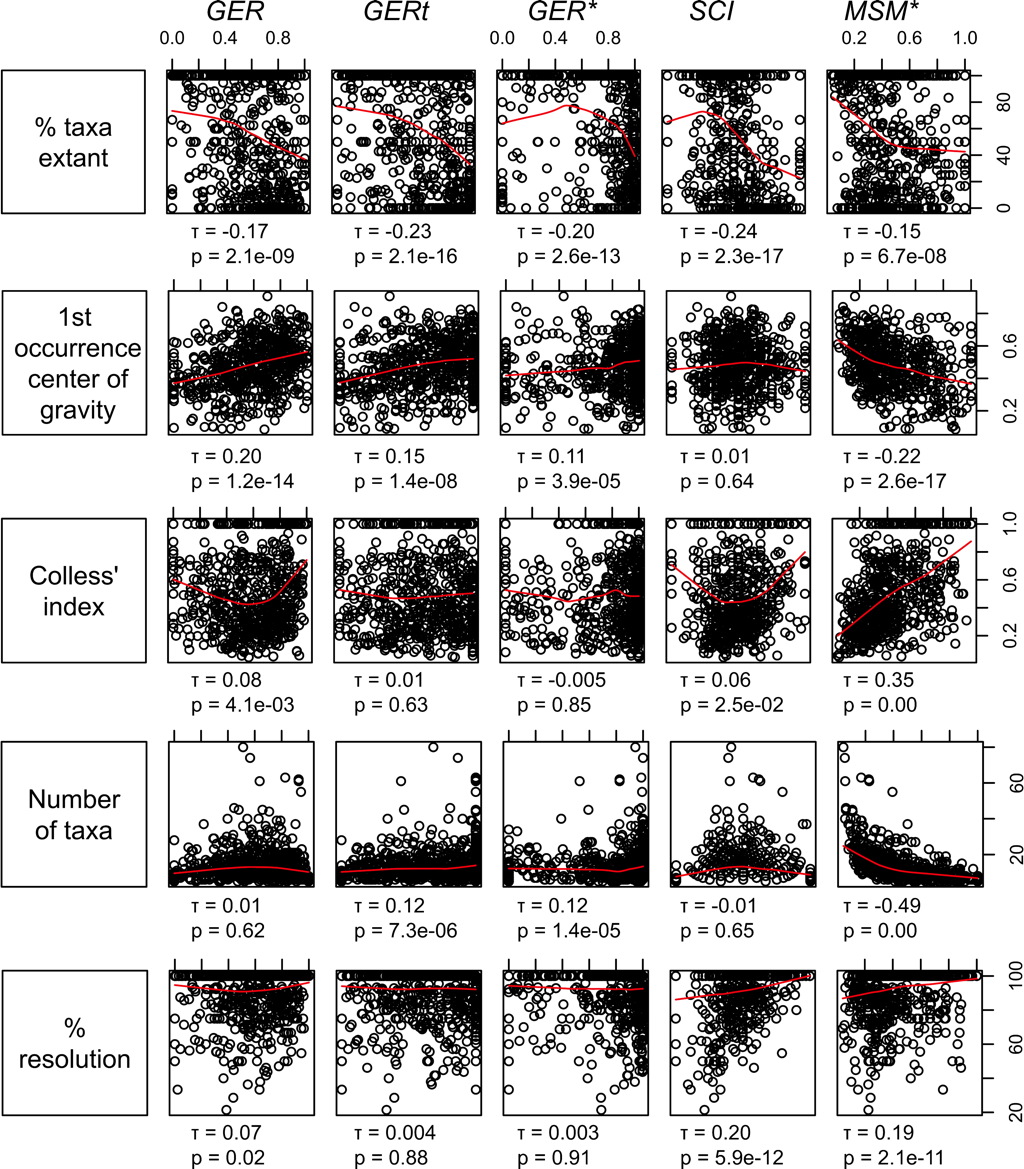
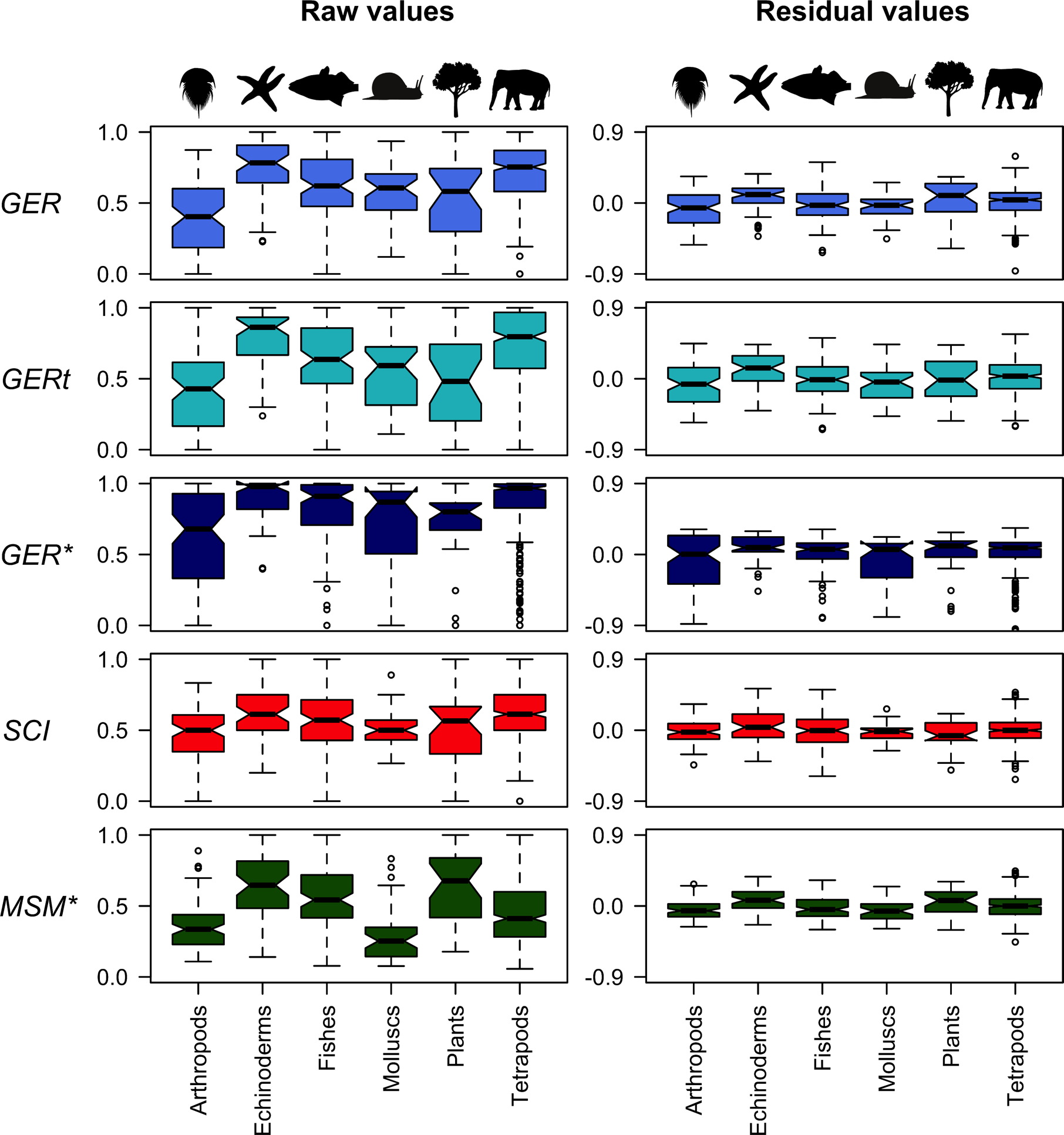
Supplementary figure 1.

