**Enquist et al. The Megabiota are disproportionately important for biosphere functioning**

This repository contains data and code to reproduce all Matlab and Madingley figures included in Enquist et al. (2019) and supplementary information. To recreate the Madingley model simulations performed for this paper, please refer to <https://github.com/Madingley/C-sharp-version-of-Madingley>.

All ecosystem metrics are calculated as a global mean from the last 12 time steps of model simulations, or one year. Sim\_10000, Sim\_1000 and Sim\_100 refer to the Pleistocene, Modern and Future worlds respectively.

ECOSYSTEM METRICS

* **State\_Heterotrophic\_Biomass:** R script to calculate mean annual grid cell heterotrophic biomass from the output Madingley state file.
* **State\_Heterotrophic\_Metabolism:** R script to calculate mean annual grid cell heterotrophic metabolism from the output Madingley state file.
* **State\_Heterotrophic\_NutrientDiffusivity:** R script to calculate mean annual grid cell heterotrophic nutrient diffusivity from the output Madingley state file.

FIGURE 4

* **Doughtynego1895.pdf:** Doughty et al. (2013) The legacy of the Pleistocene megafauna extinctions on nutrient availability in Amazonia. *Nature Geoscience,* 6, 761-764.
* **Readme.pdf:** Read me file with instructions to create figure 4.
* **SOMngeo1895-s1.pdf:** Doughty et al. (2013) Supporting Information.
* **Megabiota.m:** Matlab code to create figure 4.
* **Phosphorous2.mat:** Matlab code to create figure 4.

FIGURE 5

Figure 5A, 5B, 5C

* **HeterotrophBiomass\_map.R:** R code to create figure 5A, 5B and 5C.
* **HeterotrophBiomass\_Map\_gkm2\_MEAN.csv**: Mean annual grid cell heterotrophic biomass (g/km2) averaged for the Pleistocene, Modern and Future simulations.

Figure 5D

* **HeterotrophBiomass\_plot.R:** R code to create figure 5D.
* **HeterotrophicBiomass\_MassBins\_MEAN.csv:** Mean annual global heterotrophic biomass (g) summarised into 25 logged mass bins and averaged for Pleistocene, Modern and Future simulations.
* **HeterotrophBiomass\_EndEct\_MEAN.csv:** Mean annual global heterotrophic biomass (g) summarised into endothermic and ectothermic components and averaged for Pleistocene, Modern and Future simulations.

Figure 5E

* **HeterotrophMetabolism\_plot.R:** R code to create figure 5E.
* **HeterotrophicMetabolism\_MassBins\_MEAN.csv:** Mean annual global heterotrophic metabolism (kJ/day) summarised into 25 logged mass bins and averaged for Pleistocene, Modern and Future simulations.
* **HeterotrophMetabolism\_EndEct\_MEAN.csv:** Mean annual global heterotrophic metabolism (kJ/day) summarised into endothermic and ectothermic components and averaged for Pleistocene, Modern and Future simulations.

Figure 5F

* **HeterotrophNutrient\_plot.R:** R code to create figure 5F.
* **HeterotrophicNutrient\_MassBins\_MEAN.csv:** Mean annual global endotherm nutrient diffusivity (km2/day) summarised into 25 logged mass bins and averaged Pleistocene, Modern and Future simulations.
* **HeterotrophNutrient\_EndEct \_MEAN.csv:** Mean annual global endothermic nutrient diffusivity (km2/day) summarised into endothermic and ectothermic components and averaged for Pleistocene, Modern and Future simulations.

FIGURE S2

* **Metabolism\_graph.R:** R code to create figure S2
* **State\_Heterotrophic\_Metabolism.R:** R script to calculate mean annual grid cell heterotrophic metabolism from the output Madingley state file.

FIGURE S3

* **Regional\_plots.R:** R code to create figure S3.
* **Amazon\_MEAN.csv:** Mean annual grid cell heterotrophic biomass (g/km2) for a 10x10 degree region averaged from the Pleistocene simulations.
* **Cerrado\_MEAN.csv:** Mean annual grid cell heterotrophic biomass (g/km2) for a 10x10 degree region averaged from the Pleistocene simulations.
* **China\_MEAN.csv:** Mean annual grid cell heterotrophic biomass (g/km2) for a 10x10 degree region averaged from the Pleistocene simulations.
* **Europe\_MEAN.csv:** Mean annual grid cell heterotrophic biomass (g/km2) for a 10x10 degree region averaged from the Pleistocene simulations.
* **Sahara\_MEAN.csv:** Mean annual grid cell heterotrophic biomass (g/km2) for a 10x10 degree region averaged from the Pleistocene simulations.
* **US\_MEAN.csv:** Mean annual grid cell heterotrophic biomass (g/km2) for a 10x10 degree region averaged from the Pleistocene simulations.

FIGURE S4

* **HeterotrophMetabolism\_maps.R**: R code to create figure S4 a,b,c.
* **HeterotrophMetabolism\_EctMap\_kJday\_MEAN**.**csv:** Mean annual grid cell heterotrophic biomass (g/km2) averaged for Pleistocene, Modern and Future simulations.
* **HeterotrophMetabolism\_EndMap\_kJday\_MEAN**.**csv:** Mean annual grid cell endotherm metabolism (kJ/day/km2) averaged for Pleistocene, Modern and Future simulations.
* **HeterotrophNutrient\_maps.R:** R code to create figure S4 d,e,f.
* **HeterotrophNutirent\_Map\_km2day\_MEAN.csv:** Mean annual grid cell endotherm nutrient diffusivity (km2/day) averaged for Pleistocene, Modern and Future simulations.
* **AutotrophicBiomass\_maps.R:** R code to create figure S4 g,h,i.
* **AutotrophBiomass\_Map\_gkm2\_MEAN.csv:** Mean annual grid cell autotrophic biomass (g/km2) averaged for Pleistocene, Modern and Future simulations.

FIGURE S5

* **TrophicGroupBiomass\_graph.R:** R code to create figure S5.
* **Global\_TrophicGroup\_HeterotrophicBiomass\_MEAN:** Mean annual global heterotrophic biomass (g) summarised into trophic group and averaged for Pleistocene, Modern and Future simulations.
* **Global\_TrophicGroup\_HeterotrophicMetabolism\_MEAN:** Mean annual global heterotrophic metabolism (kJ/day) summarised into trophic group and averaged for Pleistocene, Modern and Future simulations.
* **Global\_TrophicGroup\_NutrientDiffusivity\_MEAN:** Mean annual global endothermic nutrient diffusivity (km2/day) summarised into trophic group and averaged for Pleistocene, Modern and Future simulations.

FIGURE S6

* **NutrientSensitivity\_plot.R**: R code to create figure S6.
* **NutrientDiffusivity\_Sensitivity.csv:** Mean annual global endotherm nutrient diffusivity (km2/day) summarised into 25 logged mass bins and averaged Pleistocene, Modern and Future simulations using three scaling coefficients for gut passage time. Details of the scaling coefficients are outlined in Supplementary Material II.

FIGURE S7

* **HeterotrophAbundance.R**: R code to create figure S7
* **Pleistocene\_abd.csv:** Mean abundance per grid cell across all trophic groups for one Pleistocene simulation.

FIGURE S8

* **HeterotrophBiomass\_percentagechange.R:** R code to create figure S8.
* **HeterotrophBiomass\_Map\_gkm2\_MEAN.csv**: Mean annual grid cell heterotrophic biomass (g/km2) averaged for the Pleistocene, Modern and Future simulations.