Land mammals form eight functionally and climatically distinct faunas in North America but only one in Europe

Lintulaakso, Kari

2019-01

Lintulaakso , K , Polly , P D & Eronen , J 2019 , ' Land mammals form eight functionally and climatically distinct faunas in North America but only one in Europe ' , Journal of Biogeography , vol. 46 , no. 1 , pp. 185-195 . https://doi.org/10.1111/jbi.13480

http://hdl.handle.net/10138/309471
https://doi.org/10.1111/jbi.13480

unspecified
acceptedVersion

RESEARCH PAPER

Land mammals form eight functionally and climatically distinct faunas in North America but only one in Europe

Kari Lintulaakso[1,5], P. David Polly [2], Jussi T. Eronen[1,3,4]

[1] *Department of Geosciences and Geography, University of Helsinki, Finland*

[2] *Department of Earth and Atmospheric Sciences, Indiana University, Bloomington, IN 47405, USA*

[3] *BIOS Research Unit, Meritullintori 6, Helsinki, Finland*

[4] present address: Helsinki Institute of Sustainability Science, Faculty of Biological and Environmental Sciences, Ecosystems and Environment Research Programme, University of Helsinki, P.O. Box 65 (Viikinkaari 1), 00014 University of Helsinki, Finland

[4] present address: Finnish Museum of Natural History LUOMUS, P.O. Box 44 (Kumpula Manor, Jyrängöntie 2), 00014 University of Helsinki, Finland

*Correspondence: K. Lintulaakso, E-mail: kari.lintulaakso@gmail.com

Keywords: climate variables, clustering, communities, Europe, faunal sorting, functional traits, mammals, North America, species pools

Running title: Functionally distinct mammal species pools in North America and Europe

Abstract word count: 319

Main text word count: 6431

Number of references: 47

Number of tables and figures: 6

ABSTRACT

Aim

We use cluster analysis to delimit climatically and functionally distinct mammalian faunal clusters. These entities form regional species pools and are relevant to community assembly processes. Similar clusters can be differentiated in the fossil record, offering the potential for use as palaeoenvironmental proxies.

Location

North America within W 178°, W 14°, N 83°, N 7° and Europe within W 32°, E 35°, N 80°, N 35°

Major taxa studied

575 and 124 land mammal species from North America and Europe

Methods

K-means clustering was used to subdivide North America and Europe into distinct faunas ranging in number from 3 (largest scale) to 21 (smallest scale). Each set of faunas was tested for significant differences in climate (mean annual precipitation, mean annual temperature) and functional traits (body mass, locomotion and diet).

Results

In North America, climatic differentiation exists at the scale where mammals are divided into 11 or fewer distinct faunas and, in Europe, at the scale where there are five or fewer faunas.

Functional trait differentiation in body mass occurs at a larger spatial scale in North America (8 distinct faunas), but locomotor differentiation is present at all spatial scales, and dietary differentiation is not present at any scale. No significant differentiation in any functional trait at any scale was found in Europe.

Main conclusions

Faunal clusters can be constructed at any spatial scale, but clusters are climatically and functionally meaningful only at larger scales. Climatic (and environmental) differences and their associated functional trait specialisations are likely to be barriers to large-scale mixing. We argue, therefore, that functionally and climatically distinct faunal clusters are the entities that form regional species pools for community assembly processes. In North America, there are eight such mammal pools, but only one in Europe. Since the functional traits in our study are observable in the fossil record, functional trait analysis can potentially to be used to diagnose climatically distinct regions in the past.

INTRODUCTION

An important problem in biogeography is the relationship between communities, species pools, functional traits, and climate and environments (e.g., Fox and Brown, 1993; McGill *et al*., 2006). The interaction between functional traits and the environment in local community assembly has been well studied, but its role in creating larger species pools has not (but see Zobel, 1999; Zobel *et al*., 1998 for examples). A species pool is a regional group of species from which local communities are assembled (Weiher and Keddy, 2001). The species in the pool must be functionally compatible with both local and regional environments, even if they are not all ecologically compatible in the same local community. One can, therefore, define a species pool as a group of species with distinct functional traits occupying a distinct regional environment. Because species pools are the source for community assembly processes (Weiher and Keddy, 2001), not to mention the null context for the statistical evaluation of community assembly problems (e.g., Connor and Simberloff, 1979; Gotelli, 2000), it is essential to understand their geographic extent and their relationship to climate, environment, and functional traits.

Our primary purpose is to determine whether any such pools exist by identifying faunas that are compositionally, functionally, and environmentally (specifically climatic) distinct. We analysed geographic range, trait, and climate data with clustering algorithms assessed with Monte Carlo statistics to identify diagnosable faunas of mammals and to determine at what spatial scale they are differentiated with regard to climate and functional traits. Functional traits are the mechanisms by which species interact with habitats, so we expect traits like body size, locomotion, and dietary preferences to differ between regional species pools unless.

Our secondary purpose is to test Heikinheimo *et al.*'s (2007) finding that boundaries between clusters of European mammal species correspond to geographic barriers. Those authors used gridded presence/absence records of land mammals to identify spatially coherent faunal clusters that they interpreted as metacommunities whose boundaries were influenced by the interaction of natural barriers and climatic gradients. The clusters in Heikinheimo *et al*. (2007) were strongly correlated with an independent environmental zonation based on climate (Metzger *et al*., 2005). Their clusters were geographically alike in trophic structure, body mass, and risk status. Their results were especially noteworthy because their clustering methods did not take spatial adjacency into account yet produced spatially coherent clusters. The clusters differed significantly ($p < 0.05$) in pairwise ANOVA comparisons of precipitation, temperature, annual temperature range, and elevation. The authors concluded that the clusters represent metacommunities whose ranges were influenced by climatic barriers that correspond with physiographic features. Heikinheimo *et al*. (2012) later combined climate, plant and mammal data to show that clusters of these two groups are spatially linked. Coherent floristic groups (biomes) are usually associated with climate (temperature, temperature range, and rainfall), mediated by elevation differences (Holdridge, 1967; Whittaker, 1975), leading them to conclude that vegetation drives the assembly of mammalian metacommunities.

Finally, functionally differentiated species pools provide a bridge to palaeoecology and palaeoenvironment. Preservational biases make community composition at local fossil sites incomplete, but regional faunas can be usually be robustly defined because they are derived from occurrences at many sites (Eronen *et al*., 2009). Such regional fossil faunas can often be recognised through time as so-called chronofaunas (c.f., Olson 1952), and thus provide the opportunity for studying large-scale assembly dynamics of species pools. As we show below, functional differentiation manifests itself at larger spatial scales than climatic differentiation (and environmental differentiation); therefore, functional differentiation in fossil faunas should be a reasonable proxy for palaeoenvironmental differentiation.

MATERIALS AND METHODS

Geographic ranges were from *Digital Distribution Maps of the Mammals of the Western Hemisphere, 3.0* (Patterson et al., 2003), an update of Hall (1981), and from the *Atlas of European Mammals* (Mitchell-Jones et al., 1999), the same data source that Heikinheimo *et al*. (2007) used. Because our focus is on terrestrial faunas, bats and aquatic species were excluded. Non-native species were also excluded, except for the racoon dog (*Nyctereutes*) because it was not introduced but expanded into Europe from Asia. Because of their commensalism with humans, rodents *Mus* and *Rattus* were also excluded. A total of 575 and 124 species were included for the two continents respectively.

To facilitate clustering and spatial analysis, ranges were resampled using a grid of equidistant points spaced 50 km apart (Polly, 2010). This strategy avoids problems of latitudinal biases in sampling density associated with gridding by latitude and longitudinal degrees and problems of spatial scaling associated with amalgamating data contained within grid cells (Polly, 2010; Polly and Sarwar, 2014; Lawing et al., 2016).

Species occurrences, climate variables (Willmott and Legates, 1988), ecoregions (Bailey & Hogg, 1986; Bailey, 1989), and elevation (Hastings and Dunbar, 1998) were sampled using the same grid. Ecoregions are a type of biome categorisation defined as spatially localised areas with common temperature, precipitation, and vegetation that are classified hierarchically into domains, divisions and provinces. North America has four domains and 28 divisions, and Europe has three domains and 15 divisions. To assess the association between faunal clusters and biomes, the distribution of biomes in each cluster was tabulated as frequencies of its total number of grid points.

Functional traits of log body mass, locomotion, and diet were compiled for each species from PanTHERIA (Jones et al., 2009) and MammalBase, a compilation of species attributes and diets based on hundreds of published sources (Lintulaakso, 2013). Because regional pools contain a heterogeneous mix of species, we characterised the functional traits within each cluster as frequency distributions instead of as simple means and variances. The distribution of body size within a cluster was quantified as a histogram of the natural log of median body mass (in grams) (see Appendix S1 for sources) arranged in 1.0 log unit bins. Locomotion frequency was based on six substrate categories: arboreal (e.g., opossums and two-toed sloths); arboreal-terrestrial (e.g., raccoons and grey squirrels), subterranean (e.g., pocket gophers and moles), subterranean-terrestrial (*e.g.,* ground squirrels and deer mice), terrestrial (e.g., cotton-tailed rabbits and deer), and terrestrial-aquatic (e.g., beaver and otters) (Reed, 1998; Miljutin, 2009). When published sources disagreed on the substrate, the most commonly reported one was used (Appendix S1). Dietary frequencies were based on three broad specialisations, animalivorous (a combined category for carnivores and insectivores), frugivorous and herbivorous subdivided into 28 sub-categories based on specific food resources (Appendix S1).

To identify clusters, species occurrence matrices were built where rows represented 50 km grid points and columns were species (1 for presence, 0 for absence. K-means clustering (Steinhaus, 1956) was then applied. This method builds clusters by choosing k random centroids then assigning each point (row) to its nearest centroid using Euclidean distance. A new centroid is then chosen from each resulting cluster, and each point is assigned again. The procedure is repeated until the clusters stabilise or an iteration limit is reached (see Heikinheimo *et al*., 2007). K-means clustering can arrive at different solutions in successive runs of the same data, so we adopted a "*core clusters*" strategy in which points that were not consistently assigned to the same cluster in 10 randomised clustering iterations were excluded. The whole core clustering procedure was repeated for k-values between 3 and 21.

Summary statistics for each faunal cluster were calculated: area (number of grid points in the cluster x 250 km^2), number of species (standing diversity), number of endemic species (those not found in other faunal clusters), and ubiquitous species (those found in every grid point in the cluster). Endemic and ubiquitous species define the fauna's coherency such that it can be diagnosed in the real world.

We used climate and functional traits to determine at which value of *k* faunas become meaningfully differentiated. We defined "climatic units*"* as clusters with the highest value of *k* at which annual precipitation and mean annual temperature were statistically different (Appendix S2). An iterative bootstrap procedure was used to test for significance. Precipitation was logged, and both it and mean annual temperature were standardised to a mean of zero and variance of one. For each set of *k* clusters, bivariate pairwise distances between cluster means were calculated (Euclidean distance based on precipitation and temperature). Significance was tested by randomly resampling new clusters from the pooled climate data and calculating the pairwise distances between them for 1,000 iterations. The probability (P) that the real clusters are more climatically distinct than expected by chance was estimated from the proportion of random distances that were greater than or equal to the observed pairwise distance. The largest set of *k* clusters in which all clusters were significantly distinct was selected to represent the "climatic units" of this analysis (Appendix S2). To visualise climatic differences, faunal clusters were plotted in Whittaker's (1975) biome space (axes are annual precipitation and mean annual temperature) with whisker plots to show their range.

We also used bootstrapping to find the highest value of *k* for which the species trait composition (average body mass, locomotion, and diet groups) were statistically different. Here the relevant question is whether the distribution of functional traits differs between clusters, so we measured the distances between the frequency distributions (histograms) for each of the three traits for each cluster using a chi-squared distance (sum of the squared differences between values in each bin). P-values were estimated by comparing the observed distances between clusters to a null distribution of distances derived from 1,000 iterations of randomising trait variables with respect to species.

All calculations were performed in *Mathematica*© (Wolfram, 2018).

Cenograms, which are rank ordered distributions of body mass in a group of species (Valverde 1964; Legendre 1986), were used to visualise gaps in body mass distributions among the faunal clusters. Cenograms from open environments have a gap in the medium-sized species (500–8000 g), whereas closed environments have a continuous distribution (Legendre 1986). A gap is defined to be at least two-fold difference of the body mass (in g).

RESULTS

Number of climatically and functionally distinct faunas

We found eleven faunal units in North America and five in Europe that were statistically distinct in climate (annual precipitation and mean annual temperature) (Table 1; Fig. 1b, 2). We also identified eight functionally distinct faunas in North America based on trait differences in body mass and locomotion (Table 2; Fig 1a). Diet did not differ between faunas in North America at any spatial scale, nor did any of the functional traits differ among faunas in Europe at any spatial scale. In North America, there was a close correspondence between climatic and functionally distinct faunas (R=0.86 for the number of species that were ubiquitous to both climatic and functional clusters, Appendix S4; and R= 0.99 for mean annual temperature, Table 1).

C*limatically and functionally distinct faunas in North America*

North American clusters differed statistically in body mass (in *k*=5 and *k*=8, P=0.04) and locomotion (*k*=4 to 21, P < 0.02) at the level of eight clusters, making them the smallest functionally distinct faunas at the continental scale (Fig. 1a, Appendix S4, Table 1). Diet was not statistically different at any level (*k*=3 to 21, P>0.20; Appendix S3). Starting from the coldest unit to the warmest one, we describe the main findings for each cluster, which is named based on its location (Tables 1, 2).

High Arctic Canada (Cluster 5 at *k*=8 and Cluster 11 at *k*=11) is found dominantly in Bailey's Tundra and Tundra Mountains divisions (93% of the unit's area falls within these ecological divisions). The fauna is composed of three non-contiguous areas: the Alaska Peninsula (Marine Mountains division), Vancouver Island (Marine Mountains division), and the southern coast of Cuba (Savanna Mountains division). The last is a spurious association arising from absences of species in two faunally different but depauperate areas. It is the coldest (mean annual temperature -11.4 ± 5.2 °C) and driest (289 ± 273 mm year^{-1}) of the faunal clusters, and the one with the largest mammals (median mass= 933 g). Gaps occur in the cenograms (Appendix S6) between 30,000-75,000 g, 285-750 g, and 8-18 g. Terrestrial (45%) and subterranean-terrestrial (35%) species are the primary locomotion groups. High Arctic Canada has no subterranean species and the fewest arboreal-terrestrial species (9%) (Table 2).

Eastern Beringia (Cluster 8 at *k*=8 and Cluster 2 at *k*=11) is found in the Subarctic and Subarctic Mountains divisions (84% of its total area), occurring at the highest elevation (837 ± 542 m) of the Polar Domain. It is the only northern fauna with a body mass gap in large mammals, 195,000-460,000 g, and it has another gap between 285-750 g. Terrestrial (46%) and subterranean-terrestrial (33%) species are the primary locomotion groups, the terrestrial percentage being highest of all. There are no subterranean species, and the portion of arboreal species (2%) is the lowest among the faunas.

Northern High Canada (Cluster 7 at *k*=8 and Cluster 9 at *k*=11) is found in the Subarctic division (85% of its total area). It has the lowest standing diversity (49 species), none of which are endemic to it. Body mass is also large in this fauna, with a median of 747 g and it has body mass gaps between 30,000-75,000 g and 285-750 g. Terrestrial (45%) and subterranean-terrestrial (31%) species are the major locomotion groups, the subterranean-terrestrial percentage being the lowest among the faunas. There are no subterranean species, and the portion of terrestrial-aquatic species (8%) is the highest among units.

Southern Canada (Cluster 1 at *k*=8 and Cluster 6 at *k*=11) straddles the Polar domain's Subarctic division (77% of its total area) and the Humid Temperate domain's Warm Continental division (16% of its area). Median body mass is 286 g. This fauna is the only one with no gaps in mammalian body masses. Terrestrial (38%) and subterranean-terrestrial (33%) species are the primary locomotion groups.

Great Basin (Cluster 3 at *k*=8 and Cluster 8 at *k*=11) is found in the Temperate Desert and Mountains division of the Dry domain (74% of its total area). It is the second driest fauna (336±113 mm year^{-1}) and has the highest elevation (1782 ± 603 m). This fauna has the second highest number of endemic species (n=56). There are gaps between 110,000-240,000 g and 18,000-47,000 g. Subterranean-terrestrial (51%) and terrestrial (22%) species are the most common locomotor categories in this fauna, the subterranean-terrestrial percentage being the highest and terrestrial percentage being the lowest of any. The percentage of subterranean species (6%) is highest among the faunas.

Eastern US (Cluster 4 at *k*=8 and Cluster 7 at *k*=11) is found in the Hot Continental and Hot Continental Mountains divisions (71% of its total area). It is the only fauna that substantially occupies the Prairie division (22% of its area). There are gaps between 240,000-625,000 g, 110,000-240,000 g and 30,000-75,000 g. Subterranean-terrestrial (35%) and terrestrial (32%) species are the major locomotion groups.

Northern Mexico (Cluster 2 at *k*=8 and Cluster 3 at *k*=11) is found in the Tropical/Subtropical divisions (87 % of its total area). This fauna and Great Basin have similar precipitation, elevation, number of species, and a similarly high number of endemic species. However, mean temperature differs significantly (6.8 ± 2.7 °C in Great Basin and 18.2 ± 3.1 °C in Northern Mexico). There are gaps between 240,000 - 625,000 g, 110,000 - 240,000 g, and 21,000 - 47,000 g. Subterranean-terrestrial (49%) and terrestrial (23%) species are the major locomotion groups. The percentage of terrestrial-aquatic species (2%) is the lowest of any of the faunas.

Mesoamerica (Cluster 6 at *k*=8 and Cluster 4 at *k*=11) is found in the Humid Tropical domain (99 % of the units grid points). It is the warmest and wettest fauna (23.8±3.4 °C; 1737 ± 786 mm) and has the highest number of species (248) and endemics (175). Median body mass is smaller than any other fauna (73 g). There is a gap between 84,000 - 295,000 g. Subterranean-terrestrial (36% of the community composition) and terrestrial (23%) species are the most common locomotor types, and arboreal species are more common than in any other fauna (22%).

North American climatically distinct faunas that are not functionally distinct

British Columbia (Cluster 10 at *k*=11) has 95% of its area spread over four mountain divisions: Subarctic, Marine, Warm Continental, and Temperate Steppe Mountains. Mean annual temperature is 1.4±3.0 °C, and an annual precipitation is 772±451 mm year^{-1}.

Northern Rocky Mountains (Cluster 1 at *k*=11) is located in the Temperate Steppe division (90% of its total area), has a mean annual temperature of 5.6±1.7 °C, and an annual precipitation of 361±47 mm year^{-1}.

Southeastern US (Cluster 5 at *k*=11) is located in the Subtropical division (70% of its total area), has a mean annual temperature of 17.0±2.5 °C, and an annual precipitation of 1294±160 mm year^{-1}.

European climatically distinct clusters

Northern Scandinavia – Finland (Cluster 3 at *k*=5), is the only climatically distinct fauna found primarily in the Polar domain (Subarctic division, 54% of the total area). It is the coldest European fauna (1.1±2.4 °C, Table 1) and has the fewest species (62, Appendix S5).

The remaining climatically distinct European faunas belong to the Humid Temperate domain. Three of these form a stepwise temperature-precipitation continuum: **Central Europe and The Baltic countries** (Cluster 1 at *k*=5) has similar mean annual temperature as **Southern Scandinavia – UK** (Cluster 4 at *k*=5; 8.1 ± 2.0 °C, 8.2 ± 2.6 °C, respectively). However, Central Europe and The Baltic countries have a lower mean annual precipitation than the Southern Scandinavia – UK (678 ± 172 mm year^{-1}, 837 ± 284 mm year^{-1}, respectively). **France** (Cluster 2 at *k*=5) has mean annual precipitation similar to the Southern Scandinavia – UK (839 ± 187 mm year^{-1}) but a higher mean annual temperature (9.7 ± 2.5 °C). These three climatic units have quite similar numbers of species (between 83 to 87, Appendix S5) with few endemics (0 to 2, Appendix S5). Southern Scandinavia – UK and France are found in the Marine division (46% and 45% of their total areas), while the Central Europe and The Baltic countries are found in the Hot and Warm Continental division (29% of the total area). **Mediterranean** (Cluster 5 at *k*=5) belongs to the Mediterranean domain. It has the highest mean temperature of 12.4 ± 3.7 °C and the highest number of species (111), of which ten are endemic. This unit also includes Ireland, which in Bailey's system belongs to Marine division. The European areas which were never clustered (k=3 to 21) were Iceland and the Faroe Islands (*Icecap* and *Tundra Divisions* in Bailey's system, Appendix S5).

DISCUSSION

Why are European faunas not differentiated by functional traits?

One of our most intriguing results is the lack of trait differentiation among European faunas. European faunas are climatically differentiated at a similar spatial scale as North America. While North America has more climatically differentiated faunas (k=11) than Europe (k=5), that is due to continental size because the average size of the faunas is statistically equal (ANOVA $F(1,14)=0.51$, $p < 0.49$). Therefore, one might expect as much trait differentiation in Europe as in North America albeit spread over fewer clusters.

However, even though faunas on both continents are statistically distinct in climate, Europe has a narrower climate range, which may explain why there is significant differentiation in body mass (Fig. 3). North America has a broader range of mean annual temperature (-26°C to 29°C) and annual precipitation (54 mm to 4860 mm) and fills a larger climate space than Europe (-9.7°C to 18.2°C, 242 mm to 2331 mm). The only three North American faunas that overlap climatically with European ones are the Eastern US (overlaps with France and Southern Scandinavia–UK) and Southern Canada and British Columbia (overlaps with Northern Scandinavia–Finland). The remaining eight North American faunas lie outside Europe's climatic boundaries, forming three unique groups: warm and moist, dry, and cold. Similarly, the narrower range of European vegetative habitats may not facilitate locomotor sorting (North America, 28 ecoregions; Europe 15). Tropical, desert, and basin and range environments are missing entirely from Europe. Therefore, the breadth of North American environments, which includes dense tropical forests and grasslands that are absent in Europe, may exert stronger trait-based sorting effects while simultaneously the smaller number of species in Europe reduces statistical power to detect differences.

Another factor that may impact trait differentiation in European faunas is the long-term impact of humans, who have occupied Europe for more than 780 thousand years (e.g., Ashton et al., 2014). In North America, human occupation is probably less than 25 thousand years (e.g., Bourgeon et al., 2017). Hunting and landscape change can affect trait composition, as shown for locomotor traits in carnivores (Polly and Head, 2015). Further research is needed, however.

Heikinheimo et al. (2007 and 2012) argued that major physiographic features, such as rivers and mountains, defined the faunal clusters that they identified. However, their clusters were on a small spatial scale (*k*=12) than the climatically distinct ones that we recovered (*k*=5). That scale transposed into North America would be approximately *k*=21, which would be consistent with physical barriers of the same type in North America (c.f., the 28 ecoregions in North America).

Regional species pools and the hierarchy of faunal sorting in North America

As defined above, regional species pools are groups of species that inhabit large areas of similar climate and physiography and have potential to coexist in local communities (Zobel, 1999). Characteristics of a species pool are that the species cohabit the same region, are capable of reaching local habitats and have a pool of compatible traits that allow coexistence within the physical and biotic context of local communities (Zobel et al., 1998; Zobel, 1999). The clusters we identified have these properties.

Interestingly, however, climate, ecoregion, and functional traits are differentiated in a hierarchy of spatial scales (Fig. 4). Locomotor categories differ at small spatial scales in North America, similar to the physiographic scale of ecoregions. In fact, locomotor differences appear to form a hierarchy themselves because significant differences were found between *k*=21 and *k*=4. So too with ecoregion. Bailey's ecoregions are classified in a hierarchy based successively on vegetation at the small scale (e.g., dry steppes) and climate at the large scale (e.g. polar). At k=21, faunas are divided into patches of similar size to the ecoregion divisions (Appendix S4). At k=5, faunas correspond almost precisely to ecoregion climatic domains (Appendix S4: cluster 1= humid tropical domain, cluster 2= humid temperate domain, cluster 3=dry domain, and clusters 4+5=polar domain). This hierarchy suggests that the distribution of locomotor types is loosely structured by climate and at more specific levels by vegetation and physiography (echoing similar findings by Polly *et al*. 2017 for North American Carnivora).

Body mass differed at a comparatively large spatial scale (*k*=8). The proportion of large (> 8,000 g) species varied substantially between faunas at this level, making up only 5% of the fauna in the Mesoamerica and more than 24% in High Arctic Canada, Eastern Beringia, and Northern High Canada (Table 2). Median body mass of the cluster varied in parallel from 73 g in the southern fauna, 123 g - 183 g in the central faunas, and 286 g - 933 g in the northern faunas. Cenograms showed that gaps in large body mass (20,000-75,000 g, 110,000-240,000 g, and 240,000-625,000 g) were found primarily in the mid-latitude and southern faunas. All northern community clusters have a gap at 500 g, which is consistent with open environments (Legendre 1986). These patterns generally parallel Bergmann's rule (Meiri & Dayan, 2003; Blackburn & Hawkins, 2004) and latitudinal and altitudinal biodiversity gradients (c.f., Badgley and Fox, 2000; Brown, 2001; Hillebrand, 2004).

Faunas were climatically differentiated at an intermediate spatial scale of *k*=11 (Fig. 1b). We purposefully limited our consideration of climate to mean annual temperature and annual precipitation because of the link between these variables and vegetative biomes (Whittaker, 1975). Our variables do not capture all factors that influence mammalian diversity, such as seasonal temperature extremes, evapotranspiration, or elevation, which may differentiate faunas at smaller spatial scales (Badgley and Fox, 2000).

Diet did not differentiate faunas at any scale. This lack of differentiation may be because the dietary categories were too fine (Lintulaakso & Kovarovic, 2016), but is more likely because all types of diet are likely to be mixed local communities whereas body mass and locomotor specialisations have a functional relationship to climate or landscape conditions that vary geographically.