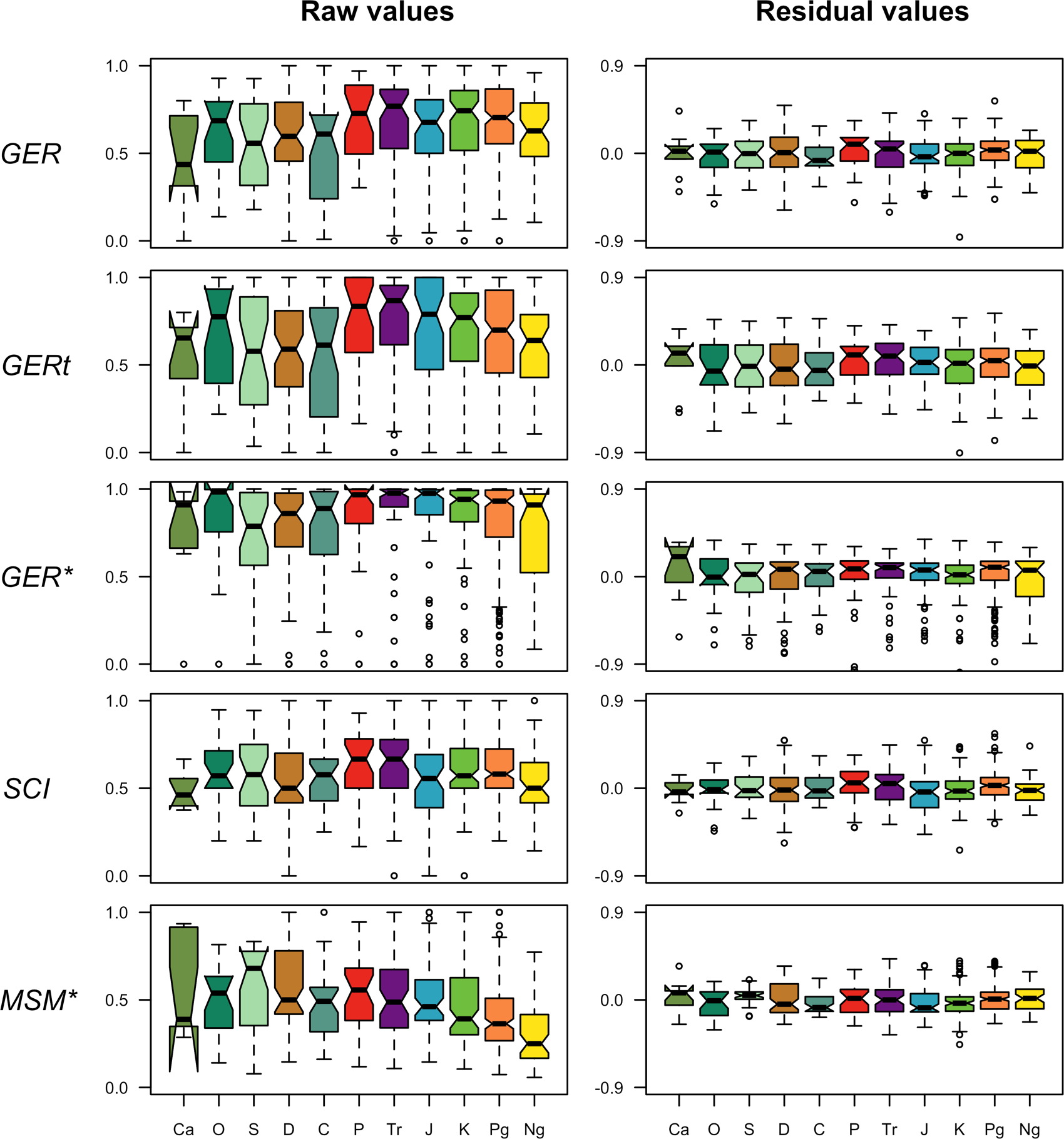


**Supplementary Figure 1.** Scatterplots and correlations of five independent variables demonstrated to influence stratigraphic congruence (the percentage of extant taxa, the center of gravity of first occurrence dates, Colless’s index of tree imbalance, the number of taxa and the percentage resolution) with each of five indices of stratigraphic congruence (*SCI*, *MSM\**, *GER*, *GERt* and *GER\*,* all resolving polytomies in reverse stratigraphic order). Kendall’s τ coefficients and p values are shown below each plot. We have fitted smoothers through the scatterplots in each panel to aid visualization of the relationship between each pair.

