	1.48E+06	0.03	0
EA	*Perissodactyla Equidae Equus hemionus*	HG S5	2.36	7.74	1.62	3.20E+06	0.04	0
EA	*Perissodactyla Equidae Equus kiang*	HG S12	2.44	9.87	1.41	3.32E+06	0.05	0
EA	*Perissodactyla Equidae Equus onager*	HG S12	2.36	7.74	1.62	3.20E+06	0.04	0
EA	*Perissodactyla Rhinocerotidae Dicerorhinus sumatrensis*	HG S14	3.10	70.03	0.45	4.58E+06	0.14	0
EA	*Perissodactyla Rhinocerotidae Rhinoceros sondaicus*	HG S13	3.24	103.62	0.35	4.90E+06	0.18	0
EA	*Perissodactyla Rhinocerotidae Rhinoceros unicornis*	HG S12	3.20	93.18	0.38	4.81E+06	0.17	0
EA	*Perissodactyla Tapiridae Tapirus indicus*	HG S12	2.47	10.91	1.34	3.37E+06	0.05	0
EA	*Proboscidea Elephantidae Elephas maximus*	HG S12	3.43	174.92	0.25	5.37E+06	0.24	0
EA	*Rodentia Castoridae Castor fiber*	HG S17	1.28	0.17	10.49	1.89E+06	0.00	0

EA	*Rodentia Hystricidae Hystrix brachyura*	HG Assumed from genus	0.90	0.03	20.08	1.58E+06	0.00	0
EA	*Rodentia Hystricidae Hystrix cristata*	HG S12	1.10	0.08	14.37	1.74E+06	0.00	0
EA	*Rodentia Hystricidae Hystrix indica*	HG S12	1.17	0.11	12.75	1.79E+06	0.00	0
EA	*Rodentia Sciuridae Marmota baibacina*	HG S18	0.88	0.03	21.07	1.56E+06	0.00	0
EA	*Rodentia Sciuridae Marmota bobak*	HG S18	0.74	0.02	26.59	1.46E+06	0.00	0
EA	*Rodentia Sciuridae Marmota himalayana*	HG S18	0.70	0.01	28.56	1.43E+06	0.00	0
EA	*Rodentia Sciuridae Marmota sibirica*	HG S18	0.90	0.03	20.08	1.58E+06	0.00	0
NA	*Artiodactyla Antilocapridae Antilocapra americana*	FG S12	1.66	6.05	5.40	2.28E+06	0.07	0
NA	*Artiodactyla Bovidae Bison bison (allometric)*	FG S12	2.76	94.75	0.81	3.88E+06	0.30	0
	Artiodactyla Bovidae Bison bison (direct estimate Table S2)		2.76				1.95	0
NA	*Artiodactyla Bovidae Oreamnos americanus*	FG S12	1.86	9.72	3.84	2.51E+06	0.09	0
NA	*Artiodactyla Bovidae Ovibos moschatus*	FG S5	2.57	56.99	1.14	3.53E+06	0.23	0
NA	*Artiodactyla Bovidae Ovis canadensis*	FG S13	1.87	10.02	3.76	2.53E+06	0.10	0
NA	*Artiodactyla Bovidae Ovis dalli*	FG S13	1.75	7.36	4.69	2.37E+06	0.08	0
NA	*Artiodactyla Cervidae Alces alces*	FG S12	2.56	55.35	1.16	3.51E+06	0.23	0
NA	*Artiodactyla Cervidae Cervus elaphus*	FG S12	2.34	31.82	1.68	3.16E+06	0.17	0
NA	*Artiodactyla Cervidae Mazama americana*	FG S13	1.36	2.95	9.15	1.97E+06	0.05	0
NA	*Artiodactyla Cervidae Odocoileus hemionus*	FG S12	1.73	7.16	4.78	2.36E+06	0.08	0
NA	*Artiodactyla Cervidae Odocoileus virginianus*	FG S12	1.74	7.34	4.70	2.37E+06	0.08	0
NA	*Artiodactyla Cervidae Rangifer tarandus*	FG S12	1.93	11.65	3.38	2.60E+06	0.10	0
NA	*Artiodactyla Tayassuidae Pecari tajacu*	FG S14	1.33	2.75	9.64	1.94E+06	0.05	0
NA	*Artiodactyla Tayassuidae Tayassu pecari*	FG S14	1.51	4.19	7.06	2.12E+06	0.06	0

NA	*Perissodactyla Tapiridae Tapirus bairdii*	HG S14	2.48	11.10	1.32	3.38E+06	0.05	0
NA	*Rodentia Agoutidae Agouti paca*	HG S19	0.90	0.03	20.08	1.58E+06	0.00	0
NA	*Rodentia Castoridae Castor canadensis*	HG S17	1.34	0.21	9.46	1.95E+06	0.00	0
NA	*Rodentia Dasyproctidae Dasyprocta mexicana*	HG S19	0.70	0.01	28.56	1.43E+06	0.00	0
NA	*Rodentia Erethizontidae Erethizon dorsatum*	HG S16	0.85	0.03	21.99	1.54E+06	0.00	0
NA	*Rodentia Sciuridae Marmota caligata*	HG S18	0.86	0.03	21.66	1.55E+06	0.00	0
NA	*Rodentia Sciuridae Marmota olympus*	HG S18	0.80	0.02	24.02	1.50E+06	0.00	0
NA	*Rodentia Sciuridae Marmota vancouverensis*	HG S18	0.80	0.02	24.02	1.50E+06	0.00	0
NA	*Xenarthra Megalonychidae Choloepus hoffmanni*	FG S14	0.78	0.82	24.91	1.49E+06	0.03	0
SA	*Artiodactyla Camelidae Lama glama*	FG S12	2.15	20.03	2.32	2.89E+06	0.13	0
SA	*Artiodactyla Camelidae Lama guanicoe*	FG S12	2.08	16.64	2.63	2.79E+06	0.12	0
SA	*Artiodactyla Camelidae Lama pacos*	FG S12	1.78	7.96	4.43	2.41E+06	0.09	0
SA	*Artiodactyla Camelidae Vicugna vicugna*	FG S12	1.68	6.24	5.28	2.30E+06	0.08	0
SA	*Artiodactyla Cervidae Blastocerus dichotomus*	FG S12	1.94	11.74	3.36	2.61E+06	0.10	0
SA	*Artiodactyla Cervidae Hippocamelus antisensis*	FG S13	1.84	9.17	4.01	2.48E+06	0.09	0
SA	*Artiodactyla Cervidae Hippocamelus bisulcus*	FG S13	1.85	9.36	3.95	2.49E+06	0.09	0
SA	*Artiodactyla Cervidae Mazama americana*	FG S13	1.36	2.95	9.15	1.97E+06	0.05	0
SA	*Artiodactyla Cervidae Mazama bricenii*	FG S13	1.22	2.14	11.67	1.84E+06	0.05	0
SA	*Artiodactyla Cervidae Mazama chunyi*	FG S13	1.22	2.14	11.67	1.84E+06	0.05	0
SA	*Artiodactyla Cervidae Mazama gouazoupira*	FG S13	1.21	2.12	11.77	1.83E+06	0.05	0
SA	*Artiodactyla Cervidae Mazama nana*	FG S13	1.22	2.14	11.67	1.84E+06	0.05	0
SA	*Artiodactyla Cervidae Mazama rufina*	FG S13	1.41	3.37	8.29	2.02E+06	0.06	0