These findings suggest a hierarchy of processes involved in the formation of regional species pools and local community assembly (Fig. 4). If we define regional species pools as those faunas that are differentiated by climatic conditions, which is only one aspect of Zobel's (1999) definition, then we find that functional locomotor traits associated with mobility and thus the ability to colonise local communities are differentiated at a smaller scale that is subequal to physiographic differences. However, body mass, which is associated more with temperature and openness of habitat, is differentiated at a larger scale. These results imply a series of hierarchical filters operating across the breadth of the North American continent. The lack of body mass differentiation in Europe is consistent with this hypothesis because the scale of climatic differentiation is less there. However, the absence of locomotor differentiation among European faunas is puzzling since in North America that differentiation is found at almost all scales.

Implications for interpreting palaeontological faunas

Recovering entire local communities is notoriously problematic in palaeontology because of taphonomic filters and biases (e.g., Kidwell and Flessa, 1995; Kowalewski and Bambach, 2008).

However, delimiting regional faunas, especially ones that persist through time as chronofaunas, is arguably a more reliable enterprise in the fossil record than in the extant world because of the same spatial and time averaging affects that help mask local community compositions (e.g., Woodburne, 1987; Eronen et al., 2009).

The hierarchical distribution of faunas, climate, and functional traits provide a framework for interpreting palaeontological faunas in terms of climate. If our North American results are typical, clustering based on a combination of species occurrences, body size, and locomotor traits should correspond climatic and environmental differentiation. Spatial or temporal turnover in those faunas should, therefore, indicate climatic and environmental turnover, a hypothesis that has been borne out in the fossil record in several studies (e.g., Fortelius et al., 2002; Eronen et al., 2009; Polly and Head, 2015). This hypothesis is not necessarily contradicted by lack of functional differentiation in European faunas since they are climatically distinct; however, the lack of functional differentiation suggests caution in interpreting palaeontological faunas based on taxonomic similarity alone.

Our results suggest that the frequency of locomotor types may be a guide to palaeoenvironmental interpretation. Purely terrestrial locomotion dominates the northern faunas (38%-46% of the fauna), while subterranean-terrestrial species dominate the mid-latitude and southern faunas (35-51%). The northern faunas of Northern High Canada, High Arctic Canada, and Eastern Beringia lack subterranean species entirely, perhaps because of permafrost conditions (Brown et al., 1997). Subterranean species are found in the Southern Canada fauna, and even more frequently in the Great Basin and Northern Mexico faunas, that have varied soils associated with high topographic relief and variable conditions, both diurnally and seasonally. This combination of conditions may favour subterranean and subterranean-terrestrial species that look for shelter and food storage underground. Mesoamerica, with its tropical and subtropical forests, has a high proportion of arboreal and arboreal-terrestrial species (12% and 22% respectively). Arboreality is generally associated with dense tree cover, while arboreal-terrestrial species are associated with savanna and woodland environments (Reed 1998; Lintulaakso & Kovarovic, 2016).

Our results confirm previous studies that showed that standing diversity and body size distributions are related to climate and could thus be useful for palaeoclimatic reconstruction (e.g., Legendre, 1986; Rosenzweig, 1995; Badgley and Fox, 2000). Cold regions (mean annual temperatures < -5 °C) have fewer mammals (between 49 to 58 species), with a comparatively large proportion of > 8000 g (>24%) but fewer of < 500 g (<51%). Wetter and milder regions (700 - 1050 mm year^{-1}; 0 - 11 °C MAT) have a moderate number of species (≈ 80) with large species making up between 10 - 21% of the fauna and small species between 53 - 61%. Dry areas with low precipitation, moderate temperatures, and high elevations (300 - 500 mm year^{-1}; 6 - 20 °C; > 1400 m) have a high number of species (140 - 150) with few large (9%) and many small ones (65 - 68%). Warm and humid areas (> 23 °C, > 1700 mm year^{-1}) have many species (>240) with fewer large (5%) and more small ones (70%).

CONCLUSIONS

Species pools are a key component of functional trait ecology because they set the boundary parameters for trait-mediated community assembly processes (Zobel, 1999; Weiher and Keddy, 2001; McGill et al., 2006). We found that in North American mammals, the factors that influence the formation of regional species pools are themselves hierarchically distributed: faunas are differentiated by locomotor traits at fairly small scales, by climate at middling scales, and by body mass at larger scales. Interestingly, however, European mammal faunas are not differentiated by functional traits even though they are climatically differentiated at approximately the same scale as North American ones. We attribute this difference to the narrower European climate space and the possible imprint of anthropogenic effects on mammalian functional diversity. Paradoxically, these findings support Heikenheimo et al.'s (2007, 2012) hypothesis that faunal clusters are likely to have functional trait differentiation, but only in North America, not in Europe where Heikenheimo's study was based. The processes that result in functional, taxonomic, and climatic differentiation between faunas support the idea that clustering methods applied to taxa and traits in the fossil record can be used to measure palaeoclimatic and palaeoenvironmental differentiation through time and across space.

ACKNOWLEDGEMENTS

David Fox and two anonymous reviewers improved the manuscript. Joonas Lintulaakso helped with figures. Funding for KL came from the Emil Aaltonen Foundation and Nordenskiöld Society in Finland. Funding for PDP was provided by US National Science Foundation grant EAR 1338298 and the Prepared for Environmental Change grand challenge initiative at Indiana University.

DATA ACCESSIBILITY

Mammal ranges for North America are available at NatureServe (http://www.natureserve.org/, Patterson et al., 2003) and for Europe via Societas Europaea Mammalogica (http://www.european-mammals.org/; Mitchell-Jones et al., 1999). Point sampled data using the equidistant 50 km grid are available at http://pollylab.indiana.edu/data/. The data are also available from iCCB (www.iccbio.org). Species trait data in additional supporting information are in the supplemental files.

Biosketch

Kari Lintulaakso is a PhD student at the University of Helsinki. He specialises in recent mammals and his main interest is linking current mammalian community structures with key environmental factors that can be used in palaeoclimatological and environmental studies.

P. David Polly is a vertebrate palaeontologist and evolutionary biologist. He is interested in mammalian evolution and the responses of both species and communities to large-scale environmental and climatic changes. His specialities are functional morphology, morphometrics, quantitative evolution, spatial analysis, and carnivores.

Jussi Eronen is investigating how humankind and society are capable of solving the looming environmental and climate crisis. He has researched how past climates have developed and what are the driving mechanisms, as well what controls the terrestrial biodiversity and ecosystems structures through time.

Author contributions: The study was conceived by JTE. Data were collected by KL and JTE, and analysed by PDP and KL. The results were interpreted by all authors. Writing the article was done by all authors with the main responsibility on KL and PDP.

REFERENCES

Ashton, N., Lewis, S.G., De Groote, I., Duffy, S.M., Bates, M., Bates, R., Hoare, P., Lewis, M., Parfitt, S.A., Peglar, S. & Williams, C. (2014). Hominin footprints from early Pleistocene deposits at Happisburgh, UK. *PLoS One*, 9, e88329.

Badgley, C. & Fox, D. L. (2000) Ecological biogeography of North American mammals: species density and ecological structure in relation to environmental gradients. *Journal of Biogeography*, 27, 1437–1467.

Bailey, R. G. (1989). Explanatory supplement to ecoregions map of the continents. *Environmental Conservation*, *16*(04), 307–309.

Bailey, R. G. & Hogg, H. C. (1986). A world ecoregions map for resource reporting. *Environmental Conservation*, *13*(03), 195–202.

Blackburn, T.M. & Hawkins, B.A., 2004. Bergmann's rule and the mammal fauna of northern North America. *Ecography*, *27*(6), pp.715-724.

Bourgeon, L., Burke, A. & Higham, T. (2017). Earliest human presence in North America dated to the last glacial maximum: new radiocarbon dates from Bluefish Caves, Canada. *PLoS One*, 12, e0169486.

Brown, J.H. (2001). Mammals on mountainsides: elevational patterns of diversity. *Global Ecology and Biogeography*, 10, 101-109.

Brown, J., Ferrians, Jr., O.J, Heginbottom, J.A. & Melnikov, E.S., eds. (1997). Circum-Arctic map of permafrost and ground-ice conditions. Washington, DC: U.S. Geological Survey in Cooperation with the Circum-Pacific Council for Energy and Mineral Resources. Circum-Pacific Map Series CP-45, scale 1:10,000,000, 1 sheet.

Connor, E.F. and Simberloff, D., 1979. The assembly of species communities: chance or competition? Ecology, 60(6), pp.1132-1140.

Eronen, J.T., Ataabadi, M.M., Micheels, A., Karme, A., Bernor, R.L. & Fortelius, M. (2009). Distribution history and climatic controls of the Late Miocene Pikermian chronofauna. *Proceedings of the National Academy of Sciences*, 106, 11867-11871.

Fox, B.J. & Brown, J.H., 1993. Assembly rules for functional groups in North American desert rodent communities. Oikos, pp.358-370.

Fortelius, M., Eronen, J., Jernvall, J., Liu, L., Pushkina, D., Rinne, J., Tesakov, A., Vislobokova, I., Zhang, Z. & Zhou, L. (2002). Fossil mammals resolve regional patterns of Eurasian climate change over 20 million years. *Evolutionary Ecology Research*, 4, 1005-1016.

Gotelli, N.J. (2000). Null model analysis of species co-occurrence patterns. *Ecology*, 81, 2606-2621.

Hall, E. 1981. *The mammals of North America. Vols. 1 and 2*. John Wiley, New York.

Hastings, D. & Dunbar, P. (1998). Development and assessment of the Global Land One-km Base Elevation digital elevation model (GLOBE). *IAPRS*, 32, 218–221.

Heikinheimo, H., Fortelius, M., Eronen, J. & Mannila, H. (2007). Biogeography of European land mammals shows environmentally distinct and spatially coherent clusters. *Journal of Biogeography*, *34*(6), 1053–1064.

Heikinheimo, H., Eronen, J.T., Sennikov, A., Preston, C.D., Oikarinen, E., Uotila, P., Mannila, H. & Fortelius, M. (2012). Convergence in the distribution patterns of Europe's plants and mammals is due to environmental forcing. *Journal of Biogeography*, *39*(9), 1633–1644.

Hillebrand, H., 2004. On the generality of the latitudinal diversity gradient. *The American Naturalist*, *163*(2), 192-211.

Holdridge, L. R. (1967). *Life Zone Ecology*. San Jose, Costa Rica: Tropical Science Center.

Jones, K.E., Bielby, J., Cardillo, M., Fritz, S.A., O'Dell, J., Orme, C.D.L., Safi, K., Sechrest, W., Boakes, E.H., Carbone, C. & Connolly, C. (2009). PanTHERIA: a species□level database of life history, ecology, and geography of extant and recently extinct mammals. *Ecology*, 90, 2648–2648.

Kidwell, S.M. & Flessa, K.W. (1995). The quality of the fossil record: populations, species, and communities. *Annual Review of Ecology and Systematics*, 26, 269-299.

Kowalewski, M. & Bambach, R.K. (2008). The limits of paleontological resolution. Pp. 1-48 in Harries, P. J. (ed.), *High-Resolution Approaches in Stratigraphic Paleontology*. Springer, Dordrecht.

Lawing, A. M., Eronen, J. T., Blois, J. L., C. Graham, C. & Polly, P. D. 2016. Community functional trait composition and the effects of non-ecological processes. *Ecography*, 39, 1-13.

Legendre, S. (1986). Analysis of mammalian communities from the late Eocene and Oligocene of southern France. *Palaeovertebrata*, 16, 191-212.

Lintulaakso, K. (2013). MammalBase — database of recent mammals. http://www.mammalbase.net.

Lintulaakso, K. & Kovarovic, K. (2016). Diet and locomotion, but not body size, differentiate mammal communities in worldwide tropical ecosystems. *Palaeogeography, Palaeoclimatology, Palaeoecology*, *454*, 20–29.

McGill, B.J., Enquist, B.J., Weiher, E. & Westoby, M. (2006). Rebuilding community ecology from functional traits. *Trends in Ecology & Evolution*, 21, 178-185.

Meiri, S. & Dayan, T. (2003). On the validity of Bergmann's rule. *Journal of Biogeography*, 30, 331–351.

Metzger, M.J., Bunce, R.G.H., Jongman, R.H.G., Mücher, C.A. & Watkins, J.W. (2005). A climatic stratification of the environment of Europe. *Global ecology and biogeography*, *14*, 549–563.

Miljutin, A. (2009). Substrate utilization and feeding strategies of mammals: description and classification. *Estonian Journal of Ecology*, *58*, 60–71.

Mitchell-Jones, A.J., Mitchell, J., Amori, G., Bogdanowicz, W., Spitzenberger, F., Krystufek, B., Vohralík, V., Thissen, J., Reijnders, P., Ziman, J.M. & Stubbe, C.M. (1999). *The atlas of European mammals* (Vol. 3). London: Academic Press.

Olson, E.C. (1952). The evolution of a Permian vertebrate chronofauna. *Evolution*, 6, 181-196.

Patterson, B., Ceballos, G., Sechrest, W., Tognelli, M., Brooks, T., Luna, L., Ortega, P., Salazar, I. & Young, B. (2003). *Digital distribution maps of the mammals of the western hemisphere, ver. 3.0.* NatureServe, Arlington, http://www.natureserve.org.

Polly, P.D. (2010). Tiptoeing through the trophics: geographic variation in carnivoran locomotor ecomorphology in relation to environment. *Carnivoran evolution: new views on phylogeny, form, and function*, (ed. by A. Goswami, and A. Friscia), pp. 374–401. Cambridge University Press, Cambridge.

Polly, P. D. & Sarwar, S. (2014). Extinction, extirpation, and exotics: effects on the correlation between traits and environment at the continental level. *Annales Zoologici Fennici,* 51, 209-226.

Polly, P. D. & Head, J. J. (2015). Measuring Earth-life transitions: ecometric analysis of functional traits from late Cenozoic vertebrates. In: P. D. Polly, J. J. Head, and D. L. Fox (eds.), *Earth-Life Transitions: Paleobiology in the Context of Earth System Evolution*. The Paleontological Society Papers, 21: 21-46. Yale Press, New Haven, CT.

Polly, P. D., Fuentes-Gonzales, J., Lawing, A. M., Bormet, A. K., & Dundas, R. G. (2017). Clade sorting has a greater effect than local adaptation on ecometric patterns in Carnivora. *Evolutionary Ecology Research*, 18, 61-95.

Reed, K.E. (1998). Using large mammal communities to examine ecological and taxonomic structure and predict vegetation in extant and extinct assemblages. *Paleobiology*, 384–408.

Rosenzweig, M.L. (1995). *Species Diversity in Space and Time*. Cambridge, United Kingdon: Cambridge University Press.

Steinhaus, H. (1956). Sur la division des corp materiels en parties. *Bulletin of the Polish Academy of Sciences and Mathematics*, 4, 801–804.

Valverde, J.A. (1964). Remarques sur la structure et l'évolution des communautés de Vertébrés terrestres. *Revue d'Écologie (La Terre et La Vie)*, 111, 121–154.

Weiher, E. & Keddy, P. eds. (2001). *Ecological Assembly Rules: Perspectives, Advances, Retreats*. Cambridge, United Kingdom: Cambridge University Press.

Whittaker R. H. (1975). *Communities and Ecosystems*. New York, NY: MacMillan Publishing.

Willmott, K.M. & Legates, D.R. (1988). Global air temperature and precipitation: regridded monthly and annual climatologies (version 2.01). Newark, Delaware: Center for Climatic Research, University of Delaware.

Wolfram, Inc., 2018. Mathematica, Version 11.3, Champaign, IL.

Woodburne, M.O. ed. (1987). *Cenozoic Mammals of North America: Geochronology and Biostratigraphy*. Berkeley, California: University of California Press.

Zobel, M. (1999). The relative role of species pools in determining plant species richness: an alternative explanation of species coexistence? *Trends in Ecology and Evolution*, 12, 266-269.

Zobel, M., van der Maarel, E., & Dupré, C. (1998). Species pool: the concept, its determination and significance for community restoration. *Applied Vegetation Science*, 1, 55-66.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web-site:

Appendix S1. Mammal species list with traits (body mass, locomotion, diet)

Appendix S2. Selecting climatically distinct clusters (“climatic units”)

Appendix S3. Number of grid points in clusters and species trait statistics between clusters

Appendix S4. North American Core Clusters 3-21

Appendix S5. European Core Clusters 3-21

Appendix S6. Cenogram of North American Core Clusters at *k*=8

TABLES

Table 1. Descriptive statistics of faunal clusters. The predominant Bailey's ecoregion domain and division are indicated of each cluster with the percentage of the area of the cluster that it occupies. *No=cluster number in supplementary material at k=8, 11 (North America) and at k=5 (Europe).*

Name and abbreviation	No	Domain	% Domain	Division	% Division	Temperature (°C) ± SD	Precipitation (mm) ± SD	Elevation (m)
North American functionally distinct clusters (k=8)								
High Arctic Canada (HC)	5	Polar	97	Tundra	78	-11.4 ± 5.2	289 ± 273	270
Eastern Beringia (EB)	8	Polar	92	Subarctic Mountains	66	-5.3 ± 3.1	448 ± 294	837
Northern High Canada (NC)	7	Polar	100	Subarctic	85	-5.2 ± 1.0	560 ± 168	360
Southern Canada (SC)	1	Polar	77	Subarctic	77	0.4 ± 2.4	705 ± 242	370
Great Basin (GB)	3	Dry	98	Temperate Desert	64	6.8 ± 2.7	336 ± 113	1782
Eastern US (EU)	4	Humid Temperate	100	Hot Continental	55	10.9 ± 1.7	1036 ± 133	287
Northern Mexico (NM)	2	Dry	87	Tropical/Subtropical Desert	58	18.2 ± 3.1	441 ± 172	1479
Mesoamerica (MA)	6	Humid Tropical	99	Savanna	31	23.8 ± 3.4	1737 ± 786	620
North America climatically distinct clusters (k=11)								
High Arctic Canada (HC)	11	Polar	98	Tundra	74	-12 ± 6.0	299 ± 191	293
Eastern Beringia (EB)	2	Polar	92	Subarctic Mountains	65	-5.4 ± 3.1	445 ± 296	827
Northern High Canada (NC)	9	Polar	100	Subarctic	97	-3.7 ± 1.1	715 ± 187	348
Southern Canada (SC)	6	Polar	87	Subarctic	87	0.3 ± 1.1	616 ± 185	417
British Columbia (BC)	10	Humid Temperate	55	Warm Continental Mountains	33	1.4 ± 3.0	772 ± 451	1234
Northern Rocky Mountains (NR)	1	Dry	100	Temperate Steppe	90	5.6 ± 1.7	361 ± 47	1022

Great Basin (GB)	8	Dry	98	Temperate Desert	58	6.3 ± 3.0	355 ± 129	1790
Eastern US (EU)	7	Humid Temperate	100	Hot Continental	82	9 ± 2.0	918 ± 136	271
Southeastern US (SU)	5	Humid Temperate	99	Subtropical	69	17 ± 2.5	1294 ± 160	129
Northern Mexico (NM)	3	Dry	87	Tropical/Subtropical Desert	41	17.4 ± 3.2	478 ± 165	1262
Mesoamerica (MA)	4	Humid Tropical	100	Savanna	30	23.9 ± 3.3	1804 ± 787	576
European climatically distinct clusters (k=5)								
Northern Scandinavia – Finland (NS)	3	Polar	54	Subarctic	54	1.1 ± 2.4	700 ± 282	360
Central Europe and The Baltic countries (CE)	1	Humid Temperate	96	Hot Continental	29	8.1 ± 2.0	678 ± 172	284
Southern Scandinavia – UK (SS)	4	Humid Temperate	62	Marine	46	8.2 ± 2.6	837 ± 284	171
France (FR)	2	Humid Temperate	96	Marine	45	9.7 ± 2.5	839 ± 187	463
Mediterranean (ME)	5	Humid Temperate	71	Mediterranean	36	12.4 ± 3.7	726 ± 287	426

Table 2. Summary of eight functionally distinct North American faunal clusters. (*No=cluster number in supplementary material at k=8; n*=total number of species; *E*=number of endemic species (species not found in any other faunal cluster); *U*=number of ubiquitous species (species that are found in every grid point of the cluster); A=arboreal; *AT*=arboreal–terrestrial; *S*=subterranean; *ST*=subterranean–terrestrial; *T*= terrestrial; *TA*=terrestrial–aquatic*;* *SD*=standard deviation).

Cluster		**Species**			**Locomotor groups (%)**						**Body mass (g)**			**body mass categories (%)**		
Name and abbreviation	**No**	**n**	**E**	**U**	**A**	**AT**	**S**	**ST**	**T**	**TA**	**mean**	**SD**	**median**	**< 500**	**500 - 8000**	**> 8000**
High Arctic Canada (HC)	5	58	8	0	6.9	8.6	0.0	34.5	44.8	5.2	25222	77201	933	43.1	32.8	24.1
Eastern Beringia (EB)	8	57	2	10	1.8	12.3	0.0	33.3	45.6	7.0	24038	68951	286	50.9	22.8	26.3
Northern High Canada (NC)	7	49	0	5	2.0	14.3	0.0	30.6	44.9	8.2	41161	118484	747	49.0	24.5	26.5
Southern Canada (SC)	1	81	1	5	3.7	14.8	4.9	33.3	38.3	4.9	27962	92261	286	53.1	25.9	21.0
Great Basin (GB)	3	150	56	8	2.0	15.3	6.0	51.3	22.0	3.3	12904	67009	183	65.3	25.3	9.3
Eastern US (EU)	4	78	11	11	5.1	15.4	5.1	34.6	32.1	7.7	15355	75921	156	60.3	29.5	10.3
Northern Mexico (NM)	2	140	33	8	2.9	17.9	5.0	49.3	22.9	2.1	11144	58256	122	67.9	22.9	9.3
Mesoamerica (MA)	6	248	175	4	11.7	21.8	4.8	35.5	23.0	3.2	3584	20603	73	72.6	22.6	4.8

FIGURES

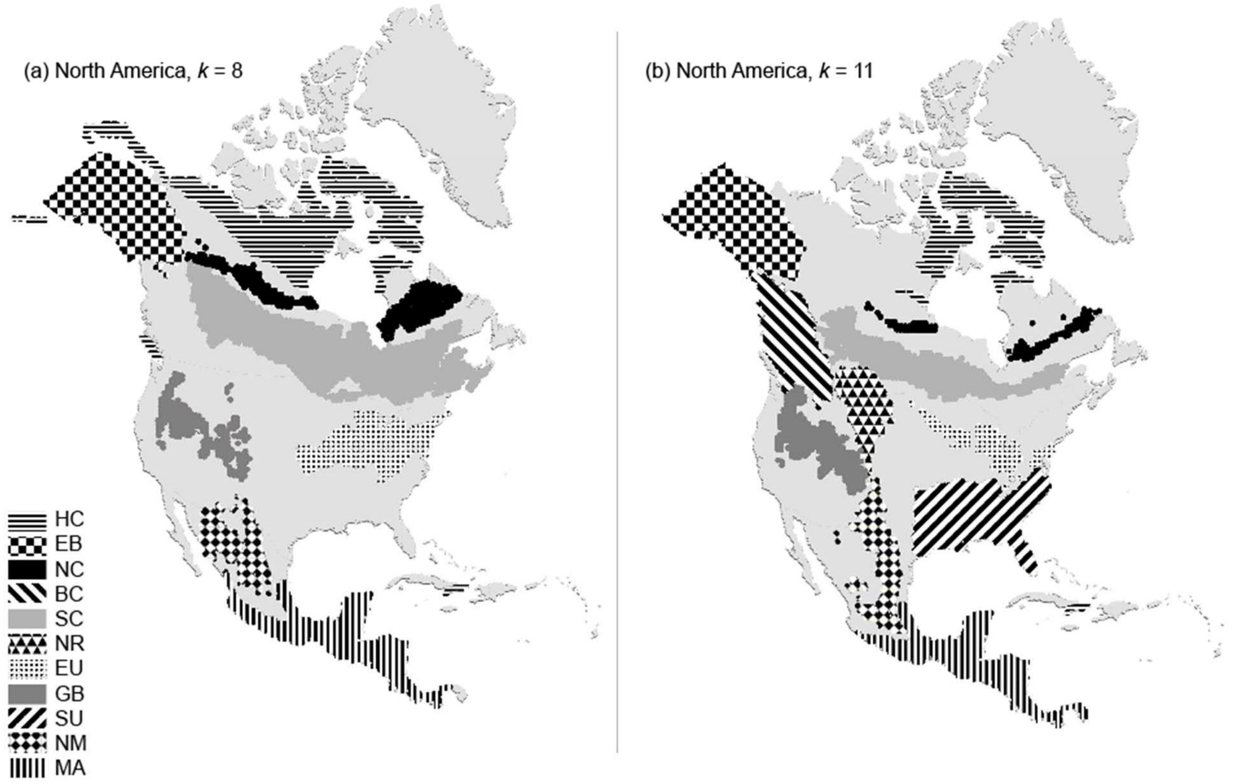


Figure 1. North American mammal community clusters based on k-means clustered species. (a) Functionally distinct faunas defined by North American community clusters at *k*=8. Each fauna differs statistically in body mass, locomotion, and climate (HC, High Arctic Canada; EB, Eastern Beringia; NC, Northern High Canada; SC, Southern Canada; EU, Eastern US; GB, Great Basin; NM, Northern Mexico; MA, Mesoamerica.). (b) Climatic units defined by North American community clusters at *k*=11. Each unit differs statistically by mean annual precipitation and mean annual temperature. (HC, High Arctic Canada; EB, Eastern Beringia; NC, Northern High Canada; BC, British Columbia; SC, Southern Canada; NR, Northern Rocky Mountains; EU, Eastern US; GB, Great Basin; SU, Southeastern US; NM, Northern Mexico; MA, Mesoamerica).