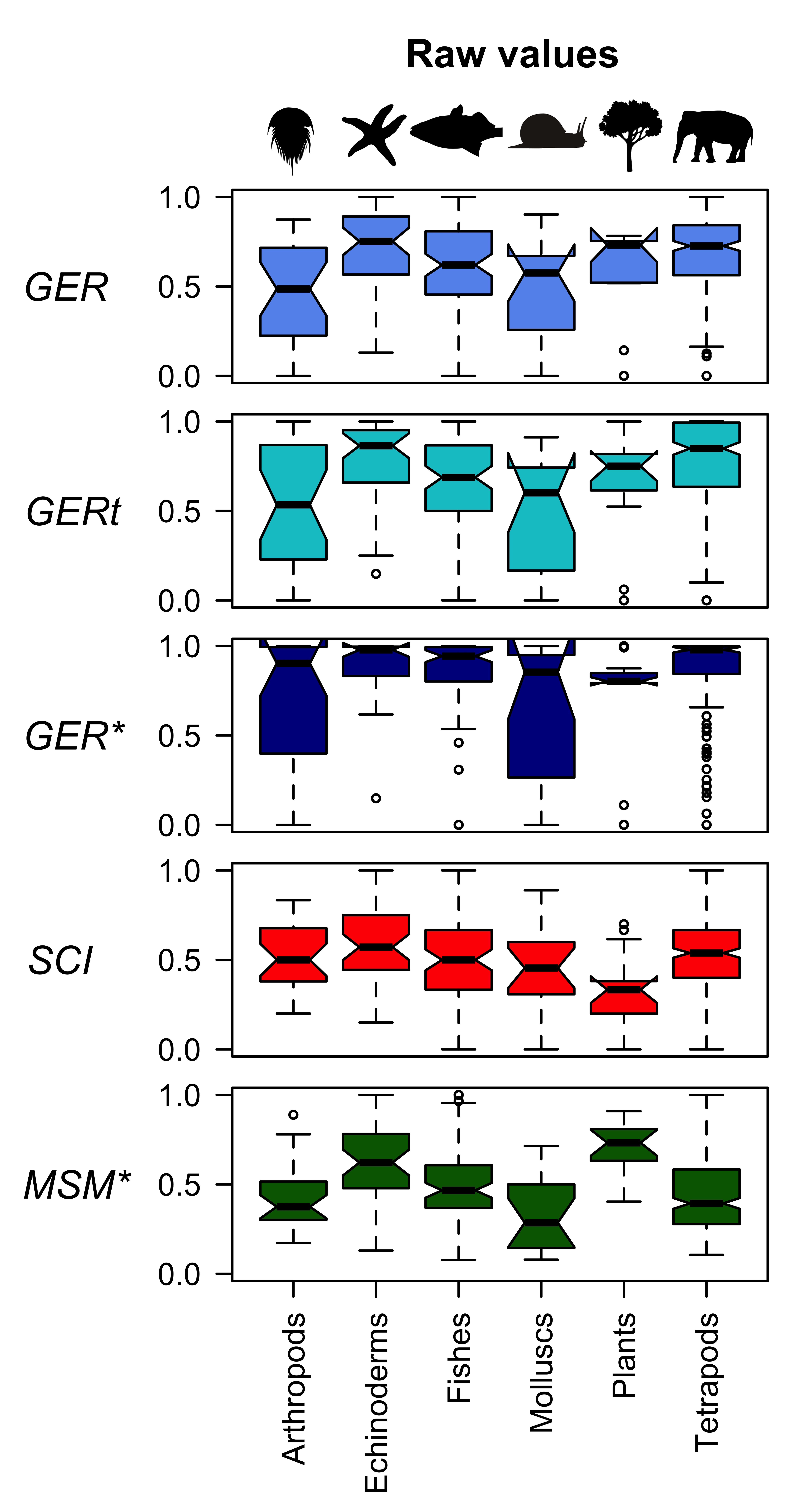


**Supplementary Figure 2.** Median indices of stratigraphic congruence (*GER, GERt, GER\*, SCI and MSM\**) and their residuals (from minimum adequate models) vary significantly across higher taxa. Median values are indicated by black horizontal bars, shaded areas represent upper and lower quartiles, and dashed lines connect to the most eccentric points within 1.5 interquartile ranges of the medians. Outliers are shown as circles. All polytomies resolved stratigraphically. Residuals are for the minimum adequate model (Supplementary Table 6).