SA	*Artiodactyla Cervidae Odocoileus virginianus*	FG S12	1.74	7.34	4.70	2.37E+06	0.08	0
SA	*Artiodactyla Cervidae Ozotoceros bezoarticus*	FG S12	1.60	5.22	6.00	2.22E+06	0.07	0
SA	*Artiodactyla Cervidae Pudu mephistophiles*	FG S13	0.98	1.27	17.51	1.64E+06	0.04	0
SA	*Artiodactyla Cervidae Pudu puda*	FG S12	0.99	1.29	17.31	1.65E+06	0.04	0
SA	*Artiodactyla Tayassuidae Catagonus wagneri*	FG S14	1.55	4.63	6.56	2.16E+06	0.07	0
SA	*Artiodactyla Tayassuidae Pecari tajacu*	FG S14	1.33	2.75	9.64	1.94E+06	0.05	0
SA	*Artiodactyla Tayassuidae Tayassu pecari*	FG S14	1.51	4.19	7.06	2.12E+06	0.06	0
SA	*Perissodactyla Tapiridae Tapirus bairdii*	HG S14	2.48	11.10	1.32	3.38E+06	0.05	0
SA	*Perissodactyla Tapiridae Tapirus pinchaque*	HG S14	2.17	4.23	2.24	2.92E+06	0.03	0
SA	*Perissodactyla Tapiridae Tapirus terrestris*	HG S12	2.32	6.72	1.75	3.13E+06	0.04	0
SA	*Rodentia Agoutidae Agouti paca*	HG S19	0.90	0.03	20.08	1.58E+06	0.00	0
SA	*Rodentia Agoutidae Agouti taczanowskii*	HG S19	0.95	0.04	18.38	1.62E+06	0.00	0
SA	*Rodentia Caviidae Dolichotis patagonum*	HG S12	0.90	0.03	20.08	1.58E+06	0.00	0
SA	*Rodentia Dinomyidae Dinomys branickii*	HG assumed from order	1.10	0.08	14.37	1.74E+06	0.00	0
SA	*Rodentia Hydrochoeridae Hydrochaeris hydrochaeris*	HG S20	1.80	1.18	4.30	2.43E+06	0.01	0
SA	*Rodentia Myocastoridae Myocastor coypus*	HG S21	0.84	0.02	22.34	1.53E+06	0.00	0
SA	*Xenarthra Megalonychidae Choloepus didactylus*	FG S12	0.71	0.72	27.89	1.44E+06	0.03	0
AF	*Artiodactyla Bovidae Antidorcas australis*	FG S13	1.60	5.22	6.00	2.22E+06	0.07	0
AF	*Artiodactyla Bovidae Antidorcas bondi*	FG S13	1.53	4.42	6.78	2.14E+06	0.06	0
AF	*Artiodactyla Bovidae Gazella atlantica*	FG S13	1.65	5.83	5.54	2.27E+06	0.07	0

AF	*Artiodactyla Bovidae Megalotragus priscus*	FG	S13	2.30	28.98	1.80	3.11E+06	0.16	0
AF	*Artiodactyla Bovidae Pelorovis antiquus*	FG	S13	3.00	176.46	0.54	4.36E+06	0.41	0
AF	*Artiodactyla Camelidae Camelus thomasi*	FG	S14	2.70	80.25	0.90	3.77E+06	0.27	0
AF	*Artiodactyla Cervidae Megaloceros algericus*	FG	S13	2.90	136.72	0.63	4.16E+06	0.36	0
AF	*Artiodactyla Giraffidae Giraffa gracilis*	FG	S13	2.93	146.51	0.61	4.21E+06	0.37	0
AF	*Artiodactyla Suidae Metridiochoerus compactus*	FG	S14	2.15	19.96	2.32	2.89E+06	0.13	0
AF	*Perissodactyla Equidae Equus capensis*	HG	S13	2.54	13.63	1.18	3.49E+06	0.06	0
AF	*Perissodactyla Equidae Hipparion libycum*	HG	S13	2.18	4.27	2.23	2.92E+06	0.03	0
AF	*Perissodactyla Rhinocerotidae Stephanorhinus kirchbergensis*	HG	S14	3.30	121.58	0.32	5.04E+06	0.20	0
AF	*Proboscidea Elephantidae Elephas iolensis*	HG	S14	3.81	475.76	0.13	6.45E+06	0.40	0
AUS	*Diprotodontia Diprotodonidae Diprotodon minor*	HG	S22	2.95	45.91	0.58	4.26E+06	0.11	0
AUS	*Diprotodontia Diprotodonidae Diprotodon optatum*	HG	S22	3.18	86.03	0.40	4.74E+06	0.16	0
AUS	*Diprotodontia Diprotodonidae Euowenia grata*	HG	S22	2.88	36.52	0.67	4.10E+06	0.10	0
AUS	*Diprotodontia Diprotodonidae Euryzygoma dunese*	HG	S22	2.70	21.75	0.90	3.77E+06	0.07	0
AUS	*Diprotodontia Diprotodonidae Nototherium mitchelli*	HG	S22	2.70	21.75	0.90	3.77E+06	0.07	0
AUS	*Diprotodontia Diprotodonidae Palorchestes azeal*	HG	S22	2.70	21.75	0.90	3.77E+06	0.07	0
AUS	*Diprotodontia Diprotodonidae Palorchestes parvus*	HG	S22	2.00	2.39	3.02	2.69E+06	0.02	0
AUS	*Diprotodontia Diprotodonidae Zygomaturus trilobus*	HG	S22	2.88	36.52	0.67	4.10E+06	0.10	0