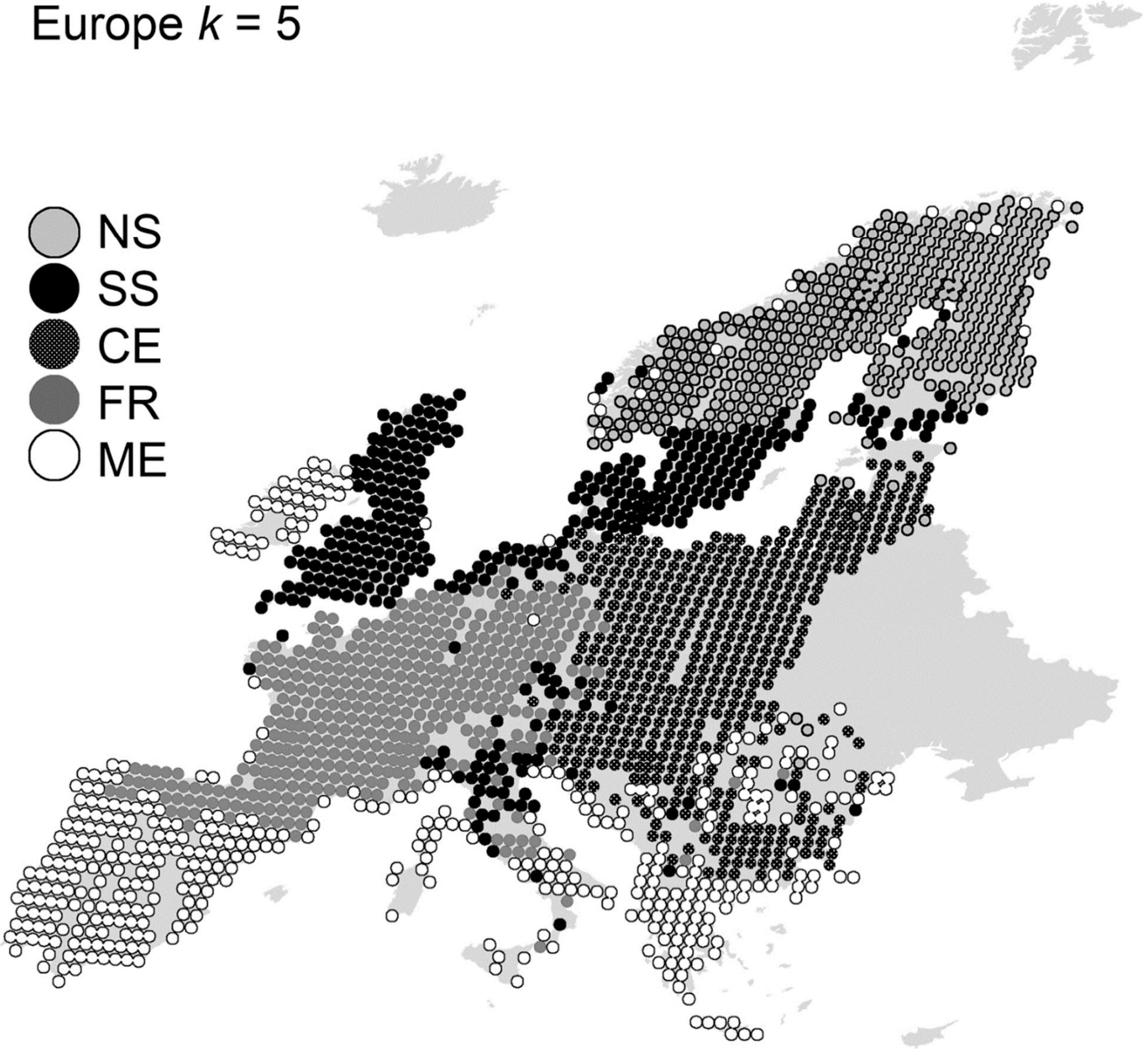


Figure 2. Climatically distinct European faunal clusters at *k*=5. Each unit differs statistically by mean annual precipitation and mean annual temperature. (NS, Northern Scandinavia – Finland; SS, Southern Scandinavia – UK; CE, Central Europe and The Baltic countries; FR, France; ME, Mediterranean).

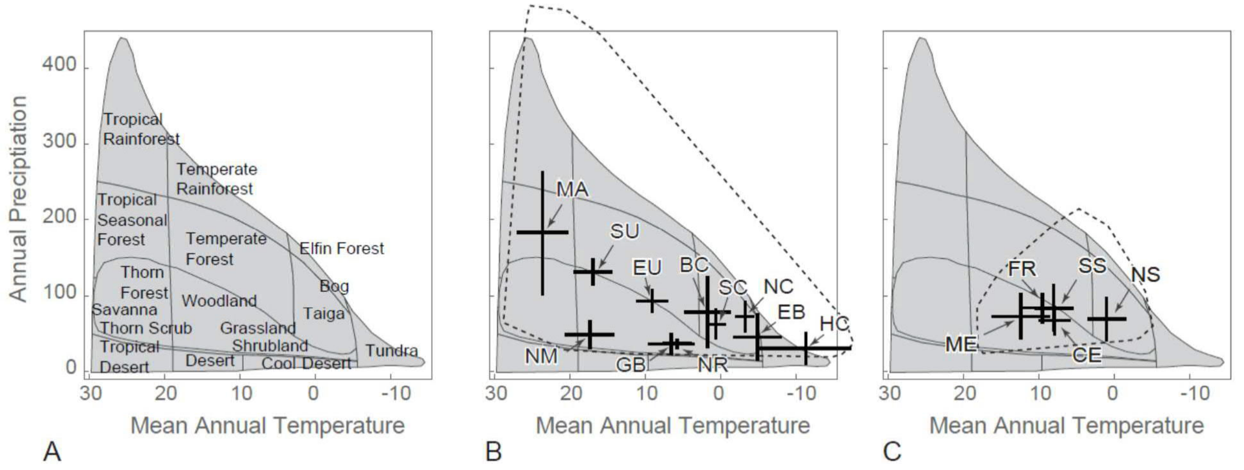


Figure 3. The faunal clusters plotted in a climate space defined by mean annual temperature and annual precipitation. (a) The climatic space that Whittaker, 1975 used to categorise vegetative biomes. North American (b) and European (c) faunal clusters shown with double box plots, corresponding to plus and minus one standard deviation of precipitation and temperature values of the grid points. The dashed areas provide a layer of continental climate ranges, the “climatic spaces”, in which all the clusters grid points belong. (BC, British Columbia; CE, Central Europe and The Baltic countries; EB, Eastern Beringia; EU, Eastern US; FR, France; GB, Great Basin; HC, High Arctic Canada; MA, Mesoamerica; ME, Mediterranean; NC, Northern High Canada; NM, Northern Mexico; NR, Northern Rocky Mountains; NS, Northern Scandinavia – Finland; SC, Southern Canada; SS, Southern Scandinavia – UK; SU, Southeastern US).

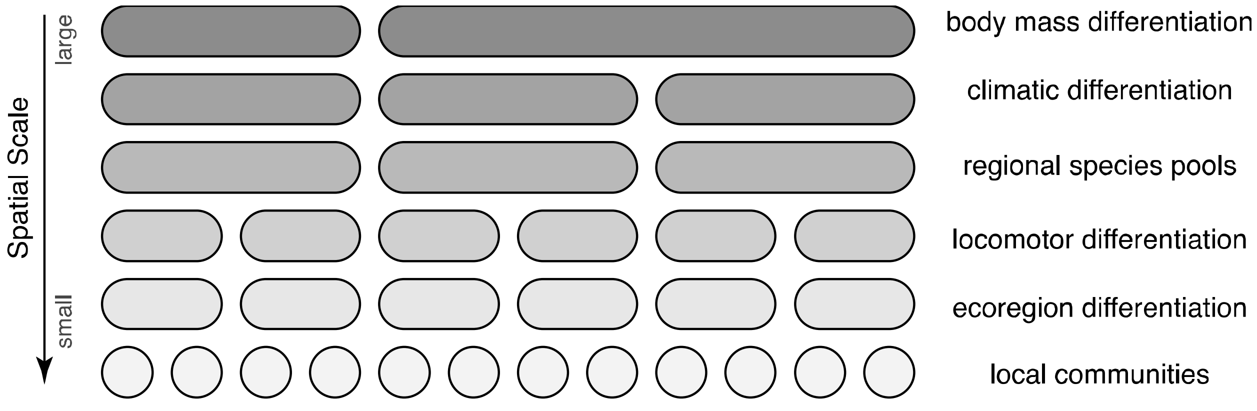
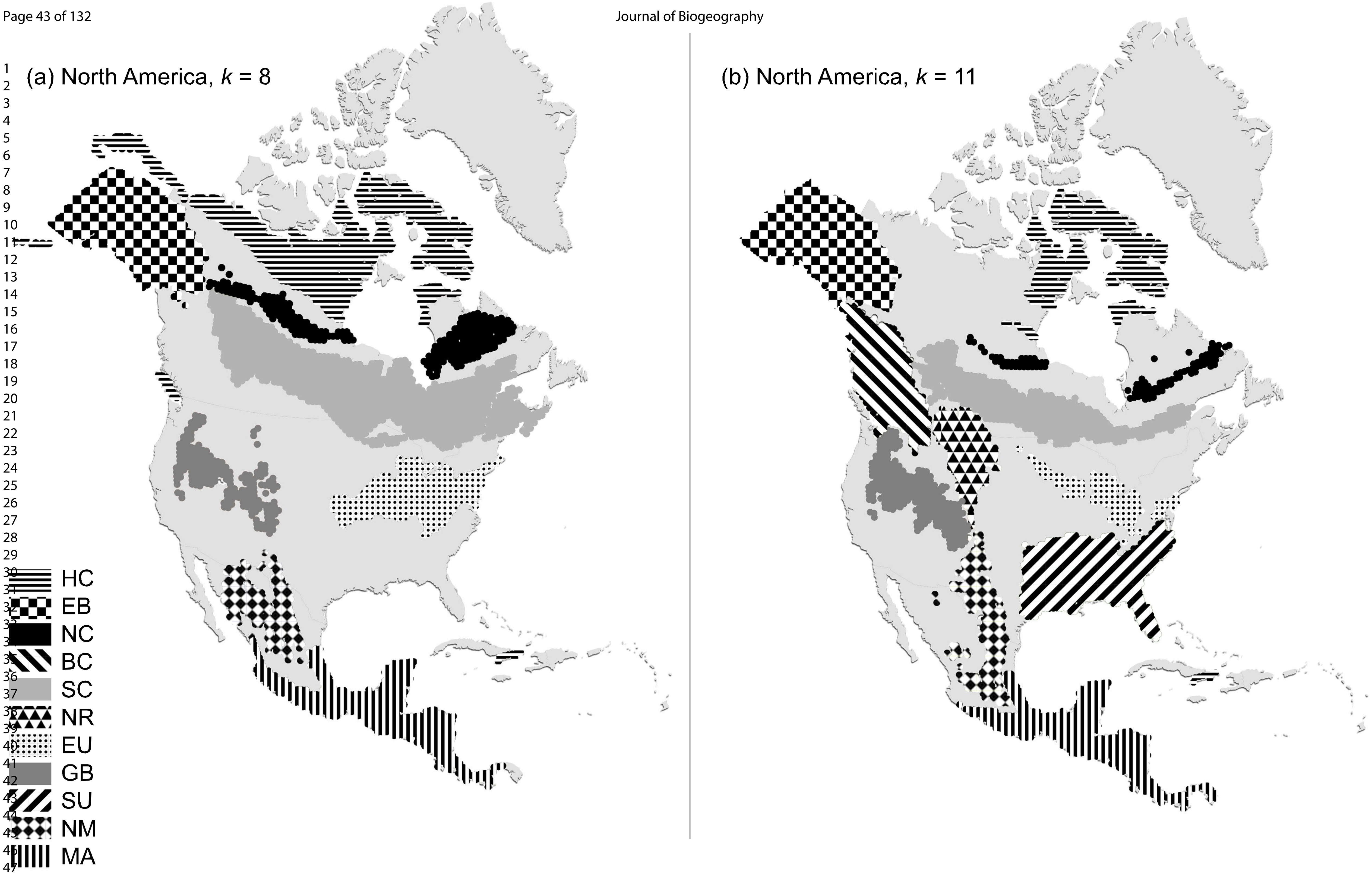
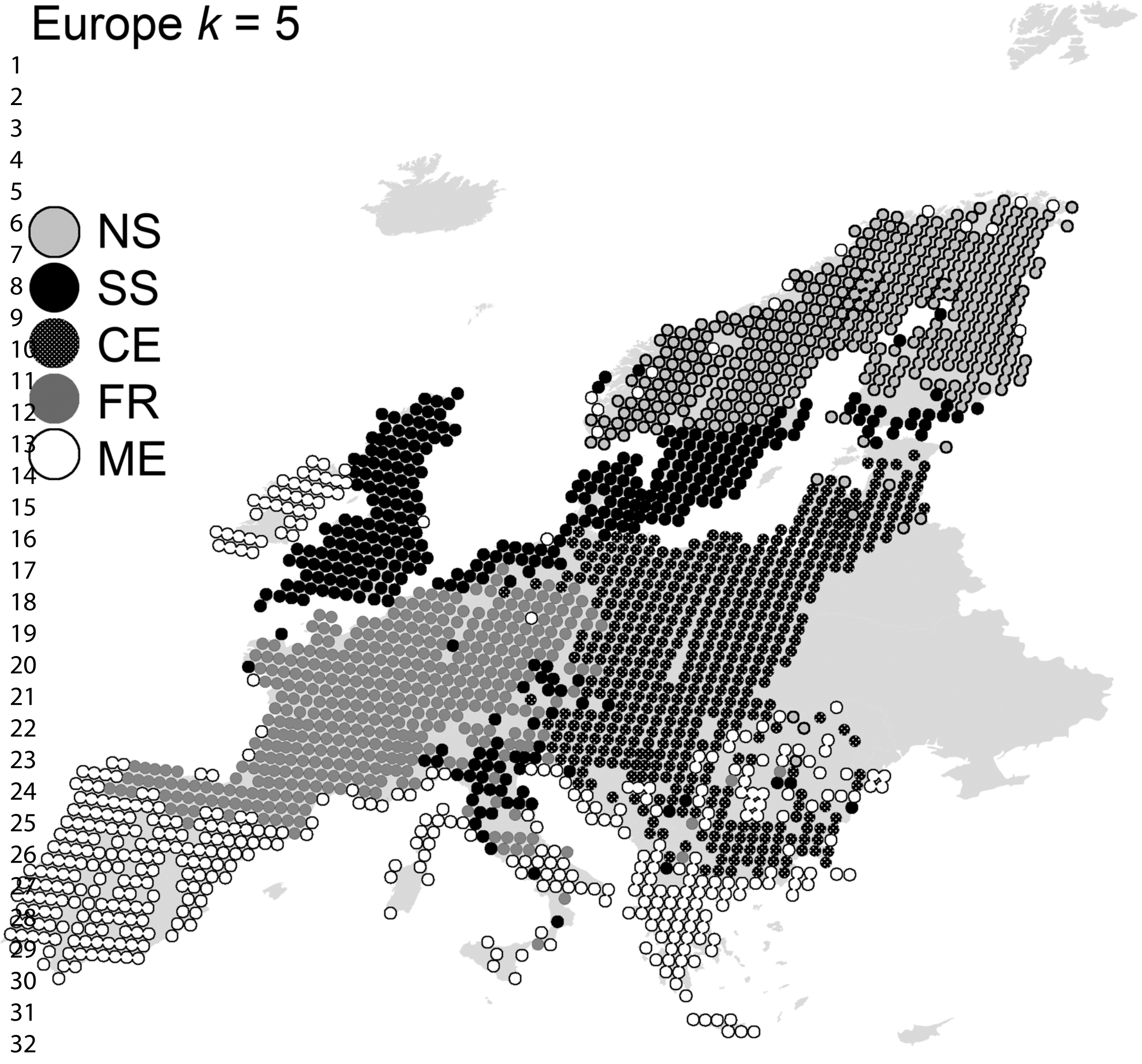


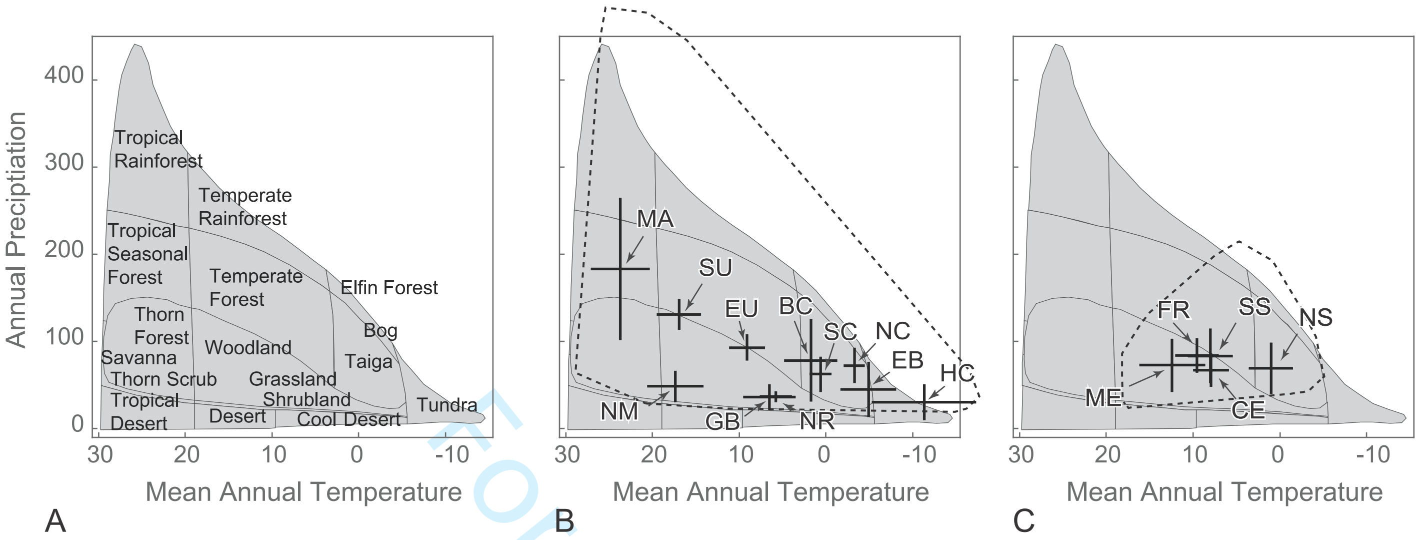
Figure 4. Diagram showing the spatial hierarchy of faunal differentiation. Local communities are

composed of subsets of the regional species pool. Regional species pools are differentiated by climate, which occurs at a larger spatial scale than locomotor differences in faunas, but a smaller scale than body mass differences.


(a) North America, $k = 8$
(b) North America, $k = 11$
HC
EB
NC
BC
SC
NR
EU
GB
SU
NM
MA



Europe $k = 5$


Annual Precipitation
400
300
200
100
0
Tropical Rainforest
Temperate Rainforest
Tropical Seasonal Forest
Temperate Forest
Elfin Forest
Thorn Forest
Bog
Savanna
Woodland
Taiga
Thorn Scrub
Grassland
Shrubland
Tundra
Tropical Desert
Desert
Cool Desert
30
20
10
0
-10
Mean Annual Temperature
A
MA
SU
EU
BC
SC
NC
EB
HC
NM
GB
NR
Mean Annual Temperature
B
FR
SS
NS
ME
CE
Mean Annual Temperature
C

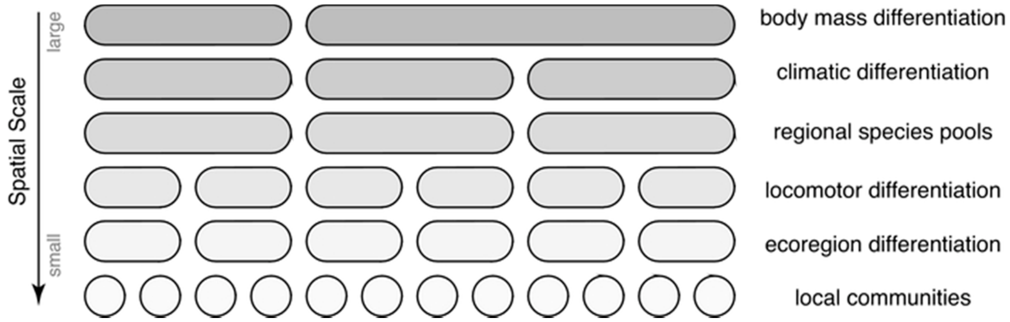


Figure 4. Diagram showing the spatial hierarchy of faunal differentiation. Local communities are composed of subsets of the regional species pool. Regional species pools are differentiated by climate, which occurs at a larger spatial scale than locomotor differences in faunas, but a smaller scale than body mass differences.

59x18mm (300 x 300 DPI)

Species list for Europe

Order	Family	Subfamily	Genus	Species	Body mass (g)	Locomotion	Diet	References
RODENTIA	Sciuridae	Sciurinae	Sciurus	vulgaris	333	Arboreal-Terrestrial	Gr	9, 29, 38, 41, 45, 48
				anomalus	600	Arboreal-Terrestrial	Gr	38, 41, 45
			Pteromys	volans	143	Arboreal	GrA	17, 18, 38, 45
		Callosciurinae	Callosciurus	erythraeus	283	Arboreal-Terrestrial	FA	17, 29, 45
				finlaysonii	325	Arboreal-Terrestrial	FA	17, 19, 45
		Xerinae	Atlantoxerus	getulus	251	Subterranean-Terrestrial	FGr	17, 29, 38
			Marmota	marmota	4059	Subterranean-Terrestrial	B	9, 17, 29
			Spermophilus	citellus	396	Subterranean-Terrestrial	GrA	9, 17, 29
				suslicus	252	Subterranean-Terrestrial	GrA	17, 19, 21
			Tamias	sibiricus	94	Subterranean-Terrestrial	FA	9, 17, 29
	Gliridae	Leithiinae	Dryomys	nitedula	30	Arboreal	GrA	9, 21, 45
			Eliomys	quercinus	115	Arboreal-Terrestrial	FA	38, 48
			Myomimus	roachi	37	Subterranean-Terrestrial	GrA	52
		Glirinae	Glis	glis	128	Arboreal	GrA	9, 38, 45
	Castoridae		Castor	fiber	19000	Terrestrial-Aquatic	B	42, 48
	Dipodidae	Sicistinae	Sicista	betulina	9	Terrestrial	GrA	7, 9, 38
				subtilis	12	Terrestrial	GrA	7, 19
	Spalacidae	Spalacinae	Spalax	graecus	393	Subterranean	R	32, 34
				leucodon	189	Subterranean	R	9, 42, 43
	Cricetidae	Arvicolinae	Arvicola	amphibius	120	Terrestrial-Aquatic	B	9, 38, 50
				sapidus	220	Terrestrial-Aquatic	G	38, 48
			Chionomys	nivalis	42	Terrestrial	G	9
			Dinaromys	bogdanovi	56	Terrestrial	BG	9, 38
			Lemmus	lemmus	68	Subterranean-Terrestrial	B	9, 51
			Microtus	agrestis	36	Subterranean-Terrestrial	GB	25, 38, 48
				arvalis	27	Subterranean-Terrestrial	GB	9, 25, 38, 48
				cabrerae	53	Subterranean-Terrestrial	GB	21, 51
				guentheri	50	Subterranean-Terrestrial	GB	7, 9
				levis	35	Subterranean-Terrestrial	GB	21, 51
				tatricus	40	Subterranean-Terrestrial	GB	7
				bavaricus	63	Subterranean-Terrestrial	GB	21, 51

Species list for Europe

				duodecimcostatus	23	Subterranean-Terrestrial	GB	7, 48
				felteni	25	Subterranean-Terrestrial	GB	51
				gerbei	21	Subterranean-Terrestrial	GB	51
				lusitanicus	63	Subterranean-Terrestrial	GB	48, 51
				multiplex	23	Subterranean-Terrestrial	GB	7, 21, 38
				savii	20	Subterranean-Terrestrial	GB	21, 51
				subterraneus	18	Subterranean-Terrestrial	GB	7, 9
				thomasi	63	Subterranean-Terrestrial	GB	51
				oeconomus	33	Subterranean-Terrestrial	GB	7, 25
			Myodes	glareolus	21	Subterranean-Terrestrial	GrA	21, 48
				rufocanus	36	Terrestrial	GrA	21, 38
				rutilus	20	Terrestrial	BA	21, 38
			Myopus	schisticolor	30	Terrestrial	B	50
		Cricetinae	Cricetulus	migratorius	31	Subterranean-Terrestrial	Gr	9, 22, 38, 51
			Cricetus	cricetus	429	Subterranean-Terrestrial	GrA	38, 50
			Mesocricetus	newtoni	98	Subterranean-Terrestrial	BA	21
	Muridae	Deomyinae	Acomys	minous	63	Arboreal-Terrestrial	IB	19, 21, 51
		Murinae	Apodemus	agrarius	21	Subterranean-Terrestrial	RA	9, 19, 51
				alpicola	24	Subterranean-Terrestrial	RA	19, 51
				flavicollis	32	Subterranean-Terrestrial	RA	9, 19, 51
				mystacinus	44	Subterranean-Terrestrial	RA	9, 19, 51
				sylvaticus	22	Subterranean-Terrestrial	RA	48
				uralensis	18	Subterranean-Terrestrial	RA	19, 21, 51
			Micromys	minutus	7	Terrestrial	BA	9, 48, 50
	Hystricidae		Hystrix	cristata	13406	Subterranean-Terrestrial	BA	9, 38, 39, 43
LAGOMORPHA	Leporidae		Lepus	capensis	2047	Terrestrial	G	38, 39, 48
				corsicanus	4618	Terrestrial	G	19, 34
				granatensis	2324	Terrestrial	G	48
				timidus	3105	Terrestrial	G	25, 38
				castroviejoi	2822	Terrestrial	GB	19, 21
				europaeus	3816	Terrestrial	G	7, 9, 38
ERINACEOMORPHA	Erinaceidae	Erinaceinae	Atelerix	algirus	904	Terrestrial	IC	7, 9, 38