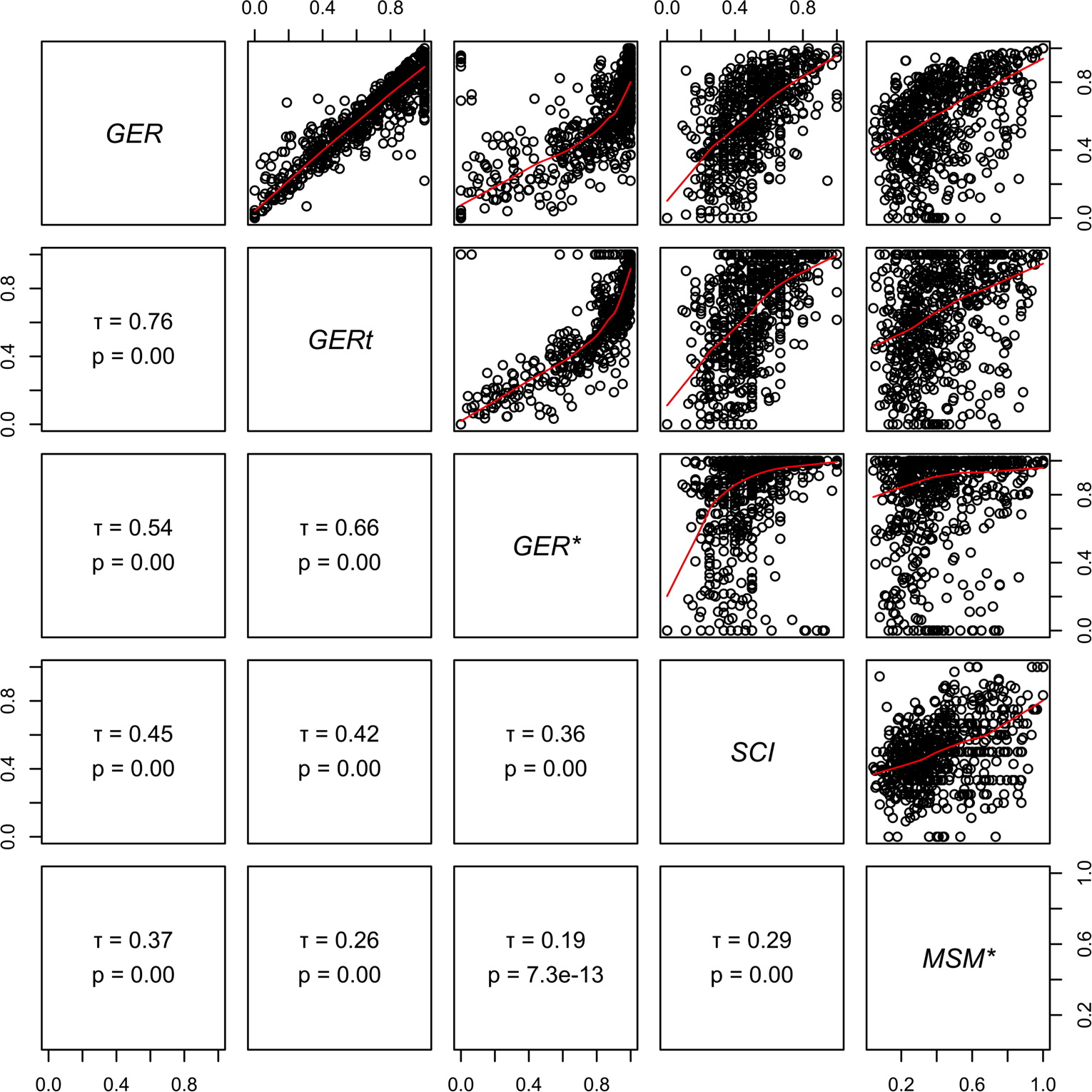
Supplementary figure 3



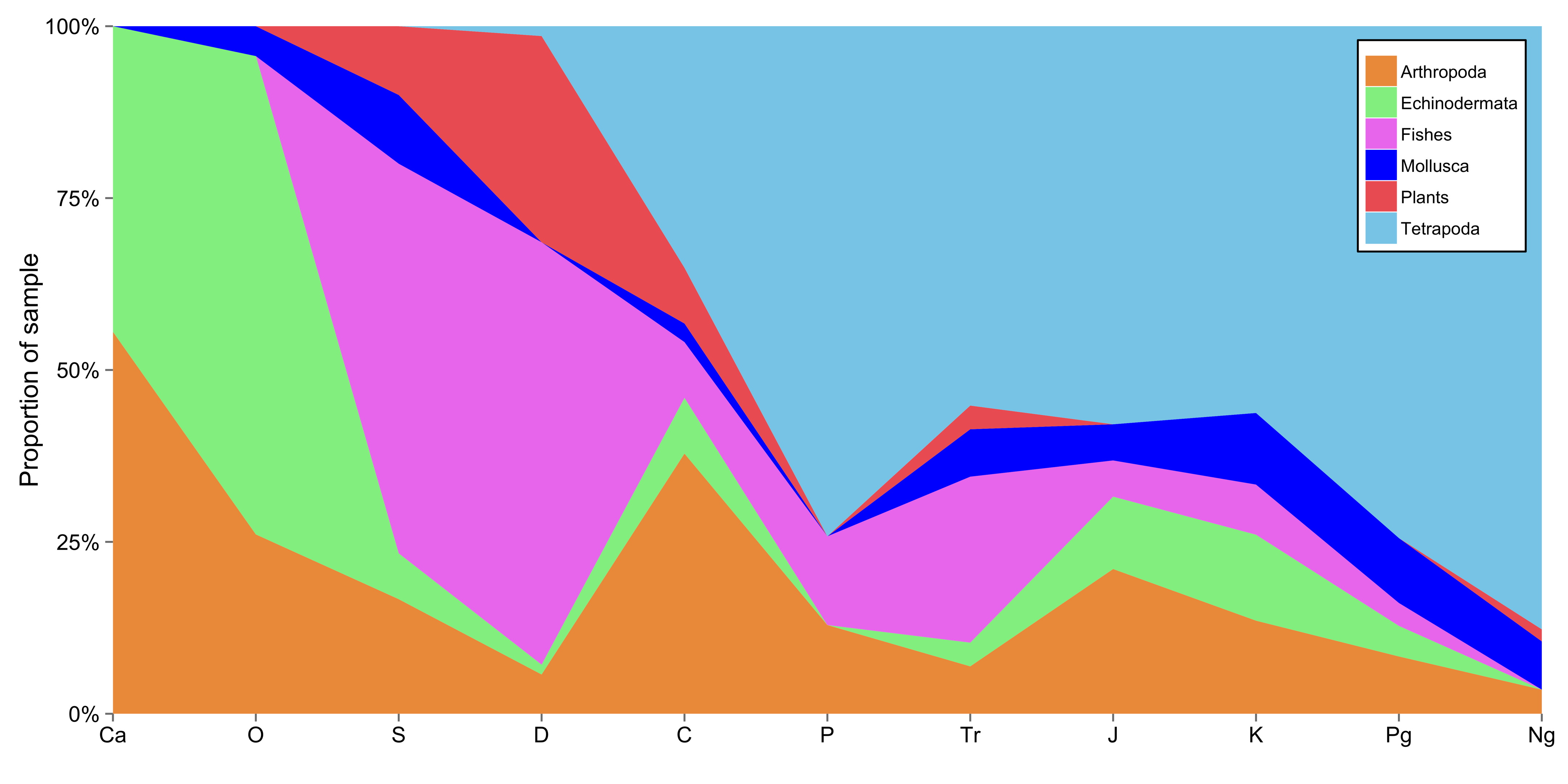
**Supplementary Figure 3.** Median indices of stratigraphic congruence (*GER, GERt, GER\*, SCI and MSM\**) and their residuals (from minimum adequate models) vary significantly across geological periods. Trees are binned according to the mean date of first occurrence of their constituent taxa. Median values are indicated by black horizontal bars, shaded areas represent upper and lower quartiles, and dashed lines connect to the most eccentric points within 1.5 interquartile ranges of the medians. Outliers are shown as circles. All polytomies resolved stratigraphically. Abbreviations: Ca, Cambrian; O, Ordovician; S, Silurian; D, Devonian; C, Carboniferous; P, Permian; Tr, Triassic; J, Jurassic; K, Cretaceous; Pg, Palaeogene; Ng, Neogene.