AUS	*Diprotodontia Macropodidae Kangurus congrous*	FG S14	1.60	5.22	6.00	2.22E+06	0.07	0
AUS	*Diprotodontia Macropodidae Macropus ferragus*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Macropus pearsoni*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Macropus piltonesis*	FG S14	1.48	3.89	7.45	2.09E+06	0.06	0
AUS	*Diprotodontia Macropodidae Macropus thor*	FG S14	1.48	3.89	7.45	2.09E+06	0.06	0
AUS	*Diprotodontia Macropodidae Procoptodon goliah*	FG S14	2.40	37.05	1.52	3.26E+06	0.18	0
AUS	*Diprotodontia Macropodidae Procoptodon pusio*	FG S14	1.88	10.07	3.75	2.53E+06	0.10	0
AUS	*Diprotodontia Macropodidae Procoptodon rapha*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Procoptodon texasensis*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Protemnodon anak*	FG S14	2.00	13.68	3.02	2.69E+06	0.11	0
AUS	*Diprotodontia Macropodidae Protemnodon brehus*	FG S14	2.00	13.68	3.02	2.69E+06	0.11	0
AUS	*Diprotodontia Macropodidae Protemnodon roechus*	FG S14	1.95	12.22	3.27	2.63E+06	0.10	0
AUS	*Diprotodontia Macropodidae Simosthenurus brownei*	FG S14	1.70	6.58	5.08	2.32E+06	0.08	0
AUS	*Diprotodontia Macropodidae Simosthenurus gilli*	FG S14	1.48	3.89	7.45	2.09E+06	0.06	0
AUS	*Diprotodontia Macropodidae Simosthenurus maddocki*	FG S14	1.70	6.58	5.08	2.32E+06	0.08	0
AUS	*Diprotodontia Macropodidae Simosthenurus occidentalis*	FG S14	1.70	6.58	5.08	2.32E+06	0.08	0
AUS	*Diprotodontia Macropodidae Simosthenurus orientalis*	FG S14	1.88	10.07	3.75	2.53E+06	0.10	0

AUS	*Diprotodontia Macropodidae Simosthenurus pales*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Sthenurus andersoni*	FG S14	1.70	6.58	5.08	2.32E+06	0.08	0
AUS	*Diprotodontia Macropodidae Sthenurus atlas*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Sthenurus oreas*	FG S14	2.00	13.68	3.02	2.69E+06	0.11	0
AUS	*Diprotodontia Macropodidae Sthenurus stirlingi*	FG S14	2.18	21.18	2.23	2.92E+06	0.14	0
AUS	*Diprotodontia Macropodidae Sthenurus tindalei*	FG S14	2.00	13.68	3.02	2.69E+06	0.11	0
AUS	*Diprotodontia Macropodidae Troposodon minor*	FG S14	1.60	5.22	6.00	2.22E+06	0.07	0
AUS	*Diprotodontia Potoroidae N. gen spp*	FG S14	0.70	0.70	28.56	1.43E+06	0.03	0
AUS	*Diprotodontia Potoroidae Propleopus oscillans*	FG S14	1.60	5.22	6.00	2.22E+06	0.07	0
AUS	*Diprotodontia Vombatidae Lasiorhinus angustidens*	HG S14	1.70	0.84	5.08	2.32E+06	0.01	0
AUS	*Diprotodontia Vombatidae Phascolomys medius*	HG S14	1.70	0.84	5.08	2.32E+06	0.01	0
AUS	*Diprotodontia Vombatidae Phascolonus gigas*	HG S14	2.30	6.39	1.80	3.11E+06	0.04	0
AUS	*Diprotodontia Vombatidae Ramsaya magna*	HG S14	2.00	2.39	3.02	2.69E+06	0.02	0
AUS	*Diprotodontia Vombatidae Vombatus hacketti*	HG S14	1.48	0.37	7.45	2.09E+06	0.01	0
AUS	*Diprotodontia Vombatidae Warenja wakefieldi*	HG S14	1.00	0.05	16.98	1.66E+06	0.00	0
EA	*Artiodactyla Bovidae Bison priscus*	FG S5	2.72	84.53	0.87	3.80E+06	0.28	0
EA	*Artiodactyla Bovidae Spirocerus kiakhtensis*	FG S13	2.90	134.90	0.64	4.15E+06	0.36	0

EA	*Artiodactyla Camelidae Camelus knoblochi*	FG S14	2.74	89.28	0.84	3.84E+06	0.29	0
EA	*Artiodactyla Cervidae Megaloceros giganteus*	FG S13	2.85	117.40	0.70	4.04E+06	0.33	0
EA	*Perissodactyla Rhinocerotidae Coelodonta antiquitatis*	HG S14	3.46	188.36	0.24	5.45E+06	0.25	0
EA	*Perissodactyla Rhinocerotidae Stephanorhinus hemitoechus*	HG S14	3.20	92.98	0.38	4.81E+06	0.17	0
EA	*Perissodactyla Rhinocerotidae Stephanorhinus kirchbergensis*	HG S14	3.20	92.98	0.38	4.81E+06	0.17	0
EA	*Proboscidea Elephantidae Mammuthus primigenius*	HG S5	3.74	393.98	0.15	6.23E+06	0.37	0
EA	*Rodentia Castoridae Trogontherium cuvieri*	HG S17	1.60	0.59	6.00	2.22E+06	0.01	0
NA	*Artiodactyla Antilocapridae Capromeryx mexicana*	FG S5	1.18	1.95	12.53	1.80E+06	0.04	0
NA	*Artiodactyla Antilocapridae Capromeryx minor*	FG S5	1.00	1.32	16.98	1.66E+06	0.04	0
NA	*Artiodactyla Antilocapridae Stockoceros conklingi*	FG S5	1.71	6.72	5.00	2.33E+06	0.08	0
NA	*Artiodactyla Antilocapridae Stockoceros onusrosagris*	FG S5	1.74	7.27	4.73	2.37E+06	0.08	0
NA	*Artiodactyla Antilocapridae Tetrameryx shuleri*	FG S5	1.78	7.96	4.43	2.41E+06	0.09	0
NA	*Artiodactyla Bovidae Bison latifrons*	HG S5	2.95	45.91	0.58	4.26E+06	0.11	0
NA	*Artiodactyla Bovidae Bison priscus*	FG S5	2.95	156.40	0.58	4.26E+06	0.39	0
NA	*Artiodactyla Bovidae Bootherium bombifrons*	FG S5	2.48	45.33	1.32	3.38E+06	0.20	0
NA	*Artiodactyla Bovidae Bos grunniens*	FG S5	2.70	80.25	0.90	3.77E+06	0.27	0
NA	*Artiodactyla Bovidae Euceratherium collinum*	FG S5	2.65	71.28	0.98	3.68E+06	0.26	0
NA	*Artiodactyla Bovidae Oreamnos harringtoni*	FG S5	1.88	10.07	3.75	2.53E+06	0.10	0