Species list for Europe

			Erinaceus	concolor	666	Terrestrial	IC	9, 38
				europaeus	778	Subterranean-Terrestrial	IC	25, 48
SORICOMORPHA	Soricidae	Crocidurinae	Crocidura	canariensis	8	Terrestrial	IC	9, 19, 51
				leucodon	11	Subterranean-Terrestrial	IC	9, 21, 50
				russula	10	Terrestrial	IC	25, 48, 50
				russula	10	Terrestrial	IC	25, 48, 50
				sicula	37	Terrestrial	IC	19, 51
				suaveolens	7	Terrestrial	IC	38, 48, 50
				zimmermanni	37	Terrestrial	IC	19, 51
			Suncus	etruscus	2	Terrestrial	I	48, 50
		Soricinae	Neomys	anomalus	13	Terrestrial-Aquatic	IC	25, 38, 48, 50
				fodiens	15	Terrestrial-Aquatic	IC	25, 38, 48, 50
			Sorex	minutissimus	2	Terrestrial	IC	38, 50
				alpinus	8	Terrestrial	IC	38, 50
				araneus	9	Subterranean-Terrestrial	IC	9, 38, 50
				caecutiens	6	Terrestrial	IC	38, 50
				coronatus	9	Terrestrial	IC	9, 21
				granarius	6	Terrestrial	IC	48
				isodon	12	Terrestrial	IC	21, 38
				minutus	4	Terrestrial	IC	38, 48, 50
				samniticus	8	Terrestrial	IC	19, 21
	Talpidae	Talpinae	Galemys	pyrenaicus	60	Terrestrial-Aquatic	I	38, 48
			Talpa	caeca	71	Subterranean	IC	48
				europaea	88	Subterranean	IC	38, 48
				occidentalis	49	Subterranean	IC	21, 32
				romana	93	Subterranean	IC	38, 48
				stankovici	71	Subterranean	IC	21, 32
CARNIVORA	Felidae	Felinae	Felis	silvestris	4573	Arboreal-Terrestrial	CI	12, 48
			Lynx	lynx	19300	Arboreal-Terrestrial	C	12, 37
				pardinus	11050	Arboreal-Terrestrial	C	9, 37, 38, 48
	Viverridae	Viverrinae	Genetta	genetta	1756	Terrestrial	CI	8, 9, 10, 39, 48
	Canidae		Canis	aureus	9659	Terrestrial	CB	12, 37, 39, 46

Species list for Europe

				lupus	31757	Terrestrial	CI	12, 37, 38, 44, 46, 48
			Nyctereutes	procyonoides	4215	Terrestrial	CB	10, 12, 37, 44, 46
			Vulpes	lagopus	3584	Terrestrial	CI	9, 10, 12, 37, 44
				vulpes	4820	Terrestrial	C	9, 10, 12, 37, 44, 46, 48
	Ursidae		Ursus	arctos	196288	Terrestrial	CB	9, 12, 37, 38, 48
	Mustelidae	Lutrinae	Lutra	lutra	8869	Terrestrial-Aquatic	C	9, 12, 25, 48
		Mustelinae	Gulo	gulo	12793	Arboreal-Terrestrial	C	9, 10, 25, 38, 43, 46
			Martes	foina	1675	Arboreal-Terrestrial	CB	37, 48
				martes	1300	Arboreal-Terrestrial	CB	12, 25, 45
			Meles	meles	11884	Subterranean-Terrestrial	CF	12, 25, 37, 44, 46, 48
			Mustela	erminea	285	Subterranean-Terrestrial	C	9, 10, 12, 25, 37, 38, 44
				eversmanii	1684	Terrestrial	C	21, 37
				lutreola	566	Subterranean-Terrestrial	IC	7, 9, 12
				nivalis	78	Terrestrial	C	10, 12, 25, 37, 38, 48
				putorius	976	Terrestrial	CI	10, 12, 38, 44, 48
			Vormela	peregusna	594	Subterranean-Terrestrial	CI	9, 12
ARTIODACTYLA	Suidae	Suinae	Sus	scrofa	84472	Terrestrial	FR	27, 31, 38, 48
	Cervidae	Capreolinae	Alces	alces	461901	Terrestrial	B	4, 5, 7, 9, 14, 23, 28, 31, 38
			Capreolus	capreolus	22502	Terrestrial	B	4, 5, 14, 23, 25, 28, 31, 38, 48
			Rangifer	tarandus	109089	Terrestrial	BG	4, 5, 7, 9, 23, 25, 28, 31, 38
		Cervinae	Cervus	elaphus	240867	Terrestrial	BG	4, 5, 14, 23, 25, 28, 31, 38, 48
			Dama	dama	57225	Terrestrial	BG	4, 5, 7, 9, 14, 23, 28, 31, 38
	Bovidae	Bovinae	Bison	bonasus	675877	Terrestrial	G	3, 4, 5, 7, 14, 28, 38
		Caprinae	Capra	hircus	47387	Terrestrial	BG	3, 5, 7, 14, 23, 31, 38
				ibex	69547	Terrestrial	BG	4, 5, 7, 9, 23, 28, 31, 38, 49
				pyrenaica	60899	Terrestrial	BG	3, 23, 31, 48
			Ovis	ammon	113999	Terrestrial	BG	3, 7, 14, 31, 38
			Rupicapra	pyrenaica	30000	Terrestrial	BG	21, 31
				rupicapra	33266	Terrestrial	BG	3, 4, 5, 7, 14, 23, 28, 31, 38

Species list for North America

Order	**Family**	**Subfamily**	**Genus**	**Species**	**Body mass (g)**	**Locomotion**	**Diet**	**References**
DIDELPHIMORPHIA	Didelphidae	Caluromyinae	Caluromys	philander	246	Arboreal	FA	13, 36, 40, 45
				derbianus	327	Arboreal	FA	26, 38, 40, 45
		Didelphinae	Chironectes	minimus	974	Terrestrial-Aquatic	CI	11, 26, 36, 38
			Didelphis	marsupialis	1135	Arboreal-Terrestrial	FA	13, 26, 36, 38, 40
				virginiana	2442	Arboreal	AF	21, 26, 38
			Marmosa	mexicana	49	Arboreal-Terrestrial	IF	21, 26
				murina	36	Arboreal	IF	36, 40
				robinsoni	61	Arboreal-Terrestrial	IF	7, 11, 40
			Marmosops	fuscatus	45	Arboreal-Terrestrial	IF	21, 40, 45
				impavidus	42	Arboreal-Terrestrial	IF	36, 45
				invictus	29	Arboreal-Terrestrial	AF	21
			Metachirus	nudicaudatus	364	Terrestrial	IB	26, 36, 40
			Micoureus	alstoni	132	Arboreal	IF	19, 45
			Monodelphis	adusta	36	Terrestrial	I	7, 21, 47
			Philander	opossum	426	Arboreal-Terrestrial	FA	11, 26, 36, 40
			Tlacuatzin	canescens	48	Arboreal-Terrestrial	CF	21, 38
CINGULATA	Dasypodidae	Dasypodinae	Dasypus	novemcinctus	3949	Subterranean-Terrestrial	IB	25, 26, 36, 40, 43
		Tolypeutinae	Cabassous	centralis	3670	Subterranean-Terrestrial	IC	9, 25, 26
PILOSA	Bradypodidae		Bradypus	variegatus	4136	Arboreal	B	25, 36, 40, 45
	Megalonychidae		Choloepus	hoffmanni	5894	Arboreal	BF	25, 36, 38, 40, 45
	Cyclopedidae		Cyclopes	didactylus	264	Arboreal	I	25, 26, 36, 38, 40, 45
	Myrmecophagidae		Myrmecophaga	tridactyla	29532	Terrestrial	I	9, 25, 36, 38, 40
			Tamandua	mexicana	4179	Arboreal-Terrestrial	I	25, 26, 38, 40
				tetradactyla	4800	Arboreal-Terrestrial	I	25, 36, 38, 40
PRIMATES	Cebidae	Callitrichinae	Saguinus	geoffroyi	493	Arboreal	FI	9, 20, 30, 38, 45
		Cebinae	Cebus	albifrons	2510	Arboreal	FC	36, 38, 40, 45
				capucinus	3006	Arboreal	FC	20, 30, 38, 40, 45
		Saimiriinae	Saimiri	oerstedii	714	Arboreal-Terrestrial	FI	20, 30, 38, 45
	Aotidae		Aotus	lemurinus	866	Arboreal	FI	9, 40, 45
	Atelidae	Alouattinae	Alouatta	coibensis	7000	Arboreal	BF	34
				palliata	6577	Arboreal	BF	20, 30, 40, 45

Species list for North America

				pigra	7172	Arboreal	BF	20, 26, 40, 45
				seniculus	6398	Arboreal	BF	20, 30, 36, 40, 45
		Atelinae	Ateles	fusciceps	9068	Arboreal	FB	9, 20, 21, 45
				geoffroyi	7582	Arboreal	FB	20, 26, 40, 45
RODENTIA	Aplodontiidae		Aplodontia	rufa	806	Subterranean-Terrestrial	B	9, 29, 38, 42, 43
	Sciuridae	Sciurinae	Microsciurus	alfari	87	Arboreal-Terrestrial	F	17, 38
				mimulus	120	Arboreal-Terrestrial	FGr	17, 21
			Sciurus	alleni	465	Arboreal-Terrestrial	GrA	9, 17, 38, 41
				arizonensis	647	Arboreal-Terrestrial	GrA	17, 21, 41, 45
				aureogaster	456	Arboreal-Terrestrial	GrF	9, 26, 45
				carolinensis	545	Arboreal-Terrestrial	GrA	29, 41, 45, 46
				colliaei	498	Arboreal-Terrestrial	GrA	17, 21, 38, 41
				deppei	250	Arboreal-Terrestrial	FB	17, 26, 45
				nayaritensis	697	Arboreal-Terrestrial	GrA	38, 41, 45
				niger	600	Arboreal-Terrestrial	Gr	38, 41, 43, 45
				oculatus	650	Arboreal-Terrestrial	GrA	17, 41, 45
				variegatoides	485	Arboreal-Terrestrial	F	17, 38, 41, 45
				yucatanensis	225	Arboreal-Terrestrial	GrA	9, 26
				aberti	623	Arboreal-Terrestrial	GrA	25, 42, 45
				granatensis	318	Arboreal-Terrestrial	GrF	9, 29, 45, 49
				richmondi	238	Arboreal-Terrestrial	GrA	17, 41
				griseus	704	Arboreal-Terrestrial	Gr	38, 41, 45
			Syntheosciurus	brochus	787	Arboreal-Terrestrial	B	17, 21
			Tamiasciurus	douglasii	225	Arboreal-Terrestrial	GrA	9, 17, 38
				hudsonicus	200	Arboreal-Terrestrial	GrA	17, 25, 29, 42, 43
				mearnsi	227	Arboreal-Terrestrial	GrA	17, 19, 34
			Glaucomys	sabrinus	138	Arboreal	GrA	9, 17, 18, 38, 42, 43, 45
				volans	72	Arboreal	GrA	17, 18, 25, 29, 38, 45
		Xerinae	Ammospermophilus	harrisii	127	Subterranean-Terrestrial	GrA	17, 38
				interpres	113	Subterranean-Terrestrial	GrA	17, 38
				leucurus	104	Subterranean-Terrestrial	GrA	17, 38, 42, 43
				nelsoni	160	Subterranean-Terrestrial	GrA	9, 17, 38

Species list for North America

Cynomys	ludovicianus	797	Subterranean-Terrestrial BG	9, 17, 29, 38
	gunnisoni	798	Subterranean-Terrestrial BG	9, 17, 38, 43
	leucurus	964	Subterranean-Terrestrial BG	9, 17, 38
	parvidens	900	Subterranean-Terrestrial BG	9, 17, 38
Marmota	broweri	5250	Subterranean-Terrestrial BG	9, 17, 19
	monax	3881	Subterranean-Terrestrial BG	9, 17, 38, 46
	caligata	2254	Subterranean-Terrestrial BG	17, 19
	flaviventris	3710	Subterranean-Terrestrial BG	17, 38, 42, 43
	olympus	6300	Subterranean-Terrestrial BG	17, 38
	vancouverensis	5232	Subterranean-Terrestrial BG	9, 17, 21
Spermophilus	adocetus	156	Subterranean-Terrestrial GrA	7, 17, 38
	annulatus	500	Subterranean-Terrestrial GrA	17, 21, 38
	columbianus	471	Subterranean-Terrestrial GrA	9, 17, 38
	parryii	747	Subterranean-Terrestrial GrA	17, 42
	armatus	306	Subterranean-Terrestrial GrA	9, 17, 38
	beldingi	273	Subterranean-Terrestrial GrA	9, 17, 38
	brunneus	300	Subterranean-Terrestrial GrA	9, 17, 38
	canus	543	Subterranean-Terrestrial GrA	17, 19
	elegans	324	Subterranean-Terrestrial GrA	17, 38
	mollis	165	Subterranean-Terrestrial GrA	17, 19
	richardsonii	325	Subterranean-Terrestrial GrA	9, 17, 38
	townsendii	207	Subterranean-Terrestrial GrA	9, 17, 38
	washingtoni	215	Subterranean-Terrestrial GrA	9, 17, 38
	atricapillus	551	Subterranean-Terrestrial GrA	17, 19, 21
	beecheyi	598	Subterranean-Terrestrial GrA	17, 43, 48
	variegatus	715	Subterranean-Terrestrial GrA	17, 38
	mohavensis	213	Subterranean-Terrestrial GrA	17, 38
	tereticaudus	148	Subterranean-Terrestrial GrA	17, 38
	mexicanus	177	Subterranean-Terrestrial GrA	9, 17, 38
	perotensis	140	Subterranean-Terrestrial GrA	17, 19, 21
	spilosoma	107	Subterranean-Terrestrial GrA	9, 17, 38
	tridecemlineatus	175	Subterranean-Terrestrial GrA	9, 17, 38

Species list for North America

			franklinii	458	Subterranean-Terrestrial	GrA	9, 17, 19
			lateralis	175	Subterranean-Terrestrial	GrA	9, 17, 38
			madrensis	207	Subterranean-Terrestrial	GrA	17, 19, 21
			saturatus	543	Subterranean-Terrestrial	GrA	17, 38
		Tamias	striatus	106	Subterranean-Terrestrial	GrA	17, 25, 38
			alpinus	37	Subterranean-Terrestrial	GrA	17, 25
			amoenus	51	Subterranean-Terrestrial	GrA	9, 17, 25, 38
			bulleri	100	Subterranean-Terrestrial	GrA	7, 17, 21, 38
			cinereicollis	62	Subterranean-Terrestrial	GrA	9, 17, 38
			dorsalis	64	Subterranean-Terrestrial	GrA	9, 17, 21
			durangae	85	Subterranean-Terrestrial	GrA	17, 21, 38
			merriami	75	Subterranean-Terrestrial	GrA	17, 48
			minimus	43	Subterranean-Terrestrial	GrA	9, 17, 38
			obscurus	73	Subterranean-Terrestrial	GrA	38, 48
			ochrogenys	92	Subterranean-Terrestrial	GrA	9, 17, 38
			panamintinus	52	Subterranean-Terrestrial	GrA	17, 38
			quadrimaculatus	84	Subterranean-Terrestrial	GrA	17, 38
			quadrivittatus	57	Subterranean-Terrestrial	GrA	9, 17, 38
			ruficaudus	60	Subterranean-Terrestrial	GrA	9, 17, 38
			rufus	54	Subterranean-Terrestrial	GrA	17, 38
			senex	89	Subterranean-Terrestrial	GrA	17, 38
			siskiyou	75	Subterranean-Terrestrial	GrA	9, 17, 19
			sonomae	75	Subterranean-Terrestrial	GrA	17, 21
			speciosus	61	Subterranean-Terrestrial	GrA	17, 38
			townsendii	79	Subterranean-Terrestrial	GrA	9, 17, 38
			umbrinus	52	Subterranean-Terrestrial	GrA	17, 19
Castoridae		Castor	canadensis	18124	Terrestrial-Aquatic	B	9, 38, 42, 43
Heteromyidae	Dipodomyinae	Dipodomys	agilis	60	Subterranean-Terrestrial	GrA	9, 19
			californicus	85	Subterranean-Terrestrial	GrA	9, 38
			compactus	49	Subterranean-Terrestrial	GrA	19, 21
			deserti	108	Subterranean-Terrestrial	GrA	9, 22, 43
			elator	106	Subterranean-Terrestrial	GrA	21, 38

Species list for North America

		heermanni	63	Subterranean-Terrestrial Gr	9, 48
		ingens	114	Subterranean-Terrestrial GrA	7, 9, 38
		merriami	38	Subterranean-Terrestrial GrA	15, 22, 43
		microps	56	Subterranean-Terrestrial GrA	7, 9, 22, 25, 38
		nelsoni	88	Subterranean-Terrestrial GrA	7, 21, 22
		nitratoides	42	Subterranean-Terrestrial GrA	7, 9, 38
		ordii	50	Subterranean-Terrestrial Gr	7, 15, 22
		panamintinus	74	Subterranean-Terrestrial GrA	7, 9, 22
		phillipsii	41	Subterranean-Terrestrial GrA	7, 38
		simulans	77	Subterranean-Terrestrial GrA	19, 34
		spectabilis	125	Subterranean-Terrestrial Gr	7, 9, 22, 38
		stephensi	68	Subterranean-Terrestrial GrA	9, 21
		venustus	82	Subterranean-Terrestrial GrA	9, 48
	Microdipodops	megacephalus	12	Subterranean-Terrestrial Gr	9, 22, 38
		pallidus	13	Subterranean-Terrestrial Gr	9, 22, 38
Heteromyinae	Heteromys	oresterus	75	Subterranean-Terrestrial Gr	9, 38, 41
		anomalus	69	Subterranean-Terrestrial Gr	25, 49
		australis	267	Subterranean-Terrestrial Gr	7, 49
		desmarestianus	74	Subterranean-Terrestrial GrF	9, 26, 38
		gaumeri	64	Subterranean-Terrestrial GrF	7, 21, 33, 41
		nelsoni	68	Subterranean-Terrestrial Gr	21, 41
	Liomys	adspersus	51	Subterranean-Terrestrial Gr	7, 9, 38, 41
		irroratus	49	Subterranean-Terrestrial Gr	7, 9, 41
		pictus	43	Subterranean-Terrestrial Gr	7, 9, 38, 41
		salvini	42	Subterranean-Terrestrial Gr	7, 9, 38, 41
		spectabilis	65	Subterranean-Terrestrial Gr	21, 41
Perognathinae	Chaetodipus	arenarius	23	Subterranean-Terrestrial GrA	7, 19
		artus	31	Subterranean-Terrestrial GrA	7, 21
		baileyi	28	Subterranean-Terrestrial GrA	7, 22, 38
		californicus	23	Subterranean-Terrestrial GrA	7, 9, 38
		eremicus	23	Subterranean-Terrestrial GrA	19, 34
		fallax	19	Subterranean-Terrestrial GrA	7, 9, 22

Species list for North America

		formosus	20	Subterranean-Terrestrial	GrA	7, 9, 22
		goldmani	31	Subterranean-Terrestrial	GrA	7, 19
		hispidus	37	Subterranean-Terrestrial	GrA	7, 9, 22, 38
		intermedius	15	Subterranean-Terrestrial	GrA	7, 15, 22
		lineatus	23	Subterranean-Terrestrial	Gr	7, 21
		nelsoni	16	Subterranean-Terrestrial	GrA	7, 9, 22, 38
		penicillatus	16	Subterranean-Terrestrial	GrA	7, 9, 22, 38
		pernix	17	Subterranean-Terrestrial	GrA	21, 38
		rudinoris	31	Subterranean-Terrestrial	GrA	19, 34
		spinatus	16	Subterranean-Terrestrial	GrA	7, 19, 21
	Perognathus	alticolus	24	Subterranean-Terrestrial	GrA	21, 38
		amplus	12	Subterranean-Terrestrial	GrA	21, 22
		fasciatus	11	Subterranean-Terrestrial	GrA	7, 9, 21
		flavescens	9	Subterranean-Terrestrial	Gr	7, 9, 38
		flavus	8	Subterranean-Terrestrial	Gr	7, 9, 22
		inornatus	10	Subterranean-Terrestrial	GrA	7, 9, 38
		longimembris	8	Subterranean-Terrestrial	Gr	7, 9, 22
		merriami	7	Subterranean-Terrestrial	GrA	9, 38
		parvus	22	Subterranean-Terrestrial	Gr	9, 22, 38, 43
Geomyidae	Cratogeomys	castanops	267	Subterranean	R	21, 32, 38
		gymnurus	600	Subterranean	R	21, 32
		merriami	420	Subterranean	R	21, 32
		tylorhinus	403	Subterranean	R	21, 38, 42, 43
		zinseri	150	Subterranean	R	21, 32
	Geomys	attwateri	144	Subterranean	R	21, 32
		arenarius	206	Subterranean	R	9, 21, 32
		breviceps	136	Subterranean	R	21, 32
		bursarius	204	Subterranean	R	9, 38, 42, 43
		knoxjonesi	172	Subterranean	R	21, 32
		personatus	397	Subterranean	R	9, 32, 38
		pinetis	201	Subterranean	R	7, 9, 21
		texensis	169	Subterranean	R	19, 32, 34

Species list for North America

		Orthogeomys	grandis	500	Subterranean	R	21, 42, 43
			hispidus	500	Subterranean	R	9, 26
			cherriei	400	Subterranean	R	9, 21, 32
			dariensis	438	Subterranean	R	21, 32
			matagalpae	349	Subterranean	R	21, 32
			underwoodi	250	Subterranean	R	21, 32
		Pappogeomys	alcorni	150	Subterranean	R	21, 32
			bulleri	150	Subterranean	R	7, 21, 32
		Thomomys	clusius	295	Subterranean	R	21, 32, 34
			idahoensis	295	Subterranean	R	7, 21
			mazama	93	Subterranean	R	21, 32, 38
			monticola	81	Subterranean	R	9, 21, 32
			talpoides	105	Subterranean	R	7, 9, 38, 42
			bottae	123	Subterranean	R	9, 38, 43, 48
			bulbivorus	360	Subterranean	R	9, 32, 38
			townsendii	263	Subterranean	R	9, 32, 38
			umbrinus	126	Subterranean	R	7, 9, 21
		Zygogeomys	trichopus	474	Subterranean	R	21, 43
Dipodidae	Zapodinae	Napaeozapus	insignis	22	Subterranean-Terrestrial	GrA	9, 38, 43
		Zapus	hudsonius	18	Subterranean-Terrestrial	GrA	7, 9, 38
			princeps	27	Subterranean-Terrestrial	Gr	9, 38, 43
			trinotatus	27	Subterranean-Terrestrial	GrA	7, 9, 38
Cricetidae	Arvicolinae	Arborimus	albipes	23	Arboreal-Terrestrial	B	9, 38
			longicaudus	22	Arboreal-Terrestrial	B	9, 38, 45
			pomo	32	Arboreal-Terrestrial	B	9, 38, 45
		Dicrostonyx	groenlandicus	58	Subterranean-Terrestrial	FB	7, 9
			hudsonius	57	Subterranean-Terrestrial	FB	9, 51
			richardsoni	63	Subterranean-Terrestrial	FB	9, 51
		Lemmiscus	curtatus	28	Subterranean-Terrestrial	B	7, 9, 38
		Lemmus	trimucronatus	70	Subterranean-Terrestrial	BG	21, 42, 51
		Microtus	californicus	57	Subterranean-Terrestrial	GB	25, 42, 43
			chrotorrhinus	39	Subterranean-Terrestrial	GB	7, 9, 38

Species list for North America

		guatemalensis	42	Subterranean-Terrestrial	GB	21, 51
		longicaudus	45	Subterranean-Terrestrial	GB	7, 22, 25, 38
		mexicanus	35	Subterranean-Terrestrial	GB	7, 25
		miurus	41	Subterranean-Terrestrial	GB	7, 9
		richardsoni	86	Subterranean-Terrestrial	GB	9, 38, 50
		umbrosus	42	Subterranean-Terrestrial	GB	21, 51
		xanthognathus	93	Subterranean-Terrestrial	GB	38, 50
		canicaudus	30	Subterranean-Terrestrial	GB	9, 51
		montanus	43	Subterranean-Terrestrial	GB	7, 22, 25, 38
		oregoni	20	Subterranean-Terrestrial	GB	9, 38, 51
		pennsylvanicus	43	Subterranean-Terrestrial	GB	7, 25, 38
		townsendii	52	Subterranean-Terrestrial	GB	9, 38, 51
		oeconomus	33	Subterranean-Terrestrial	GB	7, 25
		oaxacensis	37	Subterranean-Terrestrial	GB	21, 38, 51
		pinetorum	26	Subterranean	GB	7, 25, 38
		quasiater	40	Subterranean-Terrestrial	GB	7, 21
		ochrogaster	43	Subterranean-Terrestrial	GB	7, 9, 38
	Myodes	californicus	18	Terrestrial	BA	9, 38, 42, 43
		gapperi	20	Terrestrial	BA	21, 38
		rutilus	20	Terrestrial	BA	21, 38
	Neofiber	alleni	265	Terrestrial-Aquatic	B	9, 25, 38, 42, 50
	Ondatra	zibethicus	991	Terrestrial-Aquatic	BA	9, 25, 38, 42, 50
	Phenacomys	intermedius	25	Subterranean-Terrestrial	B	9, 25, 38, 50
		ungava	27	Subterranean-Terrestrial	B	7, 9
	Synaptomys	cooperi	28	Subterranean-Terrestrial	BA	7, 9, 38
		borealis	21	Subterranean-Terrestrial	BA	7, 9
Neotominae	Baiomys	musculus	9	Terrestrial	BA	7, 21, 38
		taylori	7	Terrestrial	B	7, 9, 22, 38
	Habromys	lepturus	85	Arboreal	N/A	21
		lophurus	40	Arboreal-Terrestrial	N/A	21
		simulatus	40	Arboreal	N/A	21
	Hodomys	alleni	368	Terrestrial	BA	7, 9