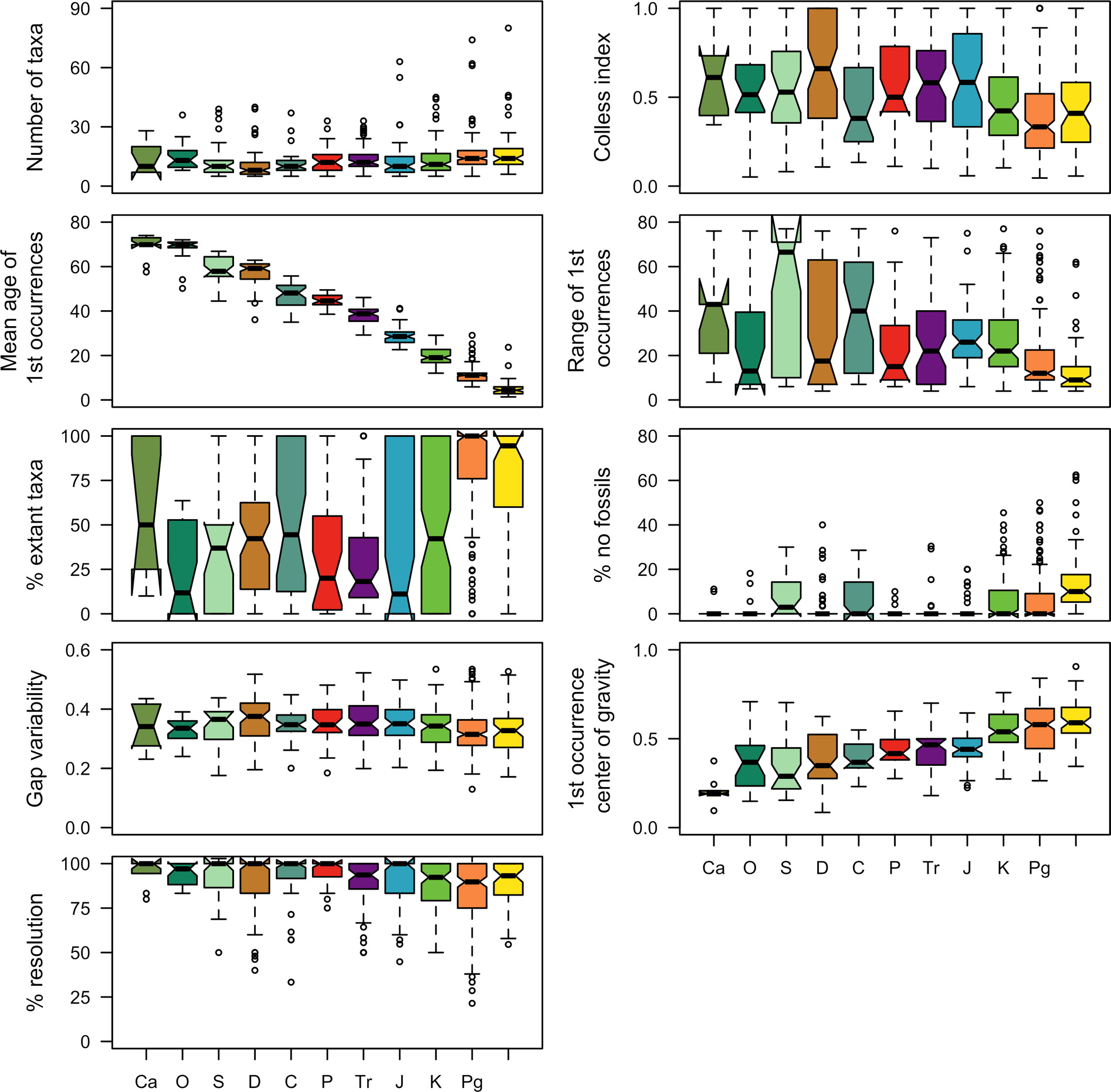
**Supplementary Figure 4.** Median indices of stratigraphic congruence (*GER, GERt, GER\*, SCI and MSM\**) vary significantly across higher taxa. Summary statistics for those trees (*n* = 443) in which all terminals have a fossil record (omitting trees in which one or more terminals are known only from the Recent). Median values are indicated by black horizontal bars, shaded areas represent upper and lower quartiles, and dashed lines connect to the most eccentric points within 1.5 interquartile ranges of the medians. Outliers are shown as circles. All polytomies resolved in reverse stratigraphic order.

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**Supplementary Figure 5.** Pairwise correlations of the *GER*\*, *GER*, *SCI*, *GERt* and *MSM*\* (all resolving polytomies in reverse stratigraphic order) for the empirical data set. Kendall’s tau τ coefficients and *p* values are shown in panels below the diagonal.



**Supplementary Figure 6.** Taxonomic composition of our empirical sample of 647 cladograms through the periods of the Phanerozoic. Trees are assigned to periods according to the mean origination date of their constituent taxa. Abbreviations: Ca, Cambrian; O, Ordovician; S, Silurian; D, Devonian; C, Carboniferous; P, Permian; Tr, Triassic; J, Jurassic; K, Cretaceous; Pg, Palaeogene; Ng, Neogene.



**Supplementary Figure 7.** Variation in nine of the independent variables reasoned or demonstrated empirically to influence stratigraphic congruence, partitioned by geological period. Trees are dated according to the mean first occurrence date of their constituent taxa. Median values are indicated by black horizontal bars, shaded areas represent upper and lower quartiles, and dashed lines connect to the most eccentric points within 1.5 interquartile ranges of the medians. Outliers are shown as circles. Abbreviations: Ca, Cambrian; O, Ordovician; S, Silurian; D, Devonian; C, Carboniferous; P, Permian; Tr, Triassic; J, Jurassic; K, Cretaceous; Pg, Palaeogene; Ng, Neogene.

Supplementary table 1.