NA	*Artiodactyla Bovidae Saiga spp.*	FG S5	1.70	6.58	5.08	2.32E+06	0.08	0
NA	*Artiodactyla Bovidae Symbos cavifrons*	FG S5	2.60	62.47	1.07	3.59E+06	0.24	0
NA	*Artiodactyla Camelidae Camelops hesternus*	FG S5	3.04	196.87	0.50	4.44E+06	0.44	0
NA	*Artiodactyla Camelidae Camelops huerfanensis*	HG S5	2.85	33.47	0.70	4.04E+06	0.09	0
NA	*Artiodactyla Camelidae Hemiauchenia macrocephala*	FG S5	2.04	15.15	2.81	2.74E+06	0.12	0
NA	*Artiodactyla Camelidae Palaeolama mirifica*	FG S5	1.90	10.78	3.57	2.56E+06	0.10	0
NA	*Artiodactyla Cervidae Alces latifrons*	FG S5	2.93	146.51	0.61	4.21E+06	0.37	0
NA	*Artiodactyla Cervidae Cervalces scotti*	FG S5	2.80	104.57	0.76	3.96E+06	0.31	0
NA	*Artiodactyla Cervidae Navahoceros fricki*	FG S5	2.40	37.05	1.52	3.26E+06	0.18	0
NA	*Artiodactyla Cervidae Sangamona fugitiva*	FG S5	2.20	22.33	2.15	2.95E+06	0.14	0
NA	*Artiodactyla Tayassuidae Mylohyus nasutus*	FG S5	1.88	10.07	3.75	2.53E+06	0.10	0
NA	*Artiodactyla Tayassuidae Platygonus compressus*	FG S5	2.04	15.15	2.81	2.74E+06	0.12	0
NA	*Perissodactyla Equidae Equus alaskae*	HG S5	2.57	14.77	1.13	3.54E+06	0.06	0
NA	*Perissodactyla Equidae Equus caballus*	HG S5	2.40	8.68	1.52	3.26E+06	0.04	0
NA	*Perissodactyla Equidae Equus complicatus*	HG S5	2.60	16.26	1.07	3.59E+06	0.06	0
NA	*Perissodactyla Equidae Equus conversidens*	HG S5	2.49	11.39	1.31	3.40E+06	0.05	0
NA	*Perissodactyla Equidae Equus fraternus*	HG S5	2.41	9.10	1.48	3.28E+06	0.04	0
NA	*Perissodactyla Equidae Equus giganteus*	HG S5	2.60	16.26	1.07	3.59E+06	0.06	0
NA	*Perissodactyla Equidae Equus hemionus*	HG S5	2.40	8.68	1.52	3.26E+06	0.04	0
NA	*Perissodactyla Equidae Equus laurentius*	HG S5	2.81	30.34	0.74	3.98E+06	0.09	0
NA	*Perissodactyla Equidae Equus niobrarensis*	HG S5	2.52	12.81	1.22	3.46E+06	0.05	0

NA	*Perissodactyla Equidae Equus occidentalis*	HG S5	2.76	25.98	0.81	3.88E+06	0.08	0
NA	*Perissodactyla Equidae Equus scotti*	HG S5	2.74	24.88	0.84	3.85E+06	0.08	0
NA	*Perissodactyla Tapiridae Tapirus californicus*	HG S14	2.60	16.26	1.07	3.59E+06	0.06	0
NA	*Perissodactyla Tapiridae Tapirus copei*	HG S14	2.50	11.95	1.27	3.42E+06	0.05	0
NA	*Perissodactyla Tapiridae Tapirus veroensis*	HG S14	2.44	9.87	1.41	3.32E+06	0.05	0
NA	*Proboscidea Elephantidae Mammuthus columbi*	HG S5	3.90	600.24	0.11	6.74E+06	0.46	0
NA	*Proboscidea Elephantidae Mammuthus imperator*	HG S5	4.00	768.68	0.10	7.06E+06	0.52	0
NA	*Proboscidea Elephantidae Mammuthus primigenius*	HG S5	3.74	393.98	0.15	6.23E+06	0.37	0
NA	*Proboscidea Gomphotheriidae Cuvieronius spp.*	HG S5	3.70	353.55	0.16	6.11E+06	0.35	0
NA	*Proboscidea Mammutidae Mammut americanum*	HG S5	3.66	315.38	0.17	5.98E+06	0.33	0
NA	*Rodentia Castoridae Castoroides ohioensis*	HG S17	2.18	4.27	2.23	2.92E+06	0.03	0
NA	*Rodentia Hydrochoeridae Neocherus oesopi*	HG S20	1.78	1.11	4.43	2.41E+06	0.01	0
NA	*Rodentia Hydrochoeridae Neochoerus pinckneyi*	HG S20	1.85	1.40	3.95	2.49E+06	0.01	0
NA	*Xenarthra Dasypodidae Holmesina septentrionalis*	HG S5	2.40	8.68	1.52	3.26E+06	0.04	0
NA	*Xenarthra Glyptodontidae Glyptotherium floridanum*	HG S5	3.04	58.88	0.50	4.44E+06	0.13	0
NA	*Xenarthra Glyptodontidae Glyptotherium mexicanum*	HG S5	3.04	58.88	0.50	4.44E+06	0.13	0
NA	*Xenarthra Megalonychidae Megalonyx jeffersonii*	HG S5	2.78	27.50	0.79	3.91E+06	0.08	0