Species list for North America

Isthmomys	flavidus	164	Arboreal-Terrestrial	N/A	21
	pirrensis	138	Arboreal-Terrestrial	N/A	21
Megadontomys	cryophilus	87	Terrestrial	F	34
	nelsoni	87	Terrestrial	F	34
	thomasi	111	Terrestrial	F	9
Nelsonia	goldmani	80	Arboreal	B	7
	neotomodon	80	Arboreal	B	7, 21
Neotoma	albigula	208	Arboreal-Terrestrial	FB	7, 22, 25, 38
	angustapalata	198	Arboreal-Terrestrial	RA	21, 51
	chrysomelas	325	Arboreal-Terrestrial	RA	16, 51
	devia	200	Arboreal-Terrestrial	B	9, 51
	floridana	249	Arboreal-Terrestrial	BF	7, 9, 38
	fuscipes	213	Arboreal-Terrestrial	RA	25, 38, 42, 48
	goldmani	198	Arboreal-Terrestrial	BA	7, 21
	lepida	144	Arboreal-Terrestrial	Gr	9, 22, 25, 38, 48
	leucodon	325	Arboreal-Terrestrial	RA	16, 51
	macrotis	226	Arboreal-Terrestrial	RA	21, 51
	magister	447	Arboreal-Terrestrial	RA	21, 51
	mexicana	203	Arboreal-Terrestrial	Gr	7, 9, 38
	micropus	255	Arboreal-Terrestrial	Gr	7, 9, 22, 38
	palatina	198	Arboreal-Terrestrial	RA	21, 51
	stephensi	149	Arboreal-Terrestrial	B	9, 38, 51
	cinerea	286	Arboreal-Terrestrial	BA	25, 38, 42, 43
	phenax	227	Arboreal-Terrestrial	RA	9, 38, 51
Neotomodon	alstoni	45	Subterranean-Terrestrial	GrA	9, 50
Ochrotomys	nuttalli	23	Arboreal-Terrestrial	Gr	9, 38, 50
Onychomys	arenicola	30	Subterranean-Terrestrial	IC	15, 51
	leucogaster	28	Subterranean-Terrestrial	IC	9, 22, 42, 43
	torridus	22	Subterranean-Terrestrial	I	7, 9, 22, 25, 38
Osgoodomys	banderanus	50	Arboreal-Terrestrial	GrA	7, 33
Peromyscus	attwateri	28	Subterranean-Terrestrial	GrA	7, 9, 38
	aztecus	34	Subterranean-Terrestrial	GrA	7, 21, 38

Species list for North America

beatae	53	Subterranean-Terrestrial	GrA	51
boylii	24	Subterranean-Terrestrial	GrA	22, 38, 48
schmidlyi	24	Subterranean-Terrestrial	GrA	22**, 38**, 48**
bullatus	40	Subterranean-Terrestrial	GrA	21, 51
californicus	43	Subterranean-Terrestrial	Gr	9, 38, 48
crinitus	16	Subterranean-Terrestrial	GrA	7, 9, 22, 38
difficilis	28	Subterranean-Terrestrial	GrA	7, 9
eremicus	23	Subterranean-Terrestrial	GrA	9, 22, 38, 48
eva	22	Subterranean-Terrestrial	GrA	7
fraterculus	63	Subterranean-Terrestrial	GrA	51
furvus	33	Subterranean-Terrestrial	GrA	7
gossypinus	28	Subterranean-Terrestrial	AGr	7, 9, 21
grandis	71	Subterranean-Terrestrial	GrA	7
gratus	27	Subterranean-Terrestrial	GrA	9, 51
guardia	53	Subterranean-Terrestrial	GrA	51
guatemalensis	40	Subterranean-Terrestrial	GrA	7, 21
gymnotis	40	Subterranean-Terrestrial	GrA	21, 51
hooperi	36	Subterranean-Terrestrial	GrA	9, 51
keeni	28	Subterranean-Terrestrial	GrA	21, 51
leucopus	18	Subterranean-Terrestrial	GrA	7, 15, 22, 38
levipes	23	Subterranean-Terrestrial	GrA	38, 51
maniculatus	20	Subterranean-Terrestrial	Gr	22, 38, 42, 43, 48
megalops	66	Subterranean-Terrestrial	GrA	9, 51
mekisturus	60	Subterranean-Terrestrial	GrA	21, 51
melanocarpus	59	Subterranean-Terrestrial	GrA	9, 51
melanophrys	40	Subterranean-Terrestrial	F	7, 9, 38
melanotis	40	Subterranean-Terrestrial	GrA	7, 9, 38
melanurus	40	Subterranean-Terrestrial	GrA	21, 51
merriami	40	Subterranean-Terrestrial	GrA	21, 51
mexicanus	43	Subterranean-Terrestrial	GrA	9, 26, 38
nasutus	63	Subterranean-Terrestrial	GrA	9, 51
ochraventer	40	Subterranean-Terrestrial	GrA	21, 51

Species list for North America

	pectoralis	39	Subterranean-Terrestrial	GrA	7, 9, 22
	perfulvus	40	Subterranean-Terrestrial	GrA	7, 9
	polionotus	14	Subterranean-Terrestrial	GrA	7, 9, 38
	polius	40	Subterranean-Terrestrial	GrA	21, 51
	sagax	63	Subterranean-Terrestrial	GrA	51
	simulus	40	Subterranean-Terrestrial	GrA	21, 51
	spicilegus	36	Subterranean-Terrestrial	GrA	7, 21
	stirtoni	29	Subterranean-Terrestrial	GrA	21, 51
	truei	27	Subterranean-Terrestrial	Gr	9, 22, 38, 48
	winkelmanni	40	Subterranean-Terrestrial	GrA	21, 51
	yucatanicus	27	Subterranean-Terrestrial	GrA	7, 9
	zarhynchus	40	Subterranean-Terrestrial	GrA	21, 51
Podomys	floridanus	31	Subterranean-Terrestrial	GrA	9, 38
Reithrodontomys	burti	20	Arboreal-Terrestrial	GrA	21, 51
	chrysopsis	19	Arboreal-Terrestrial	GrA	21, 51
	fulvescens	12	Terrestrial	GrA	7, 9, 22, 38
	hirsutus	20	Arboreal-Terrestrial	GrA	21, 51
	humulis	8	Arboreal-Terrestrial	GrA	7, 9, 38
	megalotis	11	Terrestrial	GrA	22, 38, 48
	montanus	11	Arboreal-Terrestrial	GrA	7, 9, 22, 38
	sumichrasti	19	Arboreal-Terrestrial	GrA	21, 51
	zacatecae	10	Arboreal-Terrestrial	GrA	51
	brevirostris	13	Arboreal-Terrestrial	GrA	21, 51
	creper	23	Arboreal-Terrestrial	GrA	7, 51
	darienensis	13	Arboreal-Terrestrial	GrA	21, 51
	gracilis	12	Arboreal-Terrestrial	GrA	21, 38, 51
	mexicanus	16	Arboreal-Terrestrial	BA	7, 21, 38
	microdon	20	Arboreal-Terrestrial	GrA	21, 51
	bakeri	30	Arboreal-Terrestrial	FB	53
	paradoxus	13	Arboreal-Terrestrial	GrA	51
	rodriguezi	13	Arboreal-Terrestrial	GrA	51
	tenuirostris	20	Arboreal-Terrestrial	GrA	21, 51

Species list for North America

	Scotinomys	teguina	12	Terrestrial	I	7, 9, 38
		xerampelinus	15	Terrestrial	I	9, 38
	Xenomys	nelsoni	130	Arboreal	B	38, 45
Sigmodontinae	Ichthyomys	tweedii	119	Terrestrial-Aquatic	IC	33, 38, 42, 51
	Melanomys	caliginosus	41	Terrestrial	BA	21, 38, 42
	Neacomys	pictus	16	Terrestrial	IF	21, 41, 51
	Necromys	urichi	45	Terrestrial	GrA	36
	Nectomys	palmipes	290	Terrestrial-Aquatic	BA	34
	Oecomys	bicolor	41	Arboreal-Terrestrial	FA	36, 42
		speciosus	73	Arboreal-Terrestrial	FI	21
		trinitatis	73	Arboreal-Terrestrial	GrF	36, 38
	Oligoryzomys	fulvescens	25	Terrestrial	BA	36
		vegetus	15	Arboreal-Terrestrial	GrA	35
	Oryzomys	albigularis	61	Terrestrial	BA	7, 41, 42
		alfaroi	33	Terrestrial	BA	21, 26
		bolivaris	61	Terrestrial	BA	7, 21, 41
		chapmani	50	Terrestrial	BA	21, 41, 51
		couesi	69	Terrestrial	BA	7, 21, 38, 41
		devius	60	Terrestrial	BA	41, 51
		dimidiatus	60	Terrestrial	BA	41, 51
		melanotis	50	Terrestrial	BA	21, 26
		palustris	53	Terrestrial-Aquatic	BA	9, 26, 38, 42
		rhabdops	60	Terrestrial	BA	41, 51
		rostratus	60	Terrestrial	B	7, 41
		saturatior	60	Terrestrial	BA	41, 51
		talamancae	55	Terrestrial	GrA	21, 38, 41, 51
	Rheomys	mexicanus	40	Terrestrial-Aquatic	IC	21, 38, 51
		raptor	38	Terrestrial-Aquatic	I	7, 21, 38
		thomasi	40	Terrestrial-Aquatic	IC	21, 38, 51
		underwoodi	49	Terrestrial-Aquatic	IC	21, 51
	Rhipidomys	couesi	89	Arboreal	N/A	21, 49
		latimanus	58	Arboreal	N/A	9, 21, 41, 45

Species list for North America

		Sigmodon	alleni	174	Subterranean-Terrestrial	BA	7
			arizonae	198	Subterranean-Terrestrial	BA	21, 22, 42, 51
			fulviventer	196	Subterranean-Terrestrial	BA	7, 9
			hispidus	111	Subterranean-Terrestrial	B	25, 26, 38, 42, 43, 49
			leucotis	132	Subterranean-Terrestrial	BA	7, 9, 38
			mascotensis	120	Subterranean-Terrestrial	BA	7, 21
			ochrognathus	122	Subterranean-Terrestrial	BA	7, 9, 22, 38
		Sigmodontomys	alfari	60	Terrestrial	BA	34
			aphrastus	60	Terrestrial	BA	34
		Zygodontomys	brevicauda	52	Subterranean-Terrestrial	GrF	36
	Tylomyinae	Nyctomys	sumichrasti	60	Arboreal	FB	26, 38, 43, 45
		Otonyctomys	hatti	36	Arboreal	F	45
		Ototylomys	phyllotis	87	Arboreal-Terrestrial	FB	26, 45
		Tylomys	bullaris	280	Arboreal-Terrestrial	BF	21
			nudicaudus	182	Arboreal	BF	9, 26, 43
			panamensis	264	Arboreal-Terrestrial	BF	7
			watsoni	240	Arboreal	BF	7
Erethizontidae	Erethizontinae	Coendou	prehensilis	4116	Arboreal	B	1, 36, 40, 43, 45, 49
			rothschildi	2000	Arboreal	B	38, 45
		Erethizon	dorsata	7419	Arboreal-Terrestrial	B	9, 38, 42, 43, 46
		Sphiggurus	mexicanus	2000	Arboreal	BF	9, 26, 43, 45
Caviidae	Hydrochoerinae	Hydrochoeris	hydrochaeris	48145	Terrestrial-Aquatic	BF	1, 36, 38, 40, 42, 49
Dasyproctidae		Dasyprocta	leporina	3010	Terrestrial	FGr	1, 25, 36, 40
			mexicana	5000	Terrestrial	FB	21
			punctata	2309	Terrestrial	BA	26, 36, 40, 49
Cuniculidae		Cuniculus	paca	8173	Subterranean-Terrestrial	BF	1, 9, 25, 26, 36, 40, 49
Echimyidae	Echimyinae	Makalata	didelphoides	399	Arboreal	FGr	36, 38
	Eumysopinae	Proechimys	trinitatus	340	Subterranean-Terrestrial	B	33, 41
Myocastoridae		Myocastor	coypus	6362	Terrestrial-Aquatic	B	1, 6, 36, 48
Capromyidae	Capromyinae	Capromys	pilorides	5200	Arboreal	BA	1, 25
		Geocapromys	brownii	1497	Subterranean-Terrestrial	B	1, 9, 38
			ingrahami	734	Subterranean-Terrestrial	B	1, 9, 21

Species list for North America

			Mesocapromys	melanurus	3750	Arboreal	BA	21
				nanus	3750	Arboreal	BA	21
			Mysateles	prehensilis	3750	Arboreal	BA	21
		Isolobodontinae	Isolobodon	portoricensis	1267	N/A	N/A	19
		Plagiodontinae	Plagiodontia	aedium	1267	Arboreal-Terrestrial	FB	9, 21, 45
				araeum	1267	Arboreal-Terrestrial	FB	19
				ipnaeum	1267	Arboreal-Terrestrial	FB	19
LAGOMORPHA	Ochotonidae		Ochotona	collaris	129	Terrestrial	BG	9, 38
				princeps	158	Terrestrial	BG	7, 25, 38
	Leporidae		Brachylagus	idahoensis	431	Subterranean-Terrestrial	BG	9, 38
			Lepus	californicus	2422	Terrestrial	GB	7, 25, 38
				callotis	2608	Terrestrial	GB	7, 9, 38
				flavigularis	3000	Terrestrial	GB	21, 38
				townsendii	3372	Terrestrial	GB	7, 9, 38
				arcticus	4413	Terrestrial	GB	7, 9, 38
				othus	4837	Terrestrial	GB	9, 38
				alleni	3930	Terrestrial	GB	25, 38
				americanus	1568	Terrestrial	GB	7, 9, 25, 38
			Romerolagus	diazi	466	Subterranean-Terrestrial	G	7, 9, 38
			Sylvilagus	dicei	1473	Terrestrial	B	21, 34
				insonus	3000	Terrestrial	B	19, 21
				audubonii	881	Subterranean-Terrestrial	B	25, 38, 48
				cunicularius	2490	Subterranean-Terrestrial	B	7, 21, 38
				floridanus	1207	Terrestrial	B	7, 38, 40
				nuttallii	802	Subterranean-Terrestrial	B	7, 9, 38
				robustus	1473	Terrestrial	B	19, 34
				transitionalis	814	Terrestrial	B	7, 9, 38
				aquaticus	2133	Terrestrial	B	7, 9, 38
				brasiliensis	987	Terrestrial	B	26, 36, 38, 40
				palustris	1355	Terrestrial	B	7, 9, 38
				bachmani	715	Subterranean-Terrestrial	B	38, 48
SORICOMORPHA	Solenodontidae		Solenodon	cubanus	825	Subterranean-Terrestrial	IF	9, 38

Species list for North America

			paradoxus	900	Subterranean-Terrestrial	IF	21, 46
Soricidae	Soricinae	Blarina	brevicauda	19	Subterranean-Terrestrial	IC	25, 50
			carolinensis	12	Subterranean-Terrestrial	IB	9, 24, 38
			hylophaga	14	Subterranean-Terrestrial	IB	9, 38
		Cryptotis	alticola	6	Subterranean-Terrestrial	IC	19, 34
			goldmani	7	Subterranean-Terrestrial	IC	19, 21
			goodwini	7	Subterranean-Terrestrial	IC	19, 21
			gracilis	6	Subterranean-Terrestrial	IC	19, 34
			hondurensis	6	Subterranean-Terrestrial	IC	19, 34
			magna	7	Subterranean-Terrestrial	IC	19, 21
			mayensis	6	Subterranean-Terrestrial	IC	19, 34
			merriami	6	Subterranean-Terrestrial	IC	19, 34
			mexicana	7	Subterranean-Terrestrial	IC	19, 21
			nigrescens	8	Subterranean-Terrestrial	IC	7, 19, 21
			obscura	6	Subterranean-Terrestrial	IC	19, 34
			parva	5	Subterranean-Terrestrial	IC	21, 50
			peregrina	6	Subterranean-Terrestrial	IC	19, 34
			phillipsii	6	Subterranean-Terrestrial	IC	19, 34
		Megasorex	gigas	12	Terrestrial	I	7, 19, 33
		Notiosorex	crawfordi	5	Subterranean-Terrestrial	I	7, 25, 38
			evotis	5	Terrestrial	I	19, 21
			villai	4	Terrestrial	I	19, 34
		Sorex	arizonae	3	Terrestrial	IC	19, 21
			emarginatus	7	Terrestrial	IC	19, 21
			merriami	6	Subterranean-Terrestrial	IC	7, 9, 38
			saussurei	5	Terrestrial	IC	19, 21
			trowbridgii	5	Terrestrial	IC	9, 38, 50
			ventralis	7	Terrestrial	IC	19, 21
			arcticus	8	Terrestrial	IC	38, 50
			tundrensis	8	Terrestrial	IC	21
			alaskanus	14	Terrestrial	IC	19, 50
			bairdi	8	Terrestrial	IC	19, 21

Species list for North America

			bendirii	16	Terrestrial-Aquatic	IC	38, 50
			cinereus	4	Terrestrial	IC	9, 25, 38, 50
			dispar	5	Terrestrial	IC	9, 38, 50
			fumeus	8	Terrestrial	IC	38, 50
			gaspensis	3	Terrestrial	IC	21
			haydeni	10	Terrestrial	IC	7, 9, 19
			hoyi	3	Terrestrial	IC	7, 38, 50
			jacksoni	6	Terrestrial	IC	19, 21
			longirostris	3	Terrestrial	IC	9, 21, 50
			lyelli	5	Terrestrial	IC	19, 21
			macrodon	9	Terrestrial	IC	19, 21
			milleri	4	Terrestrial	IC	19, 21
			monticolus	7	Terrestrial	IC	7, 9, 38
			nanus	3	Terrestrial	IC	7, 9, 38
			neomexicanus	10	Terrestrial	IC	19, 34
			oreopolus	7	Subterranean-Terrestrial	IC	7, 19, 21
			ornatus	5	Terrestrial	IC	38, 48
			pacificus	11	Terrestrial	IC	9, 38
			palustris	13	Terrestrial-Aquatic	IC	9, 38, 50
			preblei	3	Terrestrial	IC	19, 21
			sonomae	8	Terrestrial	IC	19, 21
			tenellus	4	Terrestrial	IC	21, 38
			ugyunak	4	Terrestrial	IC	19, 34
			vagrans	6	Terrestrial	IC	9, 43, 48, 50
			veraepacis	8	Subterranean-Terrestrial	IC	7, 19, 21
Talpidae	Scalopinae	Condylura	cristata	48	Subterranean-Terrestrial	IC	7, 9, 38
		Parascalops	breweri	51	Subterranean	I	7, 9, 38
		Scalopus	aquaticus	87	Subterranean	IB	7, 25, 38
		Scapanus	latimanus	62	Subterranean	I	7, 9, 38
			orarius	62	Subterranean	I	9, 32, 38
			townsendii	110	Subterranean	IB	9, 38, 43
	Talpinae	Neurotrichus	gibbsii	10	Subterranean-Terrestrial	I	9, 38

Species list for North America

CARNIVORA	Felidae	Felinae	Leopardus	pardalis	11880	Terrestrial	C	12, 36, 37, 38, 40
				tigrinus	2250	Arboreal-Terrestrial	C	9, 12, 36, 37
				wiedii	3271	Arboreal-Terrestrial	C	9, 36, 38, 44, 45
			Lynx	canadensis	9683	Arboreal-Terrestrial	C	9, 37, 38, 46
				rufus	6374	Arboreal-Terrestrial	C	12, 37, 38, 44, 48
			Puma	concolor	53954	Terrestrial	C	6, 9, 12, 36, 37, 44, 46
				yagouaroundi	6875	Arboreal-Terrestrial	C	12, 36, 38, 40
		Pantherinae	Panthera	onca	83943	Terrestrial	C	9, 12, 36, 37, 38, 40, 44, 46
	Herpestidae		Herpestes	javanicus	750	Terrestrial	C	10, 12, 25, 37
	Canidae		Canis	latrans	11989	Terrestrial	C	9, 12, 37, 44, 46, 48
				lupus	31757	Terrestrial	CI	12, 37, 38, 44, 46, 48
				rufus	31757	Terrestrial	CI	12*, 37*, 38*, 44*, 46*, 48*
			Speothos	venaticus	6325	Terrestrial	C	9, 10, 36, 44, 46
			Urocyon	cinereoargenteus	3834	Terrestrial	CF	9, 10, 26, 37, 44, 46, 48
			Vulpes	lagopus	3584	Terrestrial	CI	9, 10, 12, 37, 44
				macrotis	4500	Terrestrial	C	10, 37, 44
				velox	2088	Terrestrial	CI	12, 37, 38
				vulpes	4820	Terrestrial	C	9, 10, 12, 37, 44, 46, 48
	Ursidae		Ursus	americanus	110500	Terrestrial	BA	12, 37, 38, 44, 46
				arctos	196288	Terrestrial	CB	9, 12, 37, 38, 48
	Mustelidae	Lutrinae	Lontra	canadensis	8087	Terrestrial-Aquatic	CI	10, 12, 38
				longicaudis	6555	Terrestrial-Aquatic	CI	26, 36, 37, 38
		Mustelinae	Eira	barbara	4135	Arboreal-Terrestrial	CB	9, 10, 26, 44
			Galictis	vittata	2350	Subterranean-Terrestrial	C	12, 36, 37, 40, 46
			Gulo	gulo	12793	Arboreal-Terrestrial	C	9, 10, 25, 38, 43, 46
			Martes	americana	874	Arboreal-Terrestrial	CB	10, 12, 25, 37, 38, 44
				pennanti	3750	Arboreal-Terrestrial	CB	10, 37, 38, 46
			Mustela	erminea	285	Subterranean-Terrestrial	C	9, 10, 12, 25, 37, 38, 44
				frenata	190	Arboreal-Terrestrial	C	10, 12, 25, 48
				nigripes	907	Subterranean-Terrestrial	C	9, 10, 37
				nivalis	78	Terrestrial	C	10, 12, 25, 37, 38, 48
			Neovison	vison	1496	Terrestrial	CI	10, 38, 43, 44

Species list for North America

			Taxidea	taxus	7842	Subterranean-Terrestrial	C	10, 12, 37, 38, 43, 44, 46, 48
	Mephitidae		Conepatus	leuconotus	3294	Terrestrial	IC	9, 21, 44
				semistriatus	1997	Terrestrial	CF	26, 36, 37, 40
			Mephitis	macroura	1098	Subterranean-Terrestrial	IC	9, 38, 44
				mephitis	2400	Subterranean-Terrestrial	AF	9, 12, 43, 44, 46, 48
			Spilogale	gracilis	630	Subterranean-Terrestrial	CB	44, 48
				putorius	566	Subterranean-Terrestrial	C	10, 12, 44
				pygmaea	365	Subterranean-Terrestrial	CB	9, 38
	Procyonidae		Bassaricyon	gabbii	1250	Arboreal	FA	9, 21, 37
				lasius	1200	Arboreal	FA	19, 21
			Bassariscus	astutus	1010	Arboreal	CF	38, 44, 46, 48
				sumichrasti	906	Arboreal	FA	9, 21, 45
			Nasua	narica	4578	Terrestrial	IF	10, 12, 37, 38, 44, 46
			Potos	flavus	2442	Arboreal	FA	10, 12, 25, 26, 36, 37, 38, 40, 44, 45, 46
			Procyon	cancrivorus	6932	Arboreal-Terrestrial	IB	9, 36, 37, 38, 40, 44
				lotor	6374	Arboreal-Terrestrial	FI	10, 12, 26, 37, 38, 40, 43, 44, 46
PERISSODACTYLA	Tapiridae		Tapirus	bairdii	293782	Terrestrial	B	9, 26, 40
ARTIODACTYLA	Tayassuidae		Pecari	tajacu	21134	Terrestrial	FGr	25, 26, 28, 36, 38, 40
			Tayassu	pecari	31799	Terrestrial	FB	26, 27, 28, 36, 38, 40
	Cervidae	Capreolinae	Alces	alces	461901	Terrestrial	B	4, 5, 7, 9, 14, 23, 28, 31, 38
			Mazama	americana	20547	Terrestrial	FB	14, 26, 36, 40
				pandora	16500	Terrestrial	FB	2, 34
			Odocoileus	hemionus	84561	Terrestrial	B	5, 9, 23, 28, 31, 38, 48
				virginianus	75901	Terrestrial	B	4, 5, 23, 25, 26, 27, 28, 31, 36, 38, 40
			Rangifer	tarandus	109089	Terrestrial	BG	4, 5, 7, 9, 23, 25, 28, 31, 38
		Cervinae	Cervus	elaphus	240867	Terrestrial	BG	4, 5, 14, 23, 25, 28, 31, 38, 48
	Antilocapridae		Antilocapra	americana	47450	Terrestrial	F	5, 7, 9, 14, 23, 25, 28, 38
	Bovidae	Bovinae	Bison	bison	624577	Terrestrial	BG	3, 4, 5, 7, 14, 23, 28, 31, 38
		Caprinae	Oreamnos	americanus	72105	Terrestrial	BG	3, 5, 7, 14, 23, 25, 28, 31, 38
			Ovibos	moschatus	312500	Terrestrial	BG	3, 5, 7, 14, 23, 28, 31, 38
			Ovis	canadensis	74645	Terrestrial	BG	7, 14, 25, 28, 38
				dalli	70194	Terrestrial	BG	3, 7, 28, 31, 38