|  |  |  |  |
| --- | --- | --- | --- |
| **Simulation** | **Tree topology** | **Number of different first occurrence dates** | **Distributions of first occurrence dates**  **All distributed across 128 equally spaced stratigraphic intervals** |
| 1-3 | Fully balanced | 4 | *1. Symmetrical* – 16 terminals at each of 4 evenly spaced intervals  *2. Bottom-heavy* – 16 terminals at each of 3 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 16 terminals at each of 3 youngest intervals and 1 terminal at the oldest interval |
| 4-6 | Fully balanced | 8 | *1. Symmetrical* – 8 terminals at each of 8 evenly spaced intervals  *2. Bottom-heavy* – 8 terminals at each of 7 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 8 terminals at each of 7 youngest intervals and 1 terminal at the oldest interval |
| 7-9 | Fully balanced | 16 | *1. Symmetrical* – 4 terminals at each of 16 evenly spaced intervals  *2. Bottom-heavy* – 4 terminals at each of 15 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 4 terminals at each of 15 youngest intervals and 1 terminal at the oldest interval |
| 10-12 | Fully balanced | 32 | *1. Symmetrical* – 2 terminals at each of 32 evenly spaced intervals  *2. Bottom-heavy* – 2 terminals at each of 31 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 2 terminals at each of 31 youngest intervals and 1 terminal at the oldest interval |
| 13-15 | Fully balanced | 64 | *1. Symmetrical* – 1 terminal at every 2nd interval  *2. Bottom-heavy* – 1 terminal at each of 63 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 1 terminal at each of 63 youngest intervals and 1 terminal at the oldest interval |
| 16-18 | Fully pectinate | 4 | *1. Symmetrical* – 16 terminals at each of 4 evenly spaced intervals  *2. Bottom-heavy* – 16 terminals at each of 3 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 16 terminals at each of 3 youngest intervals and 1 terminal at the oldest interval |
| 19-21 | Fully pectinate | 8 | *1. Symmetrical* – 8 terminals at each of 8 evenly spaced intervals  *2. Bottom-heavy* – 8 terminals at each of 7 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 8 terminals at each of 7 youngest intervals and 1 terminal at the oldest interval |
| 22-24 | Fully pectinate | 16 | *1. Symmetrical* – 4 terminals at each of 16 evenly spaced intervals  *2. Bottom-heavy* – 4 terminals at each of 15 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 4 terminals at each of 15 youngest intervals and 1 terminal at the oldest interval |
| 25-27 | Fully pectinate | 32 | *1. Symmetrical* – 2 terminals at each of 32 evenly spaced intervals  *2. Bottom-heavy* – 2 terminals at each of 31 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 2 terminals at each of 31 youngest intervals and 1 terminal at the oldest interval |
| 28-30 | Fully pectinate | 64 | *1. Symmetrical* – 1 terminal at every 2nd interval  *2. Bottom-heavy* – 1 terminal at each of 63 oldest intervals and 1 terminal at the youngest interval  *3. Top-heavy* – 1 terminal at each of 63 youngest intervals and 1 terminal at the oldest interval |

**Supplementary table 1.** Tree topology, and number and distribution of first occurrence dates in each of 30 simulated data sets.Supplementary table 2.

Separate Excel file

**Supplementary table 2.** Summary statistics for each of the 647 empirical data sets used in the study. References below. Taxonomic rank codes: species (1), genus (2), family (3), order (4), class (5), and phylum or above (6). Super and sub ranks were subsumed into the rank to which they referred (e.g., subfamilies and superfamilies were all referred to families).

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Supplementary table 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | ***GER*** | ***GERt*** | ***GER\**** | ***SCI*** | ***MSM\**** |
| Number of taxa |  | 4.2e-04 | 3.2e-02 | 5.3e-01 | < 2.0e-16 |
| Colless index |  |  |  | 6.0e-04 | 4.6e-02 |
| Percentage resolution | 9.9e-07 |  |  | 1.2e-05 | 2.3e-06 |
| Mean age of first occurrences |  |  |  | 1.3e-01 |  |
| Range of ages of first occurrences | 4.1e-03 | 1.2e-01 | 5.3e-02 |  | 1.4e-06 |
| First occurrence centre of gravity | < 2.0e-16 | 3.8e-13 | 1.9e-08 | 9.9e-02 | 9.9e-02 |
| Gap variability |  |  |  |  | 2.1e-02 |
| Percentage no fossils | 8.8e-08 | 5.9e-07 | 4.3e-03 | 9.8e-02 | 1.9e-06 |
| Percentage extant taxa | 1.4e-09 | 3.4e-08 | 8.9e-07 | 2.7e-15 | 4.0e-09 |
| Taxonomic rank | 3.0e-01 |  |  |  | 1.8e-01 |
| Taxonomic group | 1.6e-01 | 1.7e-01 | 2.1e-01 | 2.2e-01 | 7.6e-02 |
| **Proportion of deviance explained (%)** | **38.7** | **11.3** | **3.8** | **24.6** | **58.0** |

**Supplementary table 3.** Summary of results from minimum adequate general linear models of each of five indices of stratigraphic congruence (*GER*\*, *GER*, *SCI*, *GERt* and *MSM*\*, calculated by resolving polytomies in stratigraphic order) for 647 empirical trees modelled in terms of nine independent variables without interactions. White cell = significant parameter (*p* < 0.05); gray cell = non-significant parameter (*p* > 0.05) still included in minimum adequate model; black shading indicates parameter not included in final model.

Supplementary table 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | ***GER*** | ***GERt*** | ***GER\**** | ***SCI*** | ***MSM\**** |
| Number of taxa | 9 | 8 | 9 | 8 | 1 |
| Colless’ index | 8 | 9 | 7 | 3 | 4 |
| Percentage resolution | 10 | 11 | 10 | 7 | 10 |
| Mean age of first occurrences | 4 | 5 | 2 | 2 | 5 |
| Range of first occurrences | 3 | 2 | 3 | 4 | 6 |
| First occurrence center of gravity | 1 | 1 | 1 | 5 | 3 |
| Gap variability | 7 | 7 | 5 | 6 | 2 |
| Percentage no fossils | 6 | 6 | 8 | 10 | 9 |
| Percentage extant taxa | 5 | 4 | 4 | 1 | 7 |
| Taxonomic rank | 11 | 10 | 11 | 11 | 11 |
| Taxonomic group | 2 | 3 | 6 | 9 | 8 |

**Supplementary table 4.** Results of random forest analyses for the five indices of congruence (*GER\**, *GER*, *SCI*, *GERt* and *MSM\**) calculated with polytomies resolved stratigraphically. Independent variables are ranked in importance from 1 (highest importance) to 10 (lowest importance).