NA	*Xenarthra Megatheriidae Eremotherium rusconii*	HG S5	3.54	234.71	0.21	5.67E+06	0.28	0
NA	*Xenarthra Megatheriidae Nothrotheriops shastense*	HG S5	2.48	11.10	1.32	3.38E+06	0.05	0
NA	*Xenarthra Mylodontidae Glossotherium harlani*	HG S5	3.20	92.10	0.38	4.80E+06	0.17	0
SA	*Artiodactyla Camelidae Eulamaops parallelus*	FG S5	2.18	21.18	2.23	2.92E+06	0.14	0
SA	*Artiodactyla Camelidae Hemiauchenia paradoxa*	FG S5	3.00	176.46	0.54	4.36E+06	0.41	0
SA	*Artiodactyla Camelidae Palaeolama spp.*	FG S5	3.00	176.46	0.54	4.36E+06	0.41	0
SA	*Artiodactyla Cervidae Agalmaceros spp.*	FG S5	1.78	7.96	4.43	2.41E+06	0.09	0
SA	*Artiodactyla Cervidae Charitoceros spp.*	FG S5	1.78	7.96	4.43	2.41E+06	0.09	0
SA	*Artiodactyla Cervidae Morenelaphus axpeitianus*	FG S5	1.70	6.58	5.08	2.32E+06	0.08	0
SA	*Artiodactyla Cervidae Morenelaphus lujanensis*	FG S5	1.70	6.58	5.08	2.32E+06	0.08	0
SA	*Artiodactyla Cervidae Paraceros spp.*	FG S5	2.48	45.33	1.32	3.38E+06	0.20	0
SA	*Artiodactyla Tayassuidae Platygonus spp.*	FG S5	1.70	6.58	5.08	2.32E+06	0.08	0
SA	*Litopterna Macraucheniidae Macrauchenia patachonica*	FG S5	2.99	174.04	0.54	4.34E+06	0.41	0
SA	*Litopterna Macraucheniidae Windhausenia spp.*	FG S5	2.85	117.44	0.70	4.04E+06	0.33	0
SA	*Notoungulata Toxodontidae Mixotoxodon spp.*	FG S23	3.00	176.46	0.54	4.36E+06	0.41	0
SA	*Notoungulata Toxodontidae Toxodon bilobidens*	FG S23	3.04	196.87	0.50	4.44E+06	0.44	0
SA	*Notoungulata Toxodontidae Toxodon burmeisteri*	FG S23	3.04	196.87	0.50	4.44E+06	0.44	0
SA	*Notoungulata Toxodontidae Toxodon paradoxus*	FG S23	3.00	176.46	0.54	4.36E+06	0.41	0
SA	*Notoungulata Toxodontidae Toxodon platensis*	FG S23	3.22	312.72	0.37	4.83E+06	0.56	0

SA	*Perissodactyla Equidae Equus andium*	HG S5	2.34	7.29	1.67	3.17E+06	0.04	0
SA	*Perissodactyla Equidae Equus insulatus*	HG S5	2.55	13.68	1.18	3.50E+06	0.06	0
SA	*Perissodactyla Equidae Equus lasallei*	HG S5	2.54	13.63	1.18	3.49E+06	0.06	0
SA	*Perissodactyla Equidae Equus neogeus*	HG S5	2.58	15.09	1.11	3.55E+06	0.06	0
SA	*Perissodactyla Equidae Equus santaeelenae*	HG S5	2.54	13.63	1.18	3.49E+06	0.06	0
SA	*Perissodactyla Equidae Hippidion principale*	HG S5	2.71	22.37	0.89	3.78E+06	0.08	0
SA	*Perissodactyla Equidae Hippidion saldiasi*	HG S5	2.42	9.39	1.45	3.30E+06	0.04	0
SA	*Perissodactyla Equidae Onohippidium spp.*	HG S13	2.49	11.63	1.29	3.41E+06	0.05	0
SA	*Proboscidea Gomphotheriidae Cuvieronius spp.*	HG S5	3.70	353.55	0.16	6.11E+06	0.35	0
SA	*Proboscidea Gomphotheriidae Haplomastodon chimborazi*	HG S5	3.78	434.73	0.14	6.34E+06	0.39	0
SA	*Proboscidea Gomphotheriidae Notiomastodon spp.*	HG S5	3.79	450.54	0.14	6.39E+06	0.39	0
SA	*Proboscidea Gomphotheriidae Stegomastodon superbus*	HG S5	3.88	565.20	0.12	6.66E+06	0.44	0
SA	*Rodentia Hydrochoeridae Neochoerus sulcidens*	HG S20	2.18	4.27	2.23	2.92E+06	0.03	0
SA	*Xenarthra Dasypodidae Eutatus spp.*	HG S5	2.16	4.05	2.29	2.90E+06	0.03	0
SA	*Xenarthra Dasypodidae Holmesina occidentalis*	HG S5	2.30	6.39	1.80	3.11E+06	0.04	0
SA	*Xenarthra Dasypodidae Holmesina paulacoutoi*	HG S5	2.10	3.30	2.55	2.81E+06	0.02	0
SA	*Xenarthra Dasypodidae Pampatherium humboldtii*	HG S5	2.18	4.27	2.23	2.92E+06	0.03	0
SA	*Xenarthra Dasypodidae Pampatherium typum*	HG S5	2.30	6.39	1.80	3.11E+06	0.04	0
SA	*Xenarthra Dasypodidae Propraopus grandis*	HG S5	1.67	0.76	5.32	2.29E+06	0.01	0

SA	*Xenarthra Glyptodontidae Chlamydotherium spp.*	HG S5	2.24	5.31	1.98	3.02E+06	0.03	0
SA	*Xenarthra Glyptodontidae Doedicurus clavicaudatus*	HG S5	3.17	83.81	0.40	4.72E+06	0.16	0
SA	*Xenarthra Glyptodontidae Glyptodon clavipes*	HG S5	3.30	121.58	0.32	5.04E+06	0.20	0
SA	*Xenarthra Glyptodontidae Glyptodon reticulatus*	HG S5	2.94	43.50	0.60	4.22E+06	0.11	0
SA	*Xenarthra Glyptodontidae Hoplophorus spp.*	HG S5	2.45	10.11	1.40	3.33E+06	0.05	0
SA	*Xenarthra Glyptodontidae Lomaphorus spp.*	HG S5	2.40	8.68	1.52	3.26E+06	0.04	0
SA	*Xenarthra Glyptodontidae Neosclerocalyptus spp.*	HG S5	2.30	6.39	1.80	3.11E+06	0.04	0
SA	*Xenarthra Glyptodontidae Neothoracophorus depressus*	HG S5	3.04	58.88	0.50	4.44E+06	0.13	0
SA	*Xenarthra Glyptodontidae Neothoracophorus elevatus*	HG S5	2.90	39.61	0.63	4.16E+06	0.10	0
SA	*Xenarthra Glyptodontidae Panochthus tuberculatus*	HG S5	3.03	56.32	0.51	4.41E+06	0.13	0
SA	*Xenarthra Glyptodontidae Plaxhaplous canaliculatus*	HG S5	3.11	72.28	0.44	4.60E+06	0.15	0
SA	*Xenarthra Glyptodontidae Sclerocalyptus ornatus*	HG S5	2.45	10.11	1.40	3.33E+06	0.05	0
SA	*Xenarthra Megalonychidae Nothropus spp.*	HG S5	2.00	2.39	3.02	2.69E+06	0.02	0
SA	*Xenarthra Megalonychidae Nothrotherium spp.*	HG S5	2.18	4.27	2.23	2.92E+06	0.03	0
SA	*Xenarthra Megalonychidae Ocnopus spp.*	HG S5	2.48	11.10	1.32	3.38E+06	0.05	0
SA	*Xenarthra Megalonychidae Valgipes spp.*	HG S5	2.30	6.39	1.80	3.11E+06	0.04	0
SA	*Xenarthra Megatheriidae Eremotherium laurillardi*	HG S5	2.90	39.61	0.63	4.16E+06	0.10	0