References

Reference no.	Reference type	Author (first)	Year	Title	Journal	Remarks
1	Journal Article	Arends,A.	2001	The comparative energetics of 'caviomorph' rodents	Comparative Biochemistry and Physiology-Part A: Molecular & Integrative Physiology	
2	Journal Article	Bodmer,R. E.	1990	Ungulate frugivores and the browser-grazer continuum	Oikos	Genus level data used
3	Journal Article	Bro-Jørgensen,J.	2008	Dense habitats selecting for small body size: a comparative study on bovids	Oikos	
4	Journal Article	Clauss,M.	2010	Convergence in the macroscopic anatomy of the reticulum in wild ruminant species of different feeding types and a new resulting hypothesis on reticular function	Journal of zoology	
5	Journal Article	Clauss,M.	2002	Faecal particle size distribution in captive wild ruminants: an approach to the browser/grazer dichotomy from the other end	Oecologia	
6	Journal Article	Cofre,H.	1999	Conservation status, rarity, and geographic priorities for conservation of Chilean mammals: an assessment	Biological Conservation	
7	Database	Damuth,J.	2010	ABSOLUT 6 a mammalian database compiled by the National Center for Ecological Analysis and Synthesis (NCEAS) workshop on Mammalian Communities		
8	Journal Article	Djagoun,S.	2009	Small carnivorans from southern Benin: a preliminary assessment of diversity and hunting pressure	Small Carnivore Conservation	
9	Journal Article	Ernest,S. K.	2003	Life History Characteristics of Placental Nonvolant Mammals: Ecological Archives E084-093	Ecology	
10	Journal Article	Friscia,A. R.	2006	An ecomorphological analysis of extant small carnivorans	Journal of zoology	
11	Journal Article	Geiser,F.	2003	Thermal biology and energetics of carnivorous marsupials	Predators with pouches: the biology of carnivorous marsupials	
12	Journal Article	Gittleman,J. L.	1985	Carnivore body size: ecological and taxonomic correlates	Oecologia	
13	Journal Article	Gordon,C. L.	2003	A first look at estimating body size in dentally conservative marsupials	Journal of Mammalian Evolution	
14	Journal Article	Gordon,IJ	1988	Incisor arcade structure and diet selection in ruminants	Functional Ecology	
15	Journal Article	Hallett,J. G.	1982	Habitat selection and the community matrix of a desert small-mammal fauna	Ecology	
16	Journal Article	Hallett,J. G.	1982	Habitat selection and the community matrix of a desert small-mammal fauna	Ecology	Genus level data used
17	Journal Article	Hayssen,V.	2008	Patterns of body and tail length and body mass in Sciuridae	Journal of mammalogy	
18	Journal Article	Jackson,S. M.	2002	Glide angle in the genus Petaurus and a review of gliding in mammals	Mammal Review	
19	Book, Whole	Jernvall,J.	1995	Mammalian molar cusp patterns: developmental mechanisms of diversity		Family level data used
20	Journal Article	Jernvall,J.	1998	Diversity components of impending primate extinctions	Proceedings of the National Academy of Sciences	

References

21	Database	Jones,K. E.	2009	PanTHERIA: a species-level database of life history, ecology, and geography of extant and recently extinct mammals	Ecology	
22	Journal Article	Kelt,D. A.	1996	Community structure of desert small mammals: comparisons across four continents	Ecology	
23	Journal Article	Loison,A.	1999	What factors shape sexual size dimorphism in ungulates?	Evolutionary Ecology Research	
24	Journal Article	McCay,T. S.	2001	Blarina carolinensis	Mammalian Species	
25	Journal Article	McNab,B. K.	1986	The influence of food habits on the energetics of eutherian mammals	Ecological Monographs	
26	Journal Article	MedellÃ-n,R. A.	1994	Mammal diversity and conservation in the Selva Lacandona, Chiapas, Mexico	Conservation Biology	
27	Journal Article	Mendoza,M.	2002	Characterizing complex craniodental patterns related to feeding behaviour in ungulates: a multivariate approach	Journal of zoology	
28	Journal Article	Mendoza,M.	2008	Hypsodonty in ungulates: an adaptation for grass consumption or for foraging in open habitat?	Journal of zoology	
29	Journal Article	Michaux,Jacques	2008	Phylogeny, adaptation and mandible shape in Sciuridae (Rodentia, Mammalia)	Mammalia	
30	Journal Article	Milton,K.	1976	Body weight, diet and home range area in primates	Nature	
31	Journal Article	Mysterud,A.	2000	The Relationship between Ecological Segregation and Sexual Body Size Dimorphism in Large Herbivores	Oecologia	
32	Journal Article	Nevo,E.	1979	Adaptive convergence and divergence of subterranean mammals	Annual Review of Ecology and Systematics	Genus level data used
33	Book, Whole	Nowak,R. M.	1991	Walker's mammals of the world		
34	Book, Whole	Nowak,R. M.	1991	Walker's mammals of the world		Genus level data used
35	Journal Article	Ojeda,R. A.	2001	Mammals in South American drylands: faunal similarity and trophic structure	Global Ecology and Biogeography	Genus level data used
36	Journal Article	Paglia,A. P.	2012	Lista Anotada dos Mamíferos do Brasil 2ª Edição Annotated Checklist of Brazilian Mammals 2nd Edition		
37	Journal Article	Polly,P. D.	2010	Tiptoeing through the trophics: geographic variation in carnivoran locomotor ecomorphology in relation to environment	Carnivoran Evolution: New Views on Phylogeny, Form, and Function.Cambridge University Press, Cambridge	
38	Journal Article	Price,S. A.	2012	Tempo of trophic evolution and its impact on mammalian diversification	Proceedings of the National Academy of Sciences	
39	Journal Article	Reed,K. E.	1998	Using Large Mammal Communities to Examine Ecological and Taxonomic Structure and Predict Vegetation in Extant and Extinct Assemblages	Paleobiology	
40	Journal Article	Robinson,J. G.	1986	Body Size, Diet, and Population Density of Neotropical Forest Mammals	The American Naturalist	
41	Journal Article	Robinson,J. G.	1986	Body Size, Diet, and Population Density of Neotropical Forest Mammals	The American Naturalist	Genus level data used

References

42	Journal Article	Samuels,J. X.	2009	Cranial morphology and dietary habits of rodents	Zoological Journal of the Linnean Society	
43	Journal Article	Samuels,J. X.	2008	Skeletal indicators of locomotor adaptations in living and extinct rodents	Journal of Morphology	
44	Journal Article	Samuels,J. X.	2013	Postcranial morphology and the locomotor habits of living and extinct carnivorans	Journal of Morphology	
45	Journal Article	Soligo,C.	2006	Adaptive origins of primates revisited	Journal of human evolution	
46	Journal Article	Van Valkenburgh,B.	1987	Skeletal indicators of locomotor behavior in living and extinct carnivores	Journal of Vertebrate Paleontology	
47	Journal Article	Vieira,E. M.	2003	Carnivory and insectivory in Neotropical marsupials	Predators with pouches: the biology of carnivorous marsupials	Genus level data used
48	Journal Article	Wardwell,D. A.	2008	A test of the cross-scale resilience model: Functional richness in Mediterranean-climate ecosystems	Ecological Complexity	
49	Journal Article	Williams,S. H.	2001	A comparative test of adaptive explanations for hypsodonty in ungulates and rodents	Journal of Mammalian Evolution	
50	Journal Article	Wolff,J. O.	1985	Why are aquatic small mammals so large?	Oikos	
51	Journal Article	Wolff,J. O.	1985	Why are aquatic small mammals so large?	Oikos	Genus level data used
52	Book, Whole	Grzimek,B.	2003	Grzimek's Animal Life Encyclopedia: Mammals I-V	Gale	
53	Book, Whole	Ceballos,G.	2014	Mammals of Mexico	JHU Press	

*) For *Canis rufus*, data from *C. lupus* was used

**) For *Peromyscus schmidlyi*, data from *P. boylii* was used

Dietary categories used in this study

Animalivores	
C	Carnivore
CI	Carnivore–Invertivore
IC	Invertivore–Carnivore
I	Invertivore
Animalivore–Frugivores	
AF	Animalivore–Frugivore
CF	Carnivore–Frugivore
IF	Invertivore–Frugivore
Animalivore–Herbivores	
AGr	Animalivore–Granivore
CB	Carnivore–Herbivore
Frugivores	
F	Frugivore
Frugivore–Animalivores	
FA	Frugivore–Animalivore
FC	Frugivore–Carnivore
FI	Frugivore–Invertivore
Frugivore–Herbivores	
FB	Frugivore–Herbivore
FGr	Frugivore–Granivore
Herbivores	
B	Browser
BG	Browser–Grazer

Dietary categories used in this study

GB	Grazer–Browser
G	Grazer
Gr	Granivore
R	Rootivore

Herbivore–Animalivores

BA	Herbivore–Animalivore
GrA	Granivore–Animalivore
RA	Rootivore–Animalivore

Herbivore–Frugivores

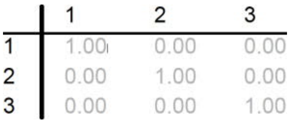
BF	Herbivore–Frugivore
GrF	Granivore–Frugivore

Lintulaakso *et al*., 2018: Supplementary material S2.
Selecting climatically distinct clusters (“climatic units”)

The following tables present p-values for pairwise distances between core clusters based on their MAT and annual precipitation. The p-values are derived from 1000 bootstrap replicates. Precipitation was log transformed and both it and MAT were standardized. Pairwise Euclidean distances were calculated between the mean values each core cluster. Data were then randomized between clusters and distances recalculated with 1000 iterations. P value is proportion of the time real distance was greater than random. Non-significant pairs are highlighted in red.

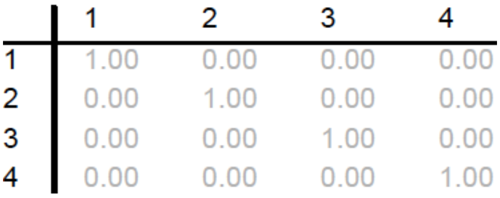
North America

P-values for *k*=3



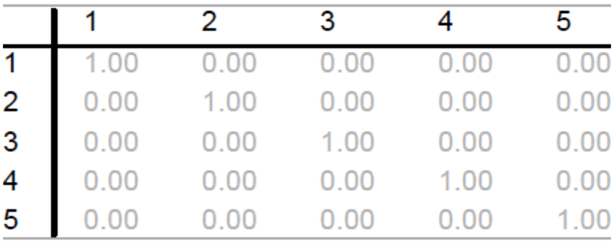
	1	2	3
1	1.00	0.00	0.00
2	0.00	1.00	0.00
3	0.00	0.00	1.00

P-values for *k*=4



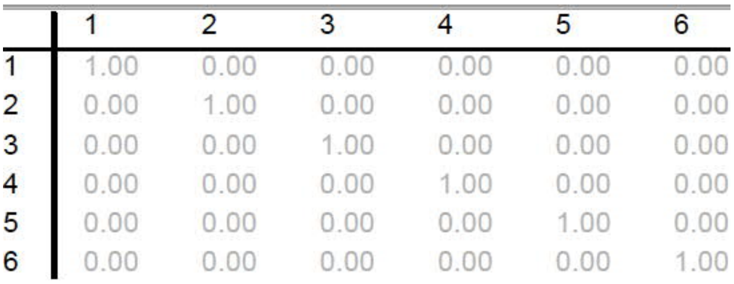
	1	2	3	4
1	1.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00
3	0.00	0.00	1.00	0.00
4	0.00	0.00	0.00	1.00

P-values for *k*=5



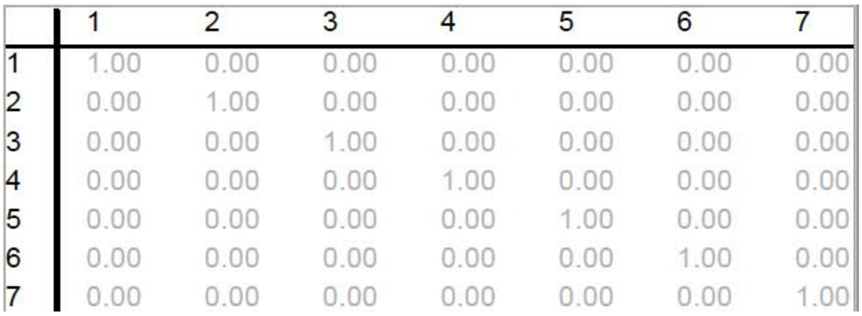
	1	2	3	4	5
1	1.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00
5	0.00	0.00	0.00	0.00	1.00

P-values for *k*=6



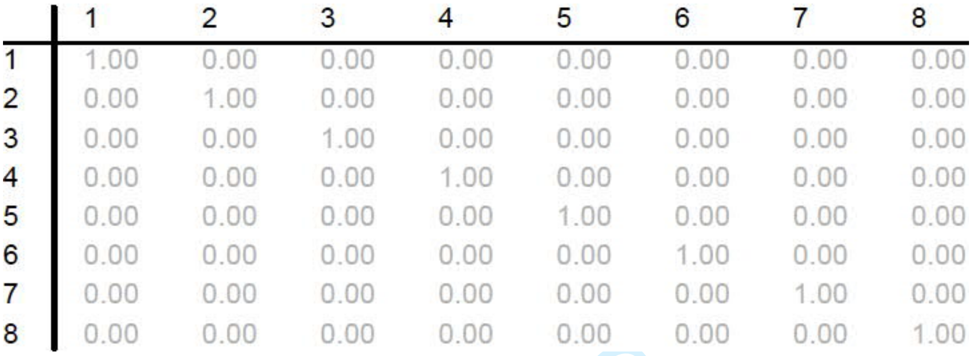
	1	2	3	4	5	6
1	1.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=7



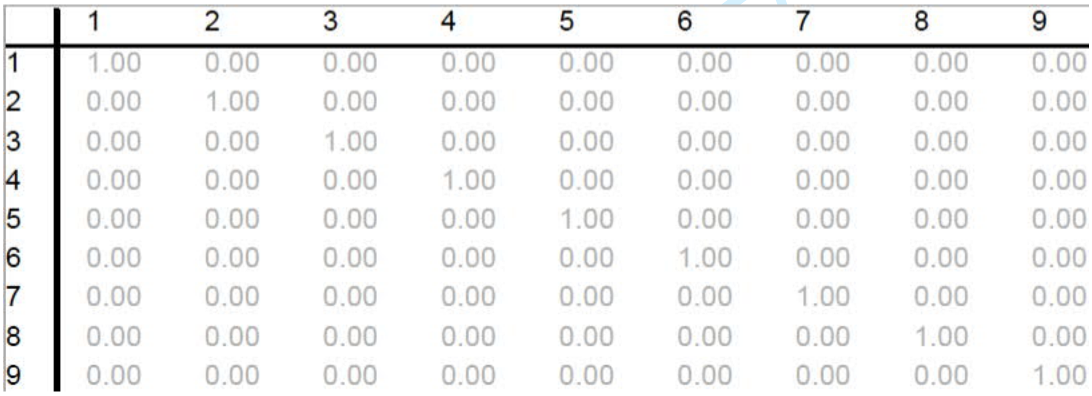
	1	2	3	4	5	6	7
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=8



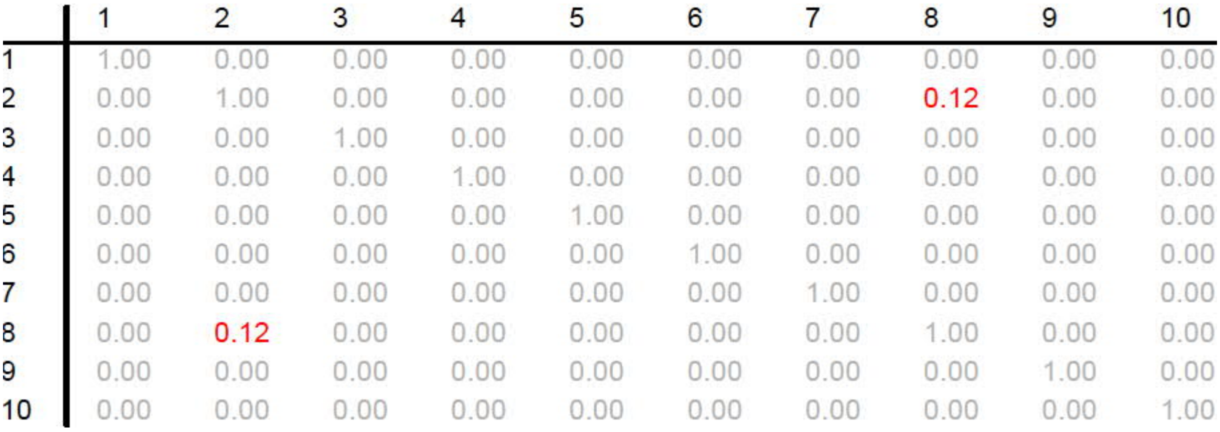
	1	2	3	4	5	6	7	8
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=9



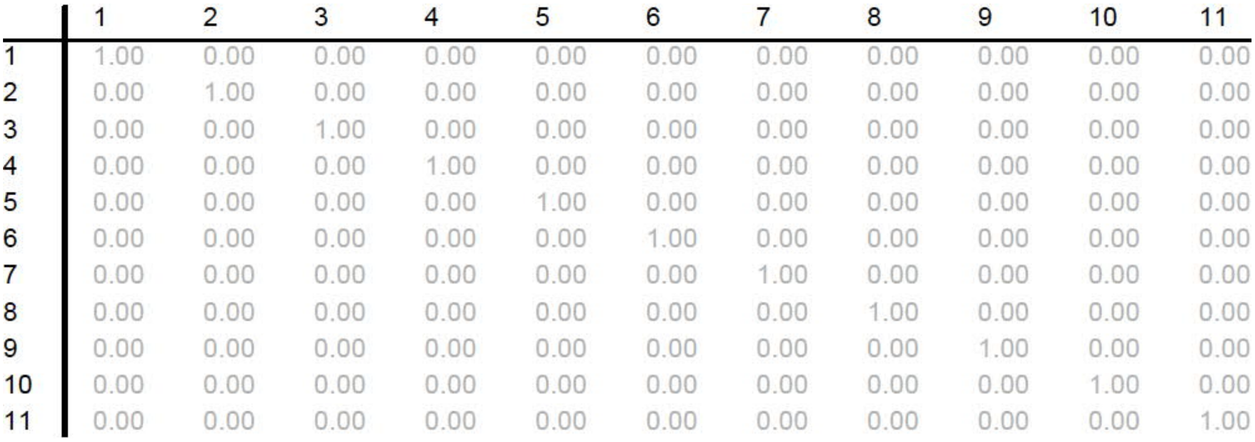
	1	2	3	4	5	6	7	8	9
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=10



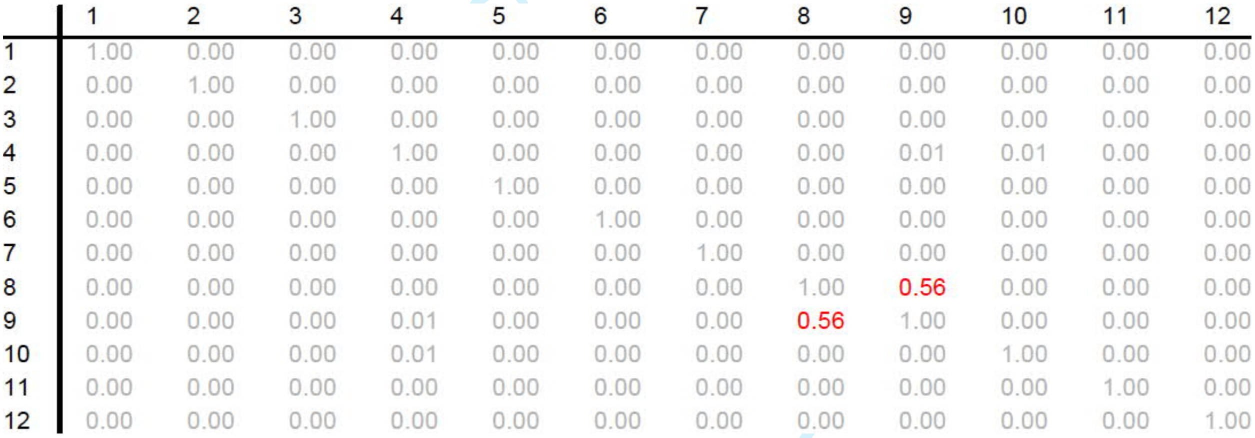
	1	2	3	4	5	6	7	8	9	10
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
8	0.00	0.12	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=11. This is set of North American clusters with the largest number of climatically distinct clusters.



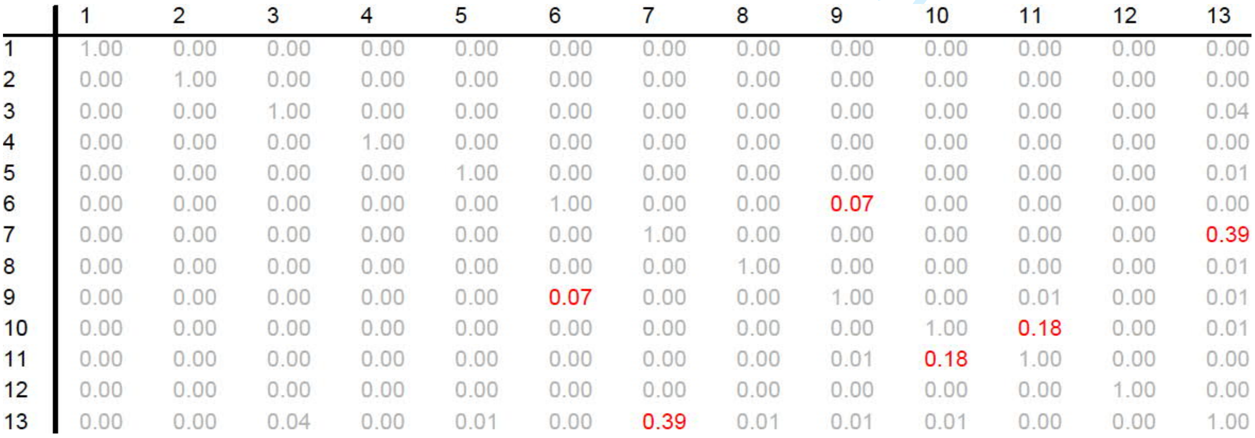
	1	2	3	4	5	6	7	8	9	10	11
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=12



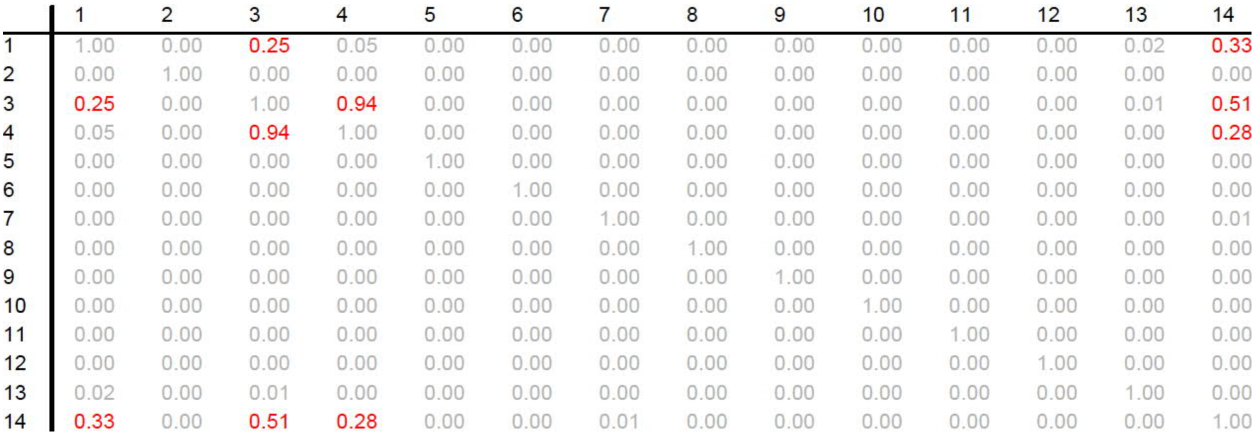
	1	2	3	4	5	6	7	8	9	10	11	12
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.56	0.00	0.00	0.00
9	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.56	1.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=13



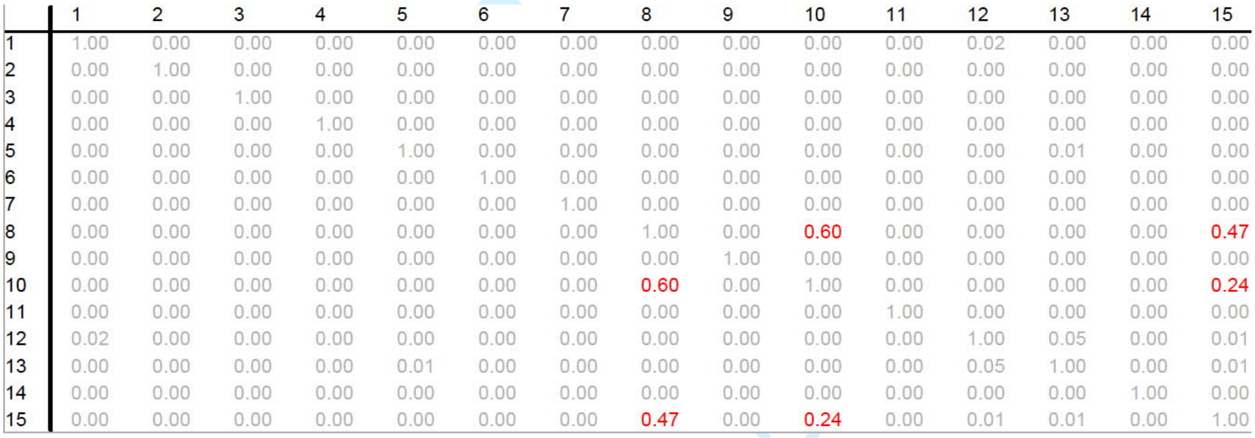
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.39
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.01
9	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	1.00	0.00	0.01	0.00	0.01
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.18	0.00	0.01
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.18	1.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
13	0.00	0.00	0.04	0.00	0.01	0.00	0.39	0.01	0.01	0.01	0.00	0.00	1.00

P-values for *k*=14



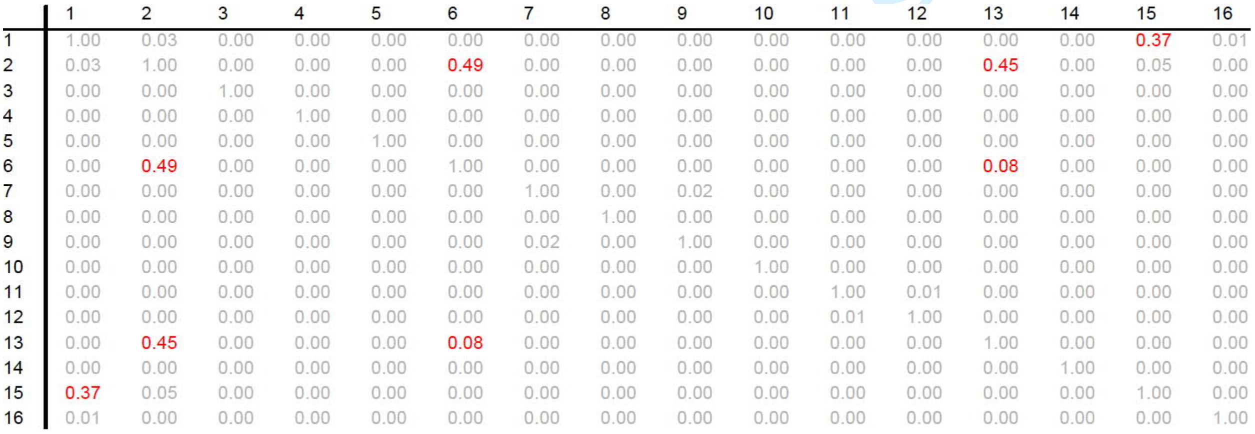
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00	0.00	0.25	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.33
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.25	0.00	1.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.51
4	0.05	0.00	0.94	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
13	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
14	0.33	0.00	0.51	0.28	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=15