Supplementary table 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | ***GER*** | ***GERt*** | ***GER\**** | ***SCI*** | ***MSM\**** |
| Number of taxa |  | 9.6e-06 | 9.4e-02 |  | < 2.0e-16 |
| Colless index |  |  |  | 7.9e-04 | 2.5e-03 |
| Percentage resolution | 3.0e-06 | 4.0e-03 | 1.5e-01 | < 2.0e-16 | 3.8e-02 |
| Mean age of first occurrences | 5.5e-03 | 2.3e-02 |  | 3.0e-02 | 4.8e-02 |
| Range of first occurrences |  |  |  | 1.2e-02 | 6.1e-04 |
| First occurrence center of gravity | < 2.0e-16 | 6.0e-13 | 2.2e-07 |  | 3.6e-04 |
| Gap variability | 4.0e-02 |  |  |  | 2.7e-02 |
| Percentage no fossils | 5.8e-11 | 2.6e-09 | 6.1e-04 |  | 1.4e-07 |
| Percentage extant taxa | 4.0e-15 | 7.2e-12 | 3.7e-06 | 4.4e-14 | 1.9e-11 |
| Taxonomic rank | 1.9e-01 | 2.1e-01 |  | 4.6e-01 | 7.5e-02 |
| **Proportion of deviance explained (%)** | **30.6** | **8.5** | **1.5** | **25.4** | **58.8** |

**Supplementary table 5.** Summary of results from minimum adequate general linear models of each of five indices of stratigraphic congruence (*GER*\*, *GER*, *SCI*, *GERt* and *MSM*\*, calculated by resolving polytomies in reverse stratigraphic order) for 647 empirical trees modelled in terms of ten independent variables (omitting taxonomic group *a priori*), without interactions. White cell = significant parameter (*p* < 0.05); gray cell = non-significant parameter (*p* > 0.05) still included in minimum adequate model; black shading indicates parameter not included in final model.

Supplementary table 6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | ***GER*** | ***GERt*** | ***GER\**** | ***SCI*** | ***MSM\**** |
| Number of taxa |  | 8.8e-05 | 5.6e-02 | 6.0e-01 | < 2.0e-16 |
| Colless index |  |  |  | 1.6e-03 | 6.5e-03 |
| Percentage resolution | 1.3e-06 |  |  | 1.3e-05 | 3.6e-07 |
| Mean age of first occurrences | 8.1e-03 | 3.2e-02 |  | 7.6e-01 | 3.4e-02 |
| Range of ages of first occurrences |  |  |  | 4.9e-04 | 2.9e-03 |
| First occurrence center of gravity | < 2.0e-16 | 7.1e-15 | 1.8e-09 |  | 6.8e-03 |
| Gap variability |  |  |  |  | 2.8e-02 |
| Percentage no fossils | 3.7e-12 | 6.8e-10 | 3.2e-05 |  | 5.2e-08 |
| Percentage extant taxa | 4.7e-15 | 1.1e-12 | 1.2e-09 | < 2.0e-16 | 1.2e-12 |
| Taxonomic rank | 1.5e-01 | 1.9e-01 |  |  | 6.5e-02 |
| **Proportion of deviance explained (%)** | **34.5** | **10.3** | **3.0** | **24.2** | **58.0** |

**Supplementary table 6.** Summary of results from minimum adequate general linear models of each of five indices of stratigraphic congruence (*GER*\*, *GER*, *SCI*, *GERt* and *MSM*\*, calculated by resolving polytomies stratigraphically) for 647 empirical trees modelled in terms of ten independent variables (omitting taxonomic group *a priori*), without interactions. White cell = significant parameter (*p* < 0.05); gray cell = non-significant parameter (*p* > 0.05) still included in minimum adequate model; black shading indicates parameter not included in final model.

Supplementary table 7

|  |  |
| --- | --- |
| **Index** | **Groups** |
| ***GER*** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Tetrapods |
| Echinoderms-Fishes |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***GERt*** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Tetrapods |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Tetrapods-Fishes |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***GER\**** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Tetrapods |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***SCI*** | Arthropods-Echinoderms |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Fishes-Molluscs |
| Fishes-Plants |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***MSM\**** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Molluscs |
| Arthropods-Plants |
| Echinoderms-Molluscs |
| Echinoderms-Tetrapods |
| Fishes-Molluscs |
| Fishes-Tetrapods |
| Molluscs-Plants |
| Tetrapods-Molluscs |
| Tetrapods-Plants |

**Supplementary table 7.** There are significant differences in all indices of stratigraphic congruence partitioned across higher taxonomic groups. Table summarizes Nemenyi-Damico-Wolfe-Dunn post-hoc test results for each of five GLMs (*GER\*, GER, SCI, GERt and MSM\**, calculated by resolving polytomies in reverse stratigraphic order), listing taxonomic group comparisons for which the null hypothesis of identical medians can be rejected with p < 0.05.

Supplementary table 8

|  |  |
| --- | --- |
| **Index** | **Groups** |
| ***GER*** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Molluscs |
| Arthropods-Tetrapods |
| Echinoderms-Fishes |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Tetrapods-Fishes |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***GERt*** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Tetrapods |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Tetrapods-Fishes |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***GER\**** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Tetrapods |
| Echinoderms-Molluscs |
| Echinoderms-Plants |
| Tetrapods-Molluscs |
| Tetrapods-Plants |
| ***SCI*** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Tetrapods |
| Echinoderms-Molluscs |
| Tetrapods-Molluscs |
| ***MSM\**** | Arthropods-Echinoderms |
| Arthropods-Fishes |
| Arthropods-Plants |
| Arthropods-Tetrapods |
| Echinoderms-Molluscs |
| Echinoderms-Tetrapods |
| Fishes-Molluscs |
| Fishes-Tetrapods |
| Molluscs-Plants |
| Tetrapods-Molluscs |
| Tetrapods-Plants |

**Supplementary table 8.** There are significant differences in all indices of stratigraphic congruence partitioned across higher taxonomic groups. Many of these differences are retained (but less significant) when the effects of nine independent variables (omitting taxonomic group) are modelled out using a minimum adequate GLM. Table summarizes Nemenyi-Damico-Wolfe-Dunn post-hoc test results for each of five GLMs (*GER\*, GER, SCI, GERt and MSM\**, calculated by resolving polytomies stratigraphically), listing taxonomic group comparisons for which the null hypothesis of identical medians can be rejected with p < 0.05.

Supplementary table 9

|  |  |
| --- | --- |
| **Index** | **Groups** |
| ***GER*** | Arthropods-Echinoderms |
| Arthropods-Plants |
| Arthropods-Tetrapods |
| Echinoderms-Fishes |
| Echinoderms-Molluscs |
| Echinoderms-Tetrapods |
| Plants-Molluscs |
| Tetrapods-Molluscs |
| ***GERt*** | Arthropods-Echinoderms |
| Echinoderms-Fishes |
| Echinoderms-Molluscs |
| Echinoderms-Tetrapods |
| ***GER\**** | Arthropods-Echinoderms |
| Echinoderms-Molluscs |
| ***MSM\**** | Arthropods-Echinoderms |
| Arthropods-Plants |
| Arthropods-Tetrapods |
| Echinoderms-Fishes |
| Echinoderms-Molluscs |
| Echinoderms-Tetrapods |
| Plants-Molluscs |

**Supplementary table 9.** Significant differences in residual indices of stratigraphic congruence, partitioned across higher taxonomic groups. The effects of nine independent variables (omitting taxonomic group) have been modelled out using a minimum adequate GLM. Table summarizes Nemenyi-Damico-Wolfe-Dunn post-hoc test results for each of five GLMs (*GER\*, GER, SCI, GERt and MSM\**, calculated by resolving polytomies in reverse stratigraphic order), listing taxonomic group comparisons for which the null hypothesis of identical medians can be rejected with p < 0.05.