SA	*Xenarthra Megatheriidae Eremotherium rusconii*	HG S5	3.54	234.71	0.21	5.67E+06	0.28	0
SA	*Xenarthra Megatheriidae Megatherium americanum*	HG S5	3.80	456.45	0.14	6.40E+06	0.40	0
SA	*Xenarthra Megatheriidae Paramegatherium spp.*	HG S5	3.54	234.71	0.21	5.67E+06	0.28	0
SA	*Xenarthra Mylodontidae Glossotherium myloides*	HG S5	3.08	65.54	0.47	4.53E+06	0.14	0
SA	*Xenarthra Mylodontidae Glossotherium robustum*	HG S5	3.23	100.99	0.36	4.88E+06	0.18	0
SA	*Xenarthra Mylodontidae Lestodon armatus*	HG S5	3.53	226.72	0.21	5.63E+06	0.27	0
SA	*Xenarthra Mylodontidae Mylodon listai*	HG S5	3.00	52.34	0.54	4.36E+06	0.12	0
SA	*Xenarthra Mylodontidae Scelidodon spp.*	HG S5	3.00	52.34	0.54	4.36E+06	0.12	0
SA	*Xenarthra Mylodontidae Scelidotherium leptocephalum*	HG S5	3.05	60.14	0.49	4.46E+06	0.13	0
AF	*Artiodactyla Bovidae Eudorcas rufina*	FG S13	1.60	5.22	6.00	2.22E+06	0.07	0
AF	*Artiodactyla Bovidae Hippotragus leucophaeus*	FG S13	2.18	21.18	2.23	2.92E+06	0.14	0
AF	*Perissodactyla Equidae Equus quagga*	HG S13	2.60	16.26	1.07	3.59E+06	0.06	0
AUS	*Diprotodontia Macropodidae Macropus greyi*	FG S14	1.00	1.32	16.98	1.66E+06	0.04	0
EA	*Artiodactyla Bovidae Gazella arabica*	FG S13	1.08	1.57	14.81	1.72E+06	0.04	0
EA	*Artiodactyla Bovidae Gazella bilkis*	FG S13	1.69	6.38	5.20	2.31E+06	0.08	0
EA	*Artiodactyla Cervidae Cervus schomburgki*	FG S13	2.04	15.15	2.81	2.74E+06	0.12	0
EA	*Perissodactyla Equidae Equus ferus*	HG S13	2.40	8.68	1.52	3.26E+06	0.04	0
AUS	*Artiodactyla Bovidae Bos javanicus*	FG S12	2.68	75.75	0.94	3.72E+06	0.26	0
AUS	*Artiodactyla Bovidae Bubalus bubalis*	FG S13	2.92	141.60	0.62	4.18E+06	0.37	0
AUS	*Artiodactyla Bovidae Capra hircus*	FG S12	1.53	4.35	6.86	2.13E+06	0.06	0
AUS	*Artiodactyla Camelidae Camelus dromedarius*	FG S12	2.90	136.72	0.63	4.16E+06	0.36	0

AUS	*Artiodactyla Cervidae Axis axis*	FG S12	1.84	9.29	3.97	2.49E+06	0.09	0
AUS	*Artiodactyla Cervidae Axis porcinus*	FG S13	1.54	4.55	6.64	2.15E+06	0.07	0
AUS	*Artiodactyla Cervidae Cervus elaphus*	FG S12	2.08	16.56	2.64	2.79E+06	0.12	0
AUS	*Artiodactyla Cervidae Cervus timorensis*	FG S12	1.80	8.38	4.27	2.44E+06	0.09	0
AUS	*Artiodactyla Cervidae Cervus unicolor*	FG S12	2.23	24.11	2.04	3.00E+06	0.15	0
AUS	*Artiodactyla Cervidae Dama dama*	FG S12	1.69	6.38	5.20	2.31E+06	0.08	0
AUS	*Artiodactyla Suidae Sus scrofa*	FG S14	1.94	11.68	3.37	2.60E+06	0.10	0
AUS	*Perissodactyla Equidae Equus asinus*	HG S12	2.51	12.35	1.25	3.44E+06	0.05	0
Domestic animals								
	Cattle		2.54	53.81				0.9
	Buffalo		2.63	66.86				0.95
	Pig		2.30	28.98				0.05
	Sheep		1.78	7.96				0.05
	Goat		1.65	5.90				0.05

Table S2. Great Basin estimates of *Bison bison*. Estimates are based on sex specific age classes and demographics. Because IPCC recommended methods were developed for herbivores about the size of bison, results based on the allometric methodology are quite similar to those from the Tier 2; this is not normally the case (S3).

Age Class	Sex	Mass (log kg)	Population (N)	Annual Population CH4 Emissions (Tg yr^{-1})	Annual Population CH4 Emissions (Tg yr^{-1})
0-1	F	2.18	2.00E+06	0.04	0.09
1-2	F	2.49	2.00E+06	0.09	0.14
2-4	F	2.60	3.00E+06	0.19	0.23
4-8	F	2.63	4.00E+06	0.27	0.30
8-12	F	2.63	3.00E+06	0.20	0.22
12-16	F	2.63	3.00E+06	0.20	0.22
0-1	M	2.22	2.00E+06	0.05	0.09
1-2	M	2.45	2.00E+06	0.08	0.10
2-4	M	2.60	3.00E+06	0.19	0.21
4-8	M	2.76	3.00E+06	0.28	0.27
8-12	M	2.85	2.00E+06	0.24	0.21
12-16	M	2.85	1.00E+06	0.12	0.10
Total Herd			30,000,000	1.95	2.16

Calculations based on whole herd allometric relationship with average mass in log kg:

Average for Herd	Both	2.61	30,000,000	1.93	2.16

Table S3. Results of Wilcoxon-Mann-Whitney Rank Sum Test on methane decreases in ice core records. Other Periods includes all time intervals of the ice core record excluding the Extinction Horizon/Younger Dryas cold episode (EX/YD). Non-parametric tests were used to assess significance because data were non-normal; results were identical when employing Students t-test for unpaired data with unequal variances. Slopes were determined for each 1000-yr window across each core (see text); for statistical reasons, a minimum of 5 values was required to estimate the regression (df=4). However, results were the same when the criteria was relaxed to N=3.