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.60	0.00	0.00	0.00	0.00	0.47
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	1.00	0.00	0.00	0.00	0.00	0.24
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
12	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05	0.00	0.01
13	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.00	0.00	0.01
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.24	0.00	0.01	0.01	0.00	1.00

P-values for *k*=16



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.01
2	0.03	1.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.05	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.49	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.00	0.00	0.00	0.00	0.00
13	0.00	0.45	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
15	0.37	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
16	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=17

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1.00	0.66	0.00	0.03	0.00	0.16	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
2	0.66	1.00	0.00	0.06	0.00	0.13	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.03	0.06	0.00	1.00	0.00	0.01	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.01
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
6	0.16	0.13	0.00	0.01	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.23	0.01	0.14	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.01	0.01	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.28
12	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	1.00	0.09	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.09	1.00	0.00	0.00	0.00
15	0.01	0.04	0.00	0.00	0.01	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
17	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=18

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49
3	0.00	0.00	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.14
4	0.00	0.00	0.00	1.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.60
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.04
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.04	0.16	0.00	0.00	1.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.29
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.05
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.07	0.00	0.01	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.03
13	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.39	0.01	0.16	0.00	0.04	0.00	0.00	0.07	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.06
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.01	0.01
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.00	0.00
18	0.00	0.49	0.14	0.60	0.04	0.00	0.29	0.00	0.05	0.00	0.00	0.03	0.00	0.00	0.06	0.01	0.00	1.00

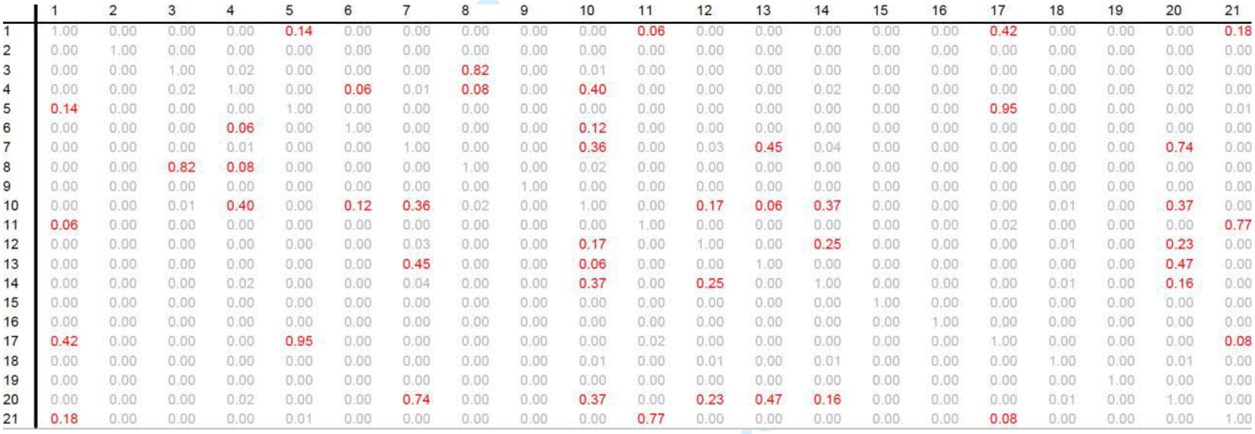
P-values for *k*=19

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.49	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.25	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
6	0.00	0.00	0.00	0.00	0.25	1.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00
7	0.00	0.00	0.02	0.00	0.01	0.00	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	1.00	0.26	0.03	0.00	0.00	0.00
15	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	1.00	0.00	0.00	0.00	0.00
16	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.12	0.03	0.00	0.00	0.03	0.00	1.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	1.00	0.00	0.01
18	0.00	0.00	0.74	0.00	0.04	0.01	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	1.00

P-values for *k*=20

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1.00	0.00	0.00	0.00	0.97	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.97	0.00	0.00	0.00	1.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.00
6	0.19	0.00	0.01	0.00	0.24	1.00	0.00	0.04	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.56	0.17
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.04	0.00	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.04	0.28
9	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.01	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.05	0.03
10	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	1.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.03	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.00	0.00	0.05	0.01	0.04
17	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.01	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.00	1.00	0.00	0.00
19	0.54	0.00	0.00	0.00	0.51	0.56	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	1.00	0.14
20	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.28	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.14	1.00

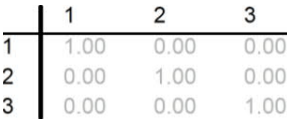
P-values for *k*=21



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	1.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.18
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.02	0.00	0.00	0.00	0.82	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.02	1.00	0.00	0.06	0.01	0.08	0.00	0.40	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00
5	0.14	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.01
6	0.00	0.00	0.00	0.06	0.00	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.01	0.00	0.00	1.00	0.00	0.00	0.36	0.00	0.03	0.45	0.04	0.00	0.00	0.00	0.00	0.00	0.74	0.00
8	0.00	0.00	0.82	0.08	0.00	0.00	0.00	1.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.01	0.40	0.00	0.12	0.36	0.02	0.00	1.00	0.00	0.17	0.06	0.37	0.00	0.00	0.00	0.01	0.00	0.37	0.00
11	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.77
12	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.17	0.00	1.00	0.00	0.25	0.00	0.00	0.00	0.01	0.00	0.23	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.06	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00
14	0.00	0.00	0.00	0.02	0.00	0.00	0.04	0.00	0.00	0.37	0.00	0.25	0.00	1.00	0.00	0.00	0.00	0.01	0.00	0.16	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
17	0.42	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.08
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	1.00	0.00	0.01	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
20	0.00	0.00	0.00	0.02	0.00	0.00	0.74	0.00	0.00	0.37	0.00	0.23	0.47	0.16	0.00	0.00	0.00	0.01	0.00	1.00	0.00
21	0.18	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	1.00

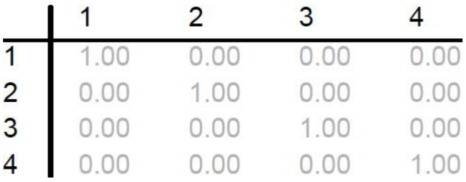
Europe

P-values for *k*=3



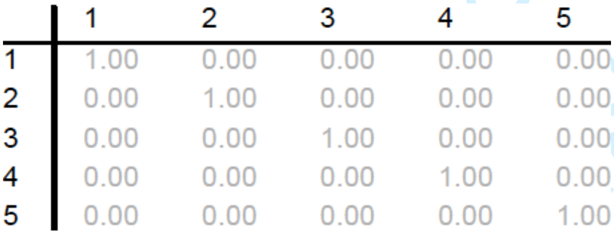
	1	2	3
1	1.00	0.00	0.00
2	0.00	1.00	0.00
3	0.00	0.00	1.00

P-values for *k*=4



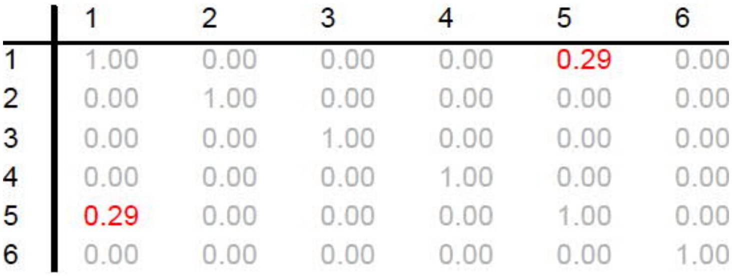
	1	2	3	4
1	1.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00
3	0.00	0.00	1.00	0.00
4	0.00	0.00	0.00	1.00

P-values for *k*=5. This is set of European clusters with the largest number of climatically distinct clusters.



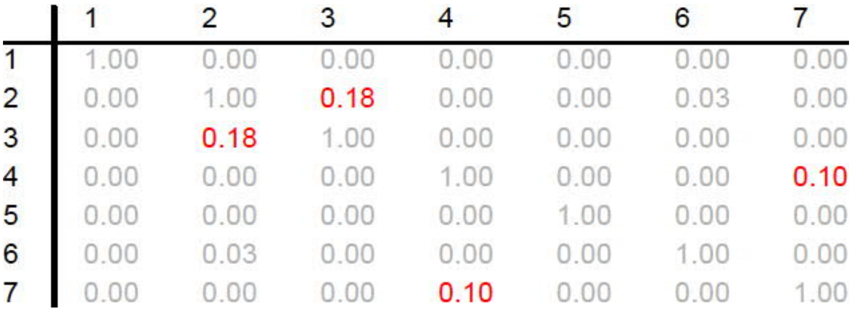
	1	2	3	4	5
1	1.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00
5	0.00	0.00	0.00	0.00	1.00

P-values for *k*=6



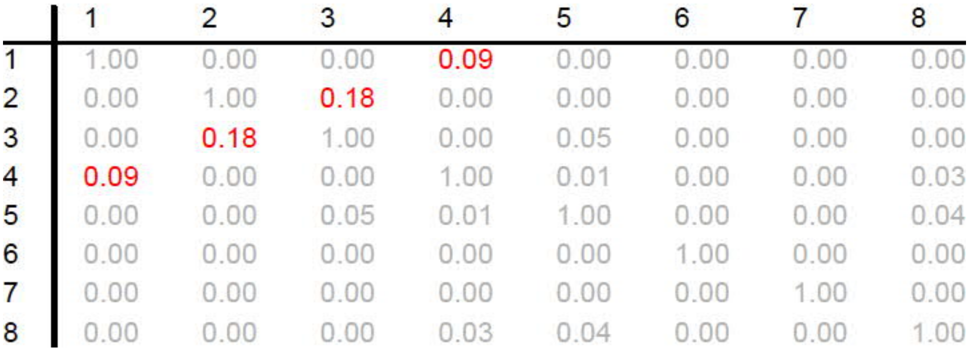
	1	2	3	4	5	6
1	1.00	0.00	0.00	0.00	0.29	0.00
2	0.00	1.00	0.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00
5	0.29	0.00	0.00	0.00	1.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=7



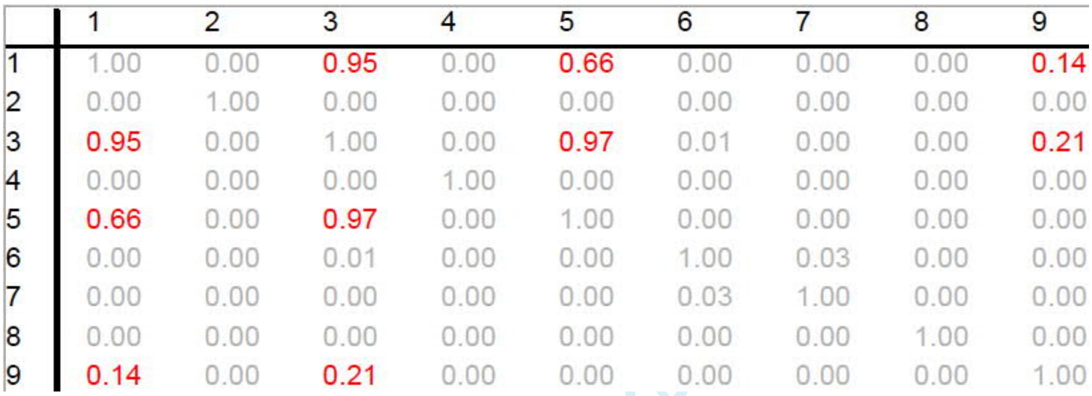
	1	2	3	4	5	6	7
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.18	0.00	0.00	0.03	0.00
3	0.00	0.18	1.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.10
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00
6	0.00	0.03	0.00	0.00	0.00	1.00	0.00
7	0.00	0.00	0.00	0.10	0.00	0.00	1.00

P-values for *k*=8



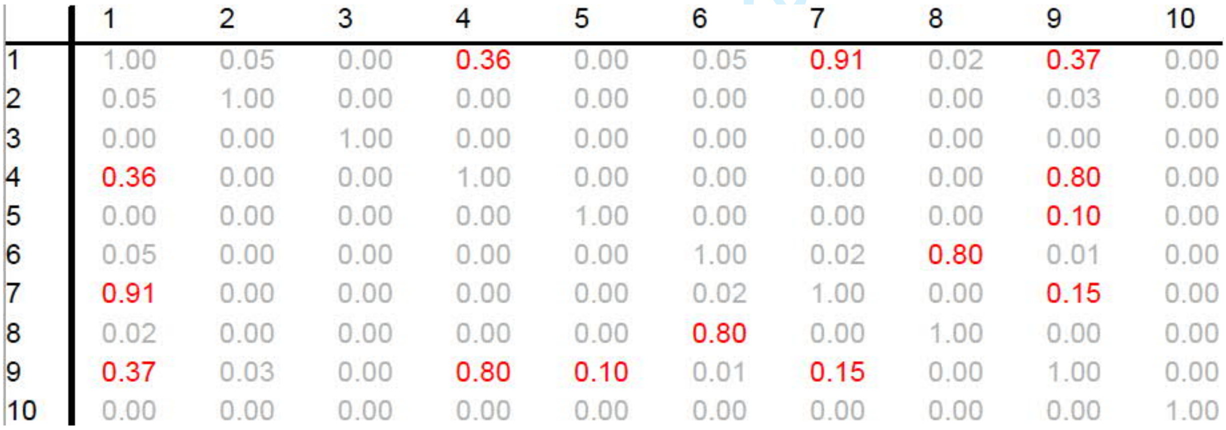
	1	2	3	4	5	6	7	8
1	1.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00
2	0.00	1.00	0.18	0.00	0.00	0.00	0.00	0.00
3	0.00	0.18	1.00	0.00	0.05	0.00	0.00	0.00
4	0.09	0.00	0.00	1.00	0.01	0.00	0.00	0.03
5	0.00	0.00	0.05	0.01	1.00	0.00	0.00	0.04
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
8	0.00	0.00	0.00	0.03	0.04	0.00	0.00	1.00

P-values for *k*=9



	1	2	3	4	5	6	7	8	9
1	1.00	0.00	0.95	0.00	0.66	0.00	0.00	0.00	0.14
2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.95	0.00	1.00	0.00	0.97	0.01	0.00	0.00	0.21
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
5	0.66	0.00	0.97	0.00	1.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.01	0.00	0.00	1.00	0.03	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.03	1.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
9	0.14	0.00	0.21	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=10



	1	2	3	4	5	6	7	8	9	10
1	1.00	0.05	0.00	0.36	0.00	0.05	0.91	0.02	0.37	0.00
2	0.05	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.36	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.80	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.10	0.00
6	0.05	0.00	0.00	0.00	0.00	1.00	0.02	0.80	0.01	0.00
7	0.91	0.00	0.00	0.00	0.00	0.02	1.00	0.00	0.15	0.00
8	0.02	0.00	0.00	0.00	0.00	0.80	0.00	1.00	0.00	0.00
9	0.37	0.03	0.00	0.80	0.10	0.01	0.15	0.00	1.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

P-values for *k*=11

	1	2	3	4	5	6	7	8	9	10	11
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.08	0.08
2	0.00	1.00	0.00	0.92	0.00	0.00	0.00	0.00	0.54	0.00	0.59
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.92	0.00	1.00	0.00	0.00	0.00	0.00	0.62	0.00	0.67
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.83	0.22	0.82
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.06	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.08	0.52	0.32
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.00
9	0.13	0.54	0.00	0.62	0.83	0.06	0.08	0.01	1.00	0.33	0.80
10	0.08	0.00	0.00	0.00	0.22	0.00	0.52	0.00	0.33	1.00	0.54
11	0.08	0.59	0.00	0.67	0.82	0.00	0.32	0.00	0.80	0.54	1.00

P-values for *k*=12

	1	2	3	4	5	6	7	8	9	10	11	12
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.06	0.00	0.34	0.31	0.00	0.00	0.00	0.00	0.24	0.79
3	0.00	0.06	1.00	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.21	0.70
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
5	0.00	0.34	0.00	0.00	1.00	0.08	0.00	0.00	0.10	0.00	0.24	0.43
6	0.00	0.31	0.91	0.00	0.08	1.00	0.00	0.06	0.00	0.00	0.52	0.69
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.11	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.06	0.00	1.00	0.00	0.00	0.01	0.01
9	0.00	0.00	0.00	0.03	0.10	0.00	0.00	0.00	1.00	0.01	0.01	0.02
10	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.01	1.00	0.00	0.00
11	0.00	0.24	0.21	0.00	0.24	0.52	0.00	0.01	0.01	0.00	1.00	0.76
12	0.00	0.79	0.70	0.00	0.43	0.69	0.00	0.01	0.02	0.00	0.76	1.00

P-values for *k*=13

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.00	0.01	0.53	0.46	0.00	0.01	0.00	0.05	0.00	0.00	0.01	0.94	0.27
2	0.01	1.00	0.42	0.00	0.00	0.06	0.00	0.47	0.00	0.00	0.00	0.00	0.00
3	0.53	0.42	1.00	0.23	0.00	0.73	0.00	0.68	0.01	0.06	0.08	0.55	0.21
4	0.46	0.00	0.23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.22
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
6	0.01	0.06	0.73	0.00	0.00	1.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.05	0.47	0.68	0.00	0.00	0.06	0.00	1.00	0.00	0.00	0.00	0.05	0.00
9	0.00	0.00	0.01	0.00	0.20	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
11	0.01	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.04	0.81
12	0.94	0.00	0.55	0.40	0.00	0.00	0.00	0.05	0.00	0.00	0.04	1.00	0.38
13	0.27	0.00	0.21	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.38	1.00

P-values for *k*=14

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.02	0.00	0.63	0.10	0.00
2	0.00	1.00	0.26	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.18	0.01	0.00
3	0.00	0.26	1.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.04	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.00	0.00	0.15	0.00	0.00	0.00	0.01	0.00	0.00	0.00
6	0.07	0.00	0.00	0.00	0.00	1.00	0.02	0.00	0.00	0.00	0.01	0.21	0.34	0.68
7	0.00	0.00	0.00	0.00	0.15	0.02	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.01
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.03	0.44	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.04	0.00	0.00
10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.09	0.00	0.00
11	0.00	0.00	0.00	0.00	0.01	0.01	0.16	0.00	0.00	0.00	1.00	0.00	0.00	0.00
12	0.63	0.18	0.04	0.00	0.00	0.21	0.00	0.00	0.04	0.09	0.00	1.00	0.73	0.07
13	0.10	0.01	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.73	1.00	0.03
14	0.00	0.00	0.00	0.00	0.00	0.68	0.01	0.00	0.00	0.00	0.00	0.07	0.03	1.00

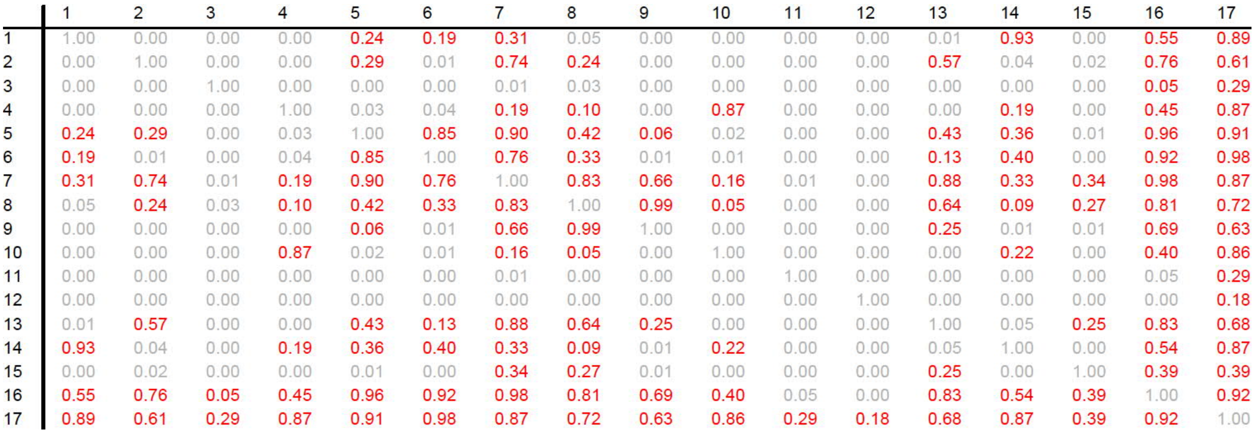
P-values for *k*=15

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.03	0.40	0.21
2	0.00	1.00	0.07	0.00	0.00	0.00	0.00	0.03	0.44	0.00	0.11	0.00	0.07	0.75	0.41
3	0.00	0.07	1.00	0.00	0.00	0.00	0.01	0.01	0.58	0.00	0.00	0.00	0.06	0.56	0.77
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.03
5	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.87	0.00
6	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
7	0.00	0.00	0.01	0.00	0.00	0.00	1.00	0.00	0.01	0.92	0.00	0.03	0.00	0.36	0.17
8	0.00	0.03	0.01	0.00	0.73	0.00	0.00	1.00	0.02	0.00	0.04	0.00	0.00	0.91	0.02
9	0.06	0.44	0.58	0.00	0.00	0.00	0.01	0.02	1.00	0.00	0.07	0.02	0.82	0.57	0.92
10	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.00	1.00	0.00	0.00	0.00	0.37	0.10
11	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.04	0.07	0.00	1.00	0.00	0.01	0.79	0.12
12	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.00	0.00	1.00	0.00	0.28	0.29
13	0.03	0.07	0.06	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.01	0.00	1.00	0.50	0.76
14	0.40	0.75	0.56	0.15	0.87	0.06	0.36	0.91	0.57	0.37	0.79	0.28	0.50	1.00	0.52
15	0.21	0.41	0.77	0.03	0.00	0.00	0.17	0.02	0.92	0.10	0.12	0.29	0.76	0.52	1.00

P-values for *k*=16

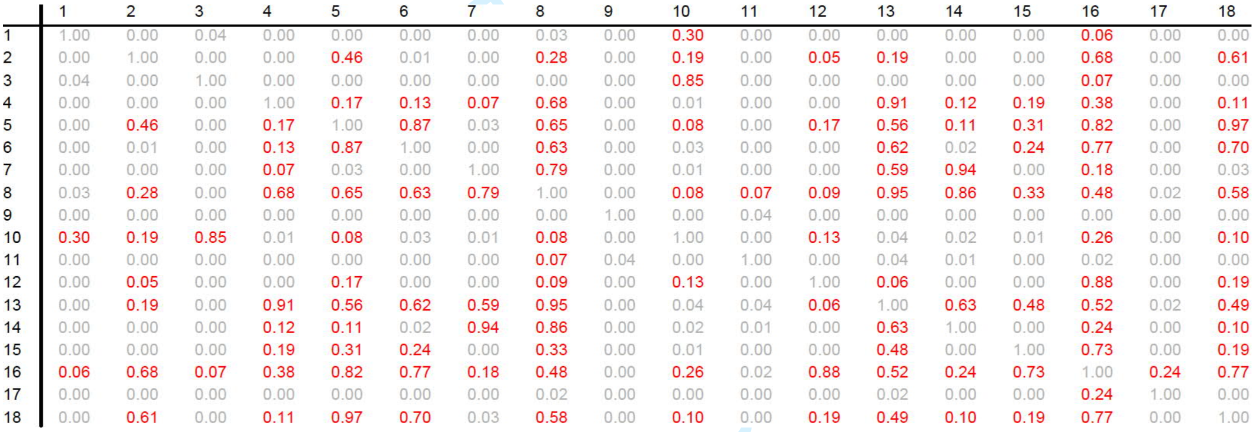
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.00	0.05	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.00	0.00
3	0.00	0.05	1.00	0.01	0.73	0.31	0.97	0.00	0.00	0.00	0.05	0.02	0.12	0.03	0.04	0.18
4	0.00	0.00	0.01	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.00	0.00	0.00	0.06
5	0.00	0.03	0.73	0.01	1.00	0.08	0.63	0.00	0.00	0.00	0.02	0.01	0.14	0.00	0.00	0.14
6	0.00	0.02	0.31	0.00	0.08	1.00	0.08	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.03	0.00
7	0.00	0.00	0.97	0.00	0.63	0.08	1.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.04
8	0.07	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.04	0.14	0.00	0.00	0.00	0.11
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.05	0.05	0.02	0.00	0.00	0.04	0.00	0.00	1.00	0.89	0.00	0.00	0.00	0.79
12	0.00	0.00	0.02	0.07	0.01	0.00	0.00	0.14	0.00	0.00	0.89	1.00	0.00	0.00	0.00	0.71
13	0.00	0.93	0.12	0.00	0.14	0.27	0.06	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.01	0.00
14	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
15	0.00	0.00	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	1.00	0.00
16	0.00	0.00	0.18	0.06	0.14	0.00	0.04	0.11	0.00	0.00	0.79	0.71	0.00	0.00	0.00	1.00