Supplementary table 10

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | ***GER*** | ***GERt*** | ***GER\**** | ***SCI*** | ***MSM\**** |
| Number of taxa |  | 2.9e-05 |  |  | < 2.0e-16 |
| Colless index |  |  | 1.5e-02 | 9.5e-04 | 1.3e-02 |
| Percentage resolution | 4.3e-06 | 4.7e-03 | 4.0e-02 | < 2.0e-16 | 1.2e-02 |
| Range of first occurrences | 1.8e-03 | 5.1e-02 | 5.8e-01 |  | 1.8e-08 |
| First occurrence centre of gravity | < 2.0e-16 | 7.6e-13 | 3.2e-08 | 8.0e-02 | 3.5e-03 |
| Gap variability | 4.2e-02 |  |  |  | 8.8e-03 |
| Percentage no fossils | 8.7e-08 | 3.9e-07 | 8.5e-03 |  | 1.2e-07 |
| Percentage extant taxa | 5.6e-09 | 2.3e-07 | 6.5e-05 | < 2.0e-16 | 1.4e-07 |
| Taxonomic rank | 2.9e-01 |  |  |  |  |
| Taxonomic group | 5.5e-02 | 2.0e-01 | 6.9e-02 | 2.3e-01 | 5.1e-02 |
| **Proportion of deviance explained (%)** | **35.6** | **9.3** | **2.3** | **25.4** | **58.8** |

**Supplementary table 10.** Summary of results from minimum adequate general linear models of each of five indices of stratigraphic congruence (*GER\*, GER, SCI, GERt and MSM\**, calculated assuming hard polytomies) for 647 empirical trees modelled in terms of ten independent variables (mean age of first occurrences excluded *a priori*), without interactions. White cell = significant parameter (*p* < 0.05); gray cell = non-significant parameter (*p* > 0.05) still included in minimum adequate model; black shading indicates parameter not included in final model.

Supplementary table 11

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | ***GER*** | ***GERt*** | ***GER\**** | ***SCI*** | ***MSM\**** |
| Number of taxa |  | 4.2e-04 | 3.2e-02 | 3.8e-02 | < 2.0e-16 |
| Colless index |  |  |  | 5.1e-04 | 4.6e-02 |
| Percentage resolution | 9.9e-07 |  |  | 3.3e-06 | 2.3e-06 |
| Range of ages of first occurrences | 4.1e-03 | 1.2e-01 | 5.3e-02 |  | 1.4e-06 |
| First occurrence centre of gravity | < 2.0e-16 | 3.8e-13 | 1.9e-08 | 5.1e-01 | 9.9e-02 |
| Gap variability |  |  |  |  | 2.1e-02 |
| Percentage no fossils | 8.8e-08 | 5.9e-07 | 4.3e-03 |  | 1.9e-06 |
| Percentage extant taxa | 1.4e-09 | 3.4e-08 | 8.9e-07 | < 2.0e-16 | 4.0e-09 |
| Taxonomic rank | 3.0e-01 |  |  |  | 1.8e-01 |
| Taxonomic group | 1.6e-01 | 1.7e-01 | 2.1e-01 | 1.6e-01 | 7.6e-02 |
| **Proportion of deviance explained (%)** | **38.7** | **11.3** | **3.8** | **24.2** | **58.0** |

**Supplementary table 11.** Summary of results from minimum adequate general linear models of each of five indices of stratigraphic congruence (*GER\*, GER, SCI, GERt and MSM\**, calculated by resolving polytomies stratigraphically) for 647 empirical trees modelled in terms of ten independent variables (mean age of first occurrences excluded *a priori*), without interactions. White cell = significant parameter (*p* < 0.05); gray cell = non-significant parameter (*p* > 0.05) still included in minimum adequate model; black shading indicates parameter not included in final model.

Supplementary table 12

|  |  |
| --- | --- |
| **Index** | **Groups** |
| ***MSM\**** | Cambrian-Neogene |
| Carboniferous-Neogene |
| Devonian-Cretaceous |
| Devonian-Neogene |
| Devonian-Palaeogene |
| Jurassic-Neogene |
| Jurassic-Palaeogene |
| Neogene-Ordovician |
| Neogene-Permian |
| Neogene-Silurian |
| Neogene-Triassic |
| Permian-Palaeogene |
| Palaeogene-Silurian |
| Palaeogene-Triassic |

**Supplementary table 12.** There are significant differences in the *MSM\** index (calculated assuming hard polytimes) when partitioned by geological periods (trees assigned by mean age of origination of constituent taxa). Table summarizes Nemenyi-Damico-Wolfe-Dunn post-hoc test results for the *MSM\**, listing taxonomic group comparisons for which the null hypothesis of identical medians can be rejected with p < 0.05.

Supplementary table 13

|  |  |
| --- | --- |
| **Index** | **Groups** |
| ***GERt*** | Devonian-Triassic |
| ***GER\**** | Devonian-Triassic |
| Neogene-Triassic |
| ***MSM\**** | Cambrian-Neogene |
| Devonian-Cretaceous |
| Devonian-Neogene |
| Devonian-Palaeogene |
| Jurassic-Neogene |
| Cretaceous-Neogene |
| Neogene-Ordovician |
| Neogene-Permian |
| Neogene-Silurian |
| Neogene-Triassic |

**Supplementary table 13.** There are significant differences in indices of stratigraphic congruence (calculated by resolving polytomies stratigraphically) when partitioned by geological periods (trees assigned by mean age of origination of constituent taxa). Table summarizes Nemenyi-Damico-Wolfe-Dunn post-hoc test results for the *MSM\**, *GERt* and *GER\**, listing taxonomic group comparisons for which the null hypothesis of identical medians can be rejected with p < 0.05.