	Other Periods	EX/YD
European Project for Ice Coring in Antarctica (EPICA) Dome 3		
N	316	6
Median	0.024	0.225
Median Difference	-0.200315	
Sum of Group 1 ranks	50086	
Sum of Group 2 ranks	1917	
P Value	< .0001	
North Greenland Eemian Ice Drilling (NEEM)		
N	547	8
Median	0.024	0.227
Median Difference	-0.202745	
Sum of Group 1 ranks	1.4991e+05	
Sum of Group 2 ranks	4385	
P Value	< .0001	
Greenland Ice Sheet Project Two (GISP2)		
N	42	3
Median	0.042	0.193
Median Difference	-0.1509	
Sum of Group 1 ranks	903	
Sum of Group 2 ranks	132	
P Value	0.004	
West Antarctic Ice Sheet Divide (WAIS)		
N	122	6
Median	0.025	0.243
Median Difference	-0.217873	
Sum of Group 1 ranks	7503	
Sum of Group 2 ranks	753	
P Value	< .0001	

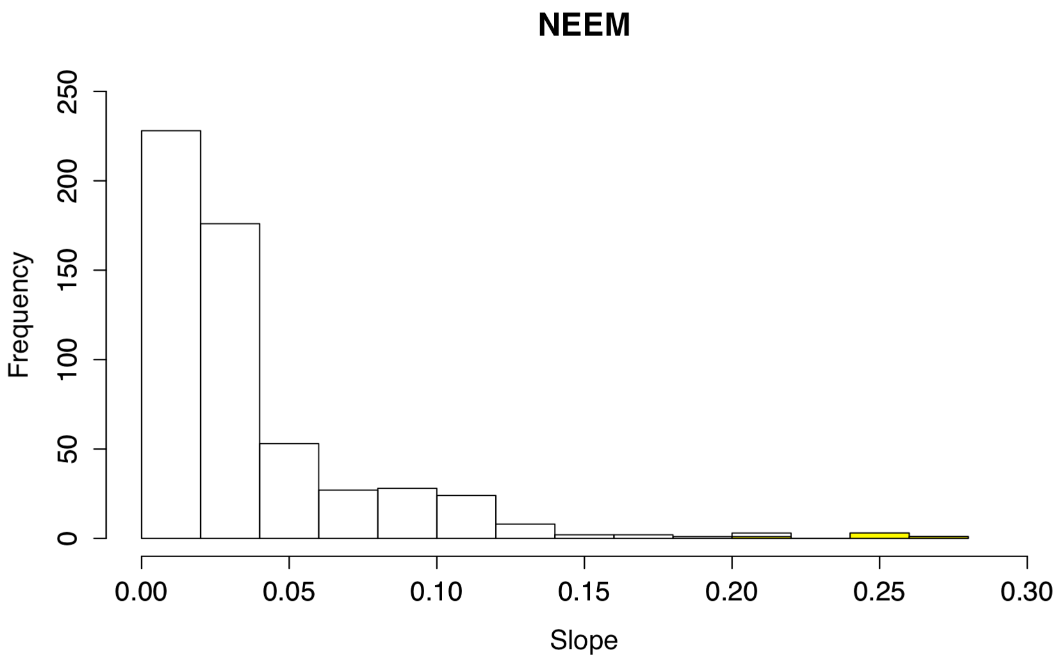

Fig. S1. Histogram of slopes from a 1000-yr moving window analysis of the North Greenland Eemian Ice Drilling (NEEM) core. Slopes from EX/YD are highlighted in yellow. All slopes are negative.

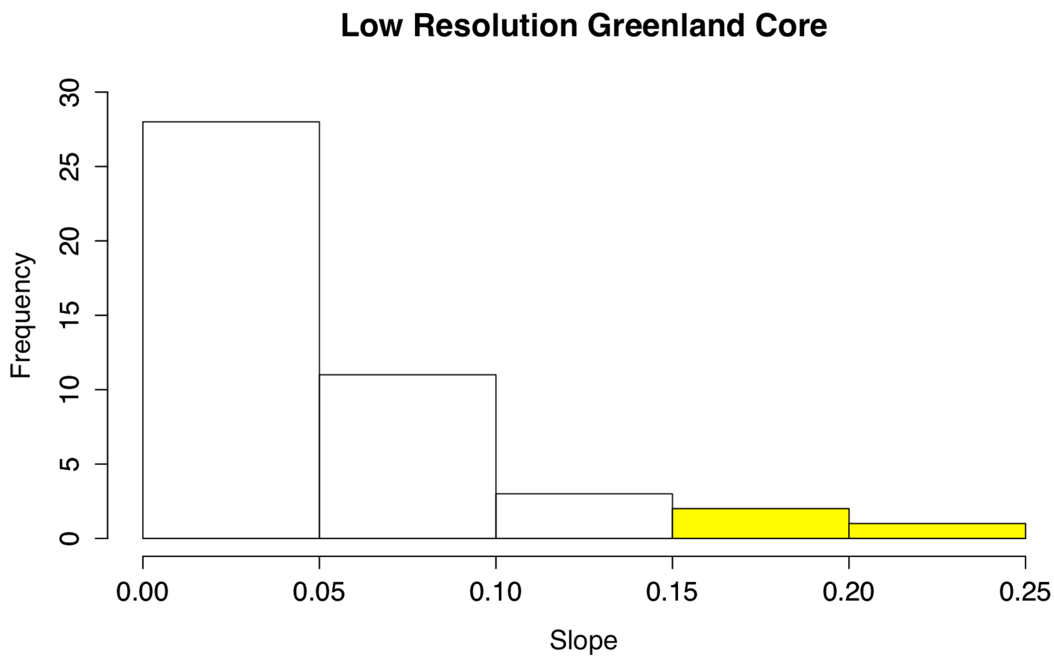

Fig. S2. Histogram of slopes from a 1000-yr moving window analysis of the Greenland Ice Sheet Project Two (GISP2) core. Slopes from EX/YD are highlighted in yellow. All slopes are negative.

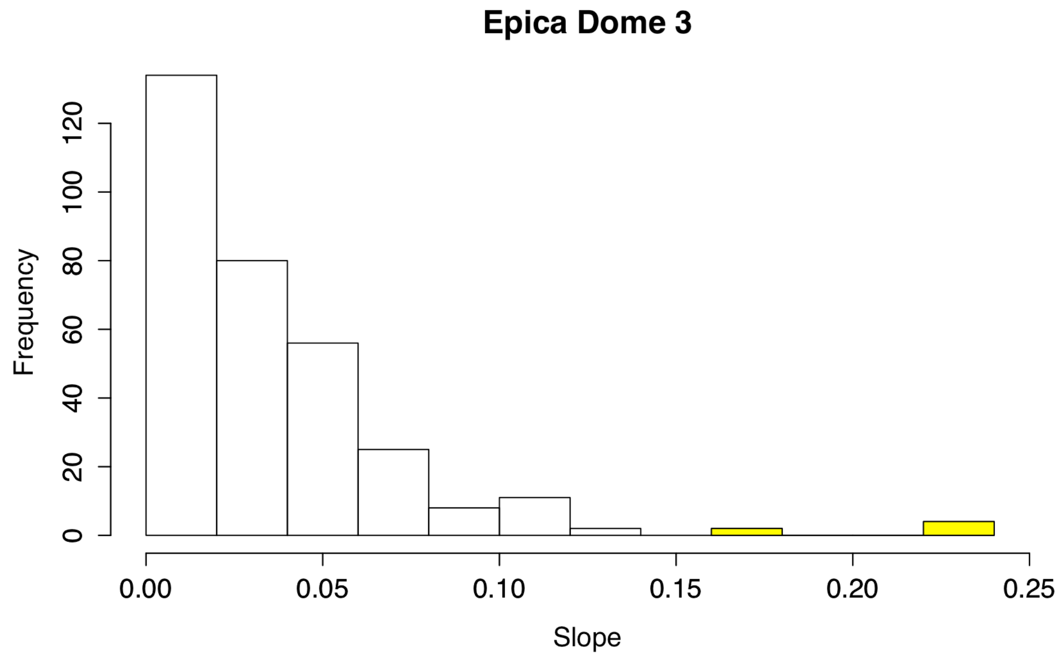

Fig. S3. Histogram of the slopes from a 1000-yr moving window analysis of the European Project for Ice Coring in Antarctica (EPICA) Dome 3 core. Slopes from EX/YD are highlighted in yellow. All slopes are negative.

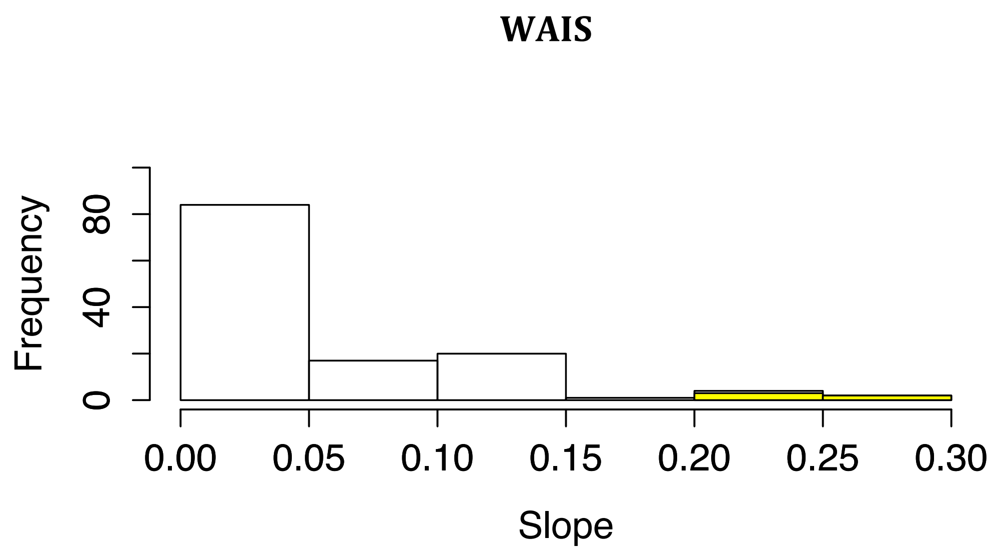

Fig. S4. Histogram of the slopes from a 1000-yr moving window analysis of the West Antarctic Ice Sheet Divide (WAIS) 2015 ice core. Slopes from EX/YD are highlighted in yellow. All slopes are negative.

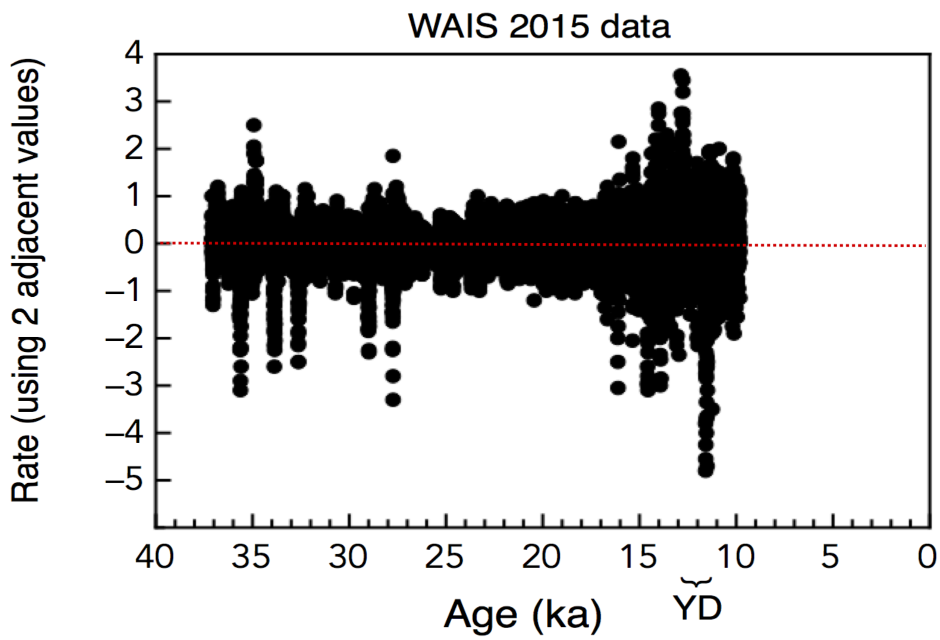

Fig. S5. ‘Rate’ of change in methane concentration between each 2-year interval for the highly-resolved 2015 West Antarctic Ice Sheet Divide (WAIS) core.

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