P-values for *k*=17



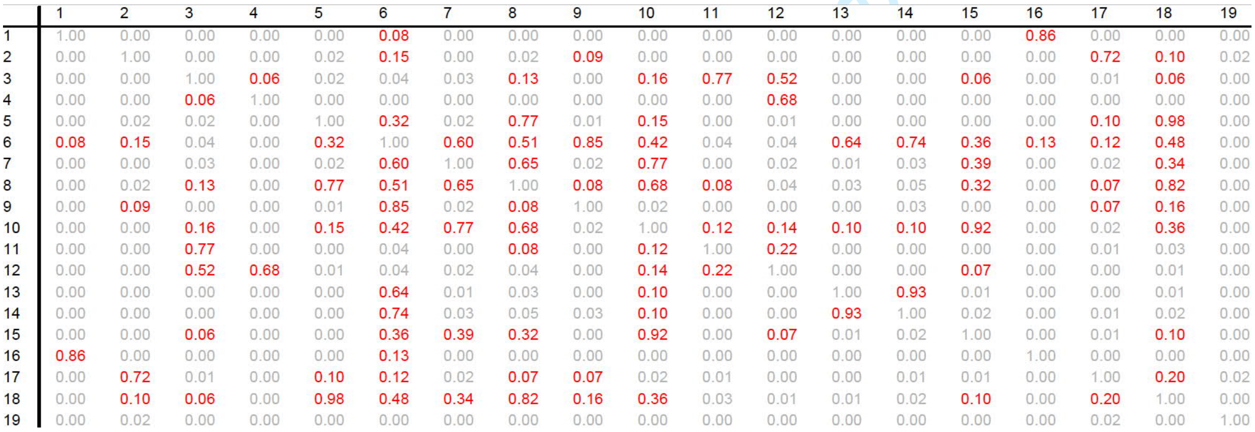
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1.00	0.00	0.00	0.00	0.24	0.19	0.31	0.05	0.00	0.00	0.00	0.00	0.01	0.93	0.00	0.55	0.89
2	0.00	1.00	0.00	0.00	0.29	0.01	0.74	0.24	0.00	0.00	0.00	0.00	0.57	0.04	0.02	0.76	0.61
3	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.29
4	0.00	0.00	0.00	1.00	0.03	0.04	0.19	0.10	0.00	0.87	0.00	0.00	0.00	0.19	0.00	0.45	0.87
5	0.24	0.29	0.00	0.03	1.00	0.85	0.90	0.42	0.06	0.02	0.00	0.00	0.43	0.36	0.01	0.96	0.91
6	0.19	0.01	0.00	0.04	0.85	1.00	0.76	0.33	0.01	0.01	0.00	0.00	0.13	0.40	0.00	0.92	0.98
7	0.31	0.74	0.01	0.19	0.90	0.76	1.00	0.83	0.66	0.16	0.01	0.00	0.88	0.33	0.34	0.98	0.87
8	0.05	0.24	0.03	0.10	0.42	0.33	0.83	1.00	0.99	0.05	0.00	0.00	0.64	0.09	0.27	0.81	0.72
9	0.00	0.00	0.00	0.00	0.06	0.01	0.66	0.99	1.00	0.00	0.00	0.00	0.25	0.01	0.01	0.69	0.63
10	0.00	0.00	0.00	0.87	0.02	0.01	0.16	0.05	0.00	1.00	0.00	0.00	0.00	0.22	0.00	0.40	0.86
11	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.05	0.29
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.18
13	0.01	0.57	0.00	0.00	0.43	0.13	0.88	0.64	0.25	0.00	0.00	0.00	1.00	0.05	0.25	0.83	0.68
14	0.93	0.04	0.00	0.19	0.36	0.40	0.33	0.09	0.01	0.22	0.00	0.00	0.05	1.00	0.00	0.54	0.87
15	0.00	0.02	0.00	0.00	0.01	0.00	0.34	0.27	0.01	0.00	0.00	0.00	0.25	0.00	1.00	0.39	0.39
16	0.55	0.76	0.05	0.45	0.96	0.92	0.98	0.81	0.69	0.40	0.05	0.00	0.83	0.54	0.39	1.00	0.92
17	0.89	0.61	0.29	0.87	0.91	0.98	0.87	0.72	0.63	0.86	0.29	0.18	0.68	0.87	0.39	0.92	1.00

P-values for *k*=18



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.00	0.00	0.04	0.00	0.00	0.00	0.00	0.03	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
2	0.00	1.00	0.00	0.00	0.46	0.01	0.00	0.28	0.00	0.19	0.00	0.05	0.19	0.00	0.00	0.68	0.00	0.61
3	0.04	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00
4	0.00	0.00	0.00	1.00	0.17	0.13	0.07	0.68	0.00	0.01	0.00	0.00	0.91	0.12	0.19	0.38	0.00	0.11
5	0.00	0.46	0.00	0.17	1.00	0.87	0.03	0.65	0.00	0.08	0.00	0.17	0.56	0.11	0.31	0.82	0.00	0.97
6	0.00	0.01	0.00	0.13	0.87	1.00	0.00	0.63	0.00	0.03	0.00	0.00	0.62	0.02	0.24	0.77	0.00	0.70
7	0.00	0.00	0.00	0.07	0.03	0.00	1.00	0.79	0.00	0.01	0.00	0.00	0.59	0.94	0.00	0.18	0.00	0.03
8	0.03	0.28	0.00	0.68	0.65	0.63	0.79	1.00	0.00	0.08	0.07	0.09	0.95	0.86	0.33	0.48	0.02	0.58
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.30	0.19	0.85	0.01	0.08	0.03	0.01	0.08	0.00	1.00	0.00	0.13	0.04	0.02	0.01	0.26	0.00	0.10
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.04	0.00	1.00	0.00	0.04	0.01	0.00	0.02	0.00	0.00
12	0.00	0.05	0.00	0.00	0.17	0.00	0.00	0.09	0.00	0.13	0.00	1.00	0.06	0.00	0.00	0.88	0.00	0.19
13	0.00	0.19	0.00	0.91	0.56	0.62	0.59	0.95	0.00	0.04	0.04	0.06	1.00	0.63	0.48	0.52	0.02	0.49
14	0.00	0.00	0.00	0.12	0.11	0.02	0.94	0.86	0.00	0.02	0.01	0.00	0.63	1.00	0.00	0.24	0.00	0.10
15	0.00	0.00	0.00	0.19	0.31	0.24	0.00	0.33	0.00	0.01	0.00	0.00	0.48	0.00	1.00	0.73	0.00	0.19
16	0.06	0.68	0.07	0.38	0.82	0.77	0.18	0.48	0.00	0.26	0.02	0.88	0.52	0.24	0.73	1.00	0.24	0.77
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.24	1.00	0.00
18	0.00	0.61	0.00	0.11	0.97	0.70	0.03	0.58	0.00	0.10	0.00	0.19	0.49	0.10	0.19	0.77	0.00	1.00

P-values for *k*=19

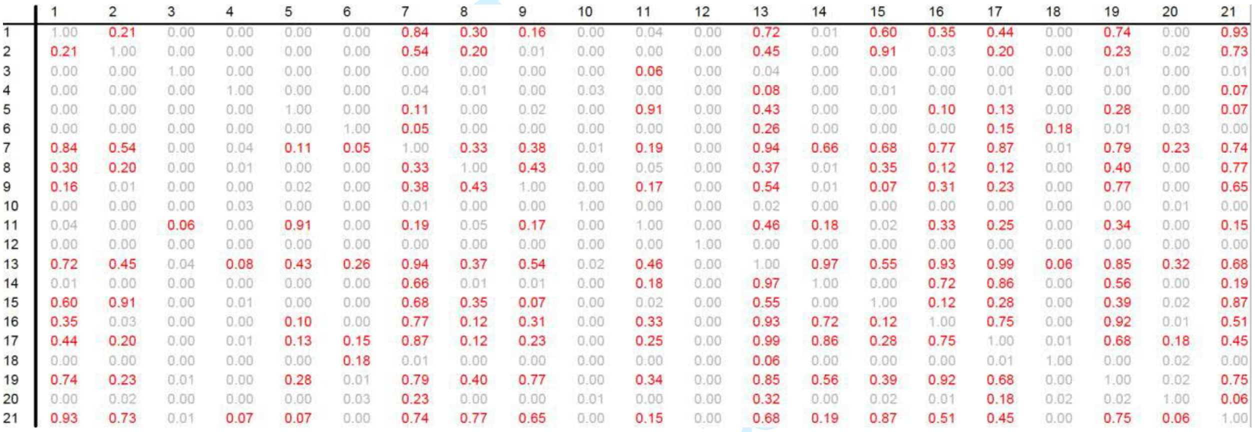


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00
2	0.00	1.00	0.00	0.00	0.02	0.15	0.00	0.02	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.10	0.02
3	0.00	0.00	1.00	0.06	0.02	0.04	0.03	0.13	0.00	0.16	0.77	0.52	0.00	0.00	0.06	0.00	0.01	0.06	0.00
4	0.00	0.00	0.06	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.02	0.02	0.00	1.00	0.32	0.02	0.77	0.01	0.15	0.00	0.01	0.00	0.00	0.00	0.00	0.10	0.98	0.00
6	0.08	0.15	0.04	0.00	0.32	1.00	0.60	0.51	0.85	0.42	0.04	0.04	0.64	0.74	0.36	0.13	0.12	0.48	0.00
7	0.00	0.00	0.03	0.00	0.02	0.60	1.00	0.65	0.02	0.77	0.00	0.02	0.01	0.03	0.39	0.00	0.02	0.34	0.00
8	0.00	0.02	0.13	0.00	0.77	0.51	0.65	1.00	0.08	0.68	0.08	0.04	0.03	0.05	0.32	0.00	0.07	0.82	0.00
9	0.00	0.09	0.00	0.00	0.01	0.85	0.02	0.08	1.00	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.07	0.16	0.00
10	0.00	0.00	0.16	0.00	0.15	0.42	0.77	0.68	0.02	1.00	0.12	0.14	0.10	0.10	0.92	0.00	0.02	0.36	0.00
11	0.00	0.00	0.77	0.00	0.00	0.04	0.00	0.08	0.00	0.12	1.00	0.22	0.00	0.00	0.00	0.00	0.01	0.03	0.00
12	0.00	0.00	0.52	0.68	0.01	0.04	0.02	0.04	0.00	0.14	0.22	1.00	0.00	0.00	0.07	0.00	0.00	0.01	0.00
13	0.00	0.00	0.00	0.00	0.00	0.64	0.01	0.03	0.00	0.10	0.00	0.00	1.00	0.93	0.01	0.00	0.00	0.01	0.00
14	0.00	0.00	0.00	0.00	0.00	0.74	0.03	0.05	0.03	0.10	0.00	0.00	0.93	1.00	0.02	0.00	0.01	0.02	0.00
15	0.00	0.00	0.06	0.00	0.00	0.36	0.39	0.32	0.00	0.92	0.00	0.07	0.01	0.02	1.00	0.00	0.01	0.10	0.00
16	0.86	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
17	0.00	0.72	0.01	0.00	0.10	0.12	0.02	0.07	0.07	0.02	0.01	0.00	0.00	0.01	0.01	0.00	1.00	0.20	0.02
18	0.00	0.10	0.06	0.00	0.98	0.48	0.34	0.82	0.16	0.36	0.03	0.01	0.01	0.02	0.10	0.00	0.20	1.00	0.00
19	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	1.00

P-values for *k*=20

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1.00	0.44	0.00	0.07	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.03	0.04	0.84	0.00	0.00	0.00	0.00	0.06	0.00
2	0.44	1.00	0.36	0.49	0.09	0.29	0.07	0.17	0.77	0.05	0.34	0.23	0.96	0.77	0.01	0.68	0.01	0.66	0.49	0.58
3	0.00	0.36	1.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.01	0.10	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.02
4	0.07	0.49	0.00	1.00	0.00	0.00	0.02	0.11	0.48	0.00	0.00	0.07	0.04	0.63	0.00	0.00	0.00	0.00	0.89	0.00
5	0.00	0.09	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.01
6	0.00	0.29	0.50	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.30	0.16	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.12
7	0.00	0.07	0.00	0.02	0.00	0.00	1.00	0.18	0.00	0.00	0.00	0.03	0.00	0.09	0.15	0.00	0.00	0.00	0.05	0.00
8	0.00	0.17	0.00	0.11	0.00	0.00	0.18	1.00	0.03	0.00	0.00	0.14	0.01	0.11	0.03	0.00	0.00	0.02	0.29	0.00
9	0.31	0.77	0.00	0.48	0.00	0.00	0.00	0.03	1.00	0.00	0.00	0.09	0.26	0.94	0.00	0.01	0.00	0.05	0.50	0.01
10	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.34	0.01	0.00	0.00	0.30	0.00	0.00	0.00	0.00	1.00	0.31	0.11	0.02	0.00	0.01	0.00	0.00	0.00	0.57
12	0.03	0.23	0.10	0.07	0.66	0.16	0.03	0.14	0.09	0.01	0.31	1.00	0.24	0.10	0.02	0.34	0.95	0.30	0.11	0.36
13	0.04	0.96	0.04	0.04	0.00	0.06	0.00	0.01	0.26	0.00	0.11	0.24	1.00	0.43	0.00	0.50	0.00	0.34	0.09	0.51
14	0.84	0.77	0.04	0.63	0.00	0.02	0.09	0.11	0.94	0.01	0.02	0.10	0.43	1.00	0.00	0.10	0.00	0.18	0.56	0.08
15	0.00	0.01	0.00	0.00	0.00	0.00	0.15	0.03	0.00	0.00	0.00	0.02	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.34	0.50	0.10	0.00	1.00	0.00	0.24	0.00	0.55
17	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
18	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.30	0.34	0.18	0.00	0.24	0.00	1.00	0.05	0.12
19	0.06	0.49	0.00	0.89	0.00	0.00	0.05	0.29	0.50	0.00	0.00	0.11	0.09	0.56	0.00	0.00	0.00	0.05	1.00	0.00
20	0.00	0.58	0.02	0.00	0.01	0.12	0.00	0.00	0.01	0.00	0.57	0.36	0.51	0.08	0.00	0.55	0.00	0.12	0.00	1.00

P-values for *k*=21



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	1.00	0.21	0.00	0.00	0.00	0.00	0.84	0.30	0.16	0.00	0.04	0.00	0.72	0.01	0.60	0.35	0.44	0.00	0.74	0.00	0.93
2	0.21	1.00	0.00	0.00	0.00	0.00	0.54	0.20	0.01	0.00	0.00	0.00	0.45	0.00	0.91	0.03	0.20	0.00	0.23	0.02	0.73
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
4	0.00	0.00	0.00	1.00	0.00	0.00	0.04	0.01	0.00	0.03	0.00	0.00	0.08	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.07
5	0.00	0.00	0.00	0.00	1.00	0.00	0.11	0.00	0.02	0.00	0.91	0.00	0.43	0.00	0.00	0.10	0.13	0.00	0.28	0.00	0.07
6	0.00	0.00	0.00	0.00	0.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.15	0.18	0.01	0.03	0.00
7	0.84	0.54	0.00	0.04	0.11	0.05	1.00	0.33	0.38	0.01	0.19	0.00	0.94	0.66	0.68	0.77	0.87	0.01	0.79	0.23	0.74
8	0.30	0.20	0.00	0.01	0.00	0.00	0.33	1.00	0.43	0.00	0.05	0.00	0.37	0.01	0.35	0.12	0.12	0.00	0.40	0.00	0.77
9	0.16	0.01	0.00	0.00	0.02	0.00	0.38	0.43	1.00	0.00	0.17	0.00	0.54	0.01	0.07	0.31	0.23	0.00	0.77	0.00	0.65
10	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.00	1.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
11	0.04	0.00	0.06	0.00	0.91	0.00	0.19	0.05	0.17	0.00	1.00	0.00	0.46	0.18	0.02	0.33	0.25	0.00	0.34	0.00	0.15
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.72	0.45	0.04	0.08	0.43	0.26	0.94	0.37	0.54	0.02	0.46	0.00	1.00	0.97	0.55	0.93	0.99	0.06	0.85	0.32	0.68
14	0.01	0.00	0.00	0.00	0.00	0.00	0.66	0.01	0.01	0.00	0.18	0.00	0.97	1.00	0.00	0.72	0.86	0.00	0.56	0.00	0.19
15	0.60	0.91	0.00	0.01	0.00	0.00	0.68	0.35	0.07	0.00	0.02	0.00	0.55	0.00	1.00	0.12	0.28	0.00	0.39	0.02	0.87
16	0.35	0.03	0.00	0.00	0.10	0.00	0.77	0.12	0.31	0.00	0.33	0.00	0.93	0.72	0.12	1.00	0.75	0.00	0.92	0.01	0.51
17	0.44	0.20	0.00	0.01	0.13	0.15	0.87	0.12	0.23	0.00	0.25	0.00	0.99	0.86	0.28	0.75	1.00	0.01	0.68	0.18	0.45
18	0.00	0.00	0.00	0.00	0.00	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.01	1.00	0.00	0.02	0.00
19	0.74	0.23	0.01	0.00	0.28	0.01	0.79	0.40	0.77	0.00	0.34	0.00	0.85	0.56	0.39	0.92	0.68	0.00	1.00	0.02	0.75
20	0.00	0.02	0.00	0.00	0.00	0.03	0.23	0.00	0.00	0.01	0.00	0.00	0.32	0.00	0.02	0.01	0.18	0.02	0.02	1.00	0.06
21	0.93	0.73	0.01	0.07	0.07	0.00	0.74	0.77	0.65	0.00	0.15	0.00	0.68	0.19	0.87	0.51	0.45	0.00	0.75	0.06	1.00

Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Cluster Sizes for North America

Number of 50 km grid points in North American Clusters

Total grids in NA = 9699

Cluster Num	Mean	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3	1081.3	1836	250	1158																		
4	1521.8	1146	1812	1168	1961																	
5	1616.0	1394	1283	1149	2158	2096																
6	856.3	926	820	1294	871	892	335															
7	602.0	520	493	1291	108	470	507	825														
8	502.1	1167	221	235	377	745	436	285	551													
9	389.6	383	614	438	490	165	320	711	276	109												
10	417.7	561	273	174	354	418	290	835	35	540	697											
11	349.5	229	539	245	409	589	527	147	301	109	392	358										
12	291.7	287	415	260	326	363	254	409	202	39	514	289	142									
13	251.6	163	659	207	588	60	472	215	102	47	203	265	273	17								
14	222.4	175	112	66	350	628	591	194	134	115	365	152	122	71	39							
15	238.8	194	112	164	180	639	586	186	115	230	161	340	348	42	257	28						
16	235.4	112	55	407	589	205	186	230	245	107	184	111	79	169	406	168	513					
17	194.4	306	89	85	48	494	98	33	126	594	359	38	65	91	59	100	120	600				
18	211.1	409	118	120	311	136	142	166	184	78	209	251	590	165	580	24	169	135	12			
19	187.5	563	124	160	124	174	271	73	168	139	254	285	65	367	45	33	25	615	35	42		
20	174.2	117	109	303	173	42	33	107	182	104	112	554	399	162	127	63	42	101	597	22	135	
21	153.3	51	191	114	81	232	171	56	62	111	28	132	233	139	123	581	161	44	91	559	34	25

Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Cluster Sizes for Europe

Number of 50 km grid points in European Clusters

Total grids in Europe = 2670

Cluster Num	**Mean**	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***
3	276.3	360	137	332																		
4	317.5	345	361	239	325																	
5	403.2	474	394	373	333	442																
6	189.8	327	254	203	95	142	118															
7	140.7	128	87	198	237	20	296	19														
8	129.0	299	237	16	69	37	117	103	154													
9	101.1	33	218	13	68	297	28	34	107	112												
10	116.6	19	136	222	292	87	19	142	75	11	163											
11	97.6	133	85	54	79	120	172	166	227	11	22	5										
12	87.8	156	51	291	64	46	14	226	66	65	22	36	17									
13	60.2	37	25	9	170	20	24	107	38	73	150	74	35	20								
14	58.4	97	64	27	61	95	16	15	126	63	104	33	21	42	53							
15	54.2	105	83	52	158	78	53	44	7	24	55	39	47	56	2	10						
16	43.4	97	91	18	43	32	56	45	23	93	17	38	30	17	53	27	14					
17	40.3	37	95	73	48	17	36	9	11	88	54	97	54	19	8	35	3	1				
18	30.1	60	61	18	14	16	53	52	4	30	3	28	39	6	18	28	3	93	16			
19	33.5	52	6	8	91	84	4	45	15	27	14	92	10	61	42	44	24	3	11	4		
20	36.3	22	3	99	46	49	26	21	17	20	73	36	4	16	9	93	91	18	41	22	20	
21	23.4	37	35	82	21	89	12	4	10	23	34	5	5	4	49	20	16	6	13	6	16	5

Lintulaakso et al., 2018: Supplementary material S3.
Cluster sizes and species trait statistics for clusters - Distances Between Clusters NA: Body Mass

Euclidean distances between trait distributions (chi-distances)

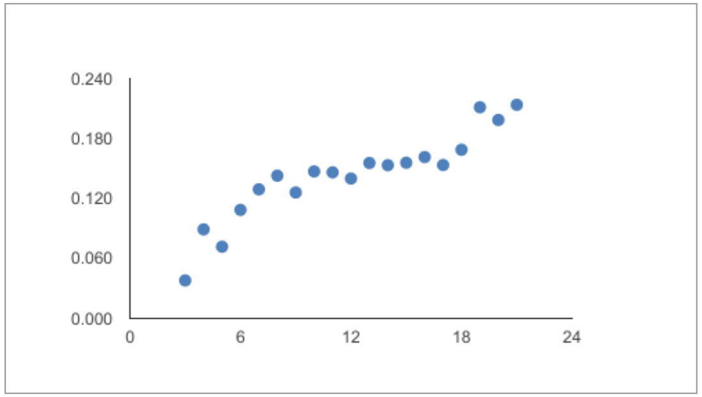
Individual differcences are "partial disparities", the distance between cluster distribution and the distribution for all NA mammals. The "Mean" is the average distance between the clusters and the NA mean.

P-values are the probability that the distance betwen clusters and the NA distribution is greater than expected by chance. To calculate trait data were randomized between clusters 1000 times and distances recalculated. P is the proportion of the mean distances among randomized clusters that are smaller than the observed.

Body Mass (North America)

Total points in NA = 9699

Cluster Num	P	Var	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3	0.63	0.038	0.090	0.021	0.002																		
4	0.09	0.089	0.002	0.089	0.103	0.162																	
5	**0.04**	0.072	0.002	0.060	0.023	0.044	0.229																
6	0.16	0.109	0.227	0.009	0.141	0.116	0.032	0.128															
7	0.26	0.129	0.009	0.210	0.162	0.133	0.038	0.141	0.211														
8	**0.04**	0.143	0.169	0.031	0.045	0.142	0.266	0.024	0.239	0.226													
9	0.25	0.126	0.032	0.102	0.025	0.211	0.149	0.219	0.197	0.051	0.147												
10	0.14	0.147	0.124	0.117	0.050	0.059	0.027	0.242	0.187	0.158	0.210	0.296											
11	0.14	0.146	0.114	0.210	0.027	0.027	0.106	0.197	0.144	0.053	0.224	0.104	0.401										
12	0.15	0.140	0.150	0.276	0.028	0.218	0.134	0.035	0.027	0.128	0.215	0.216	0.066	0.189									
13	0.33	0.156	0.035	0.224	0.063	0.096	0.181	0.206	0.118	0.053	0.351	0.213	0.246	0.032	0.204								
14	0.52	0.153	0.228	0.043	0.238	0.205	0.251	0.098	0.187	0.132	0.051	0.032	0.246	0.055	0.124	0.257							
15	0.74	0.156	0.321	0.165	0.033	0.055	0.257	0.103	0.057	0.126	0.112	0.074	0.200	0.207	0.299	0.124	0.203						
16	0.27	0.161	0.188	0.276	0.028	0.097	0.170	0.202	0.124	0.043	0.193	0.028	0.142	0.059	0.320	0.193	0.234	0.287					
17	0.53	0.154	0.205	0.258	0.042	0.242	0.206	0.294	0.026	0.036	0.101	0.030	0.228	0.044	0.133	0.137	0.272	0.102	0.254				
18	0.54	0.169	0.027	0.228	0.185	0.205	0.074	0.127	0.247	0.032	0.334	0.127	0.033	0.255	0.151	0.101	0.190	0.253	0.187	0.284			
19	**0.04**	0.211	0.107	0.167	0.076	0.044	0.251	0.207	0.171	0.133	0.046	0.206	0.165	0.290	0.032	0.131	0.026	1.114	0.235	0.223	0.391		
20	0.38	0.199	0.132	0.057	0.121	0.056	0.165	0.163	0.171	0.245	0.318	0.177	0.107	0.028	0.180	0.288	0.405	0.265	0.212	0.267	0.272	0.341	
21	0.25	0.214	0.131	0.053	0.103	0.163	0.115	0.126	0.268	0.114	0.052	0.233	0.188	0.206	0.341	0.375	0.114	0.029	0.033	0.201	0.246	0.285	1.114



Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Distances Between Clusters NA: Diet

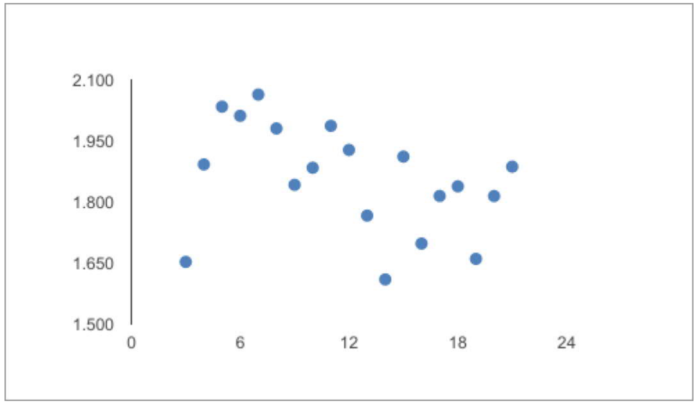
Euclidean distances between trait distributions (chi-distances)

Individual differcences are "partial disparities", the distance between cluster distribution and the distribution for all NA mammals. The "Mean" is the average distance between the clusters and the NA mean.

P-values are the probability that the distance betwen clusters and the NA distribution is greater than expected by chance. To calculate trait data were randomized between clusters 1000 times and distances recalculated. P is the proportion of the mean distances among randomized clusters that are smaller than the observed.

Diet Level 3 (North America)

Total points in NA = 9699



Cluster Num	P	Var																					
3	0.36	1.653	2.212	1.299	1.448																		
4	0.33	1.892	1.556	2.286	1.891	1.836																	
5	0.26	2.034	1.458	2.272	1.886	2.316	2.239																
6	0.24	2.012	2.536	1.332	1.946	1.825	1.776	2.657															
7	0.21	2.064	1.190	2.536	2.208	1.713	1.616	2.641	2.545														
8	0.28	1.981	2.598	1.142	1.412	2.776	1.274	1.748	2.477	2.419													
9	0.43	1.842	1.342	1.750	1.890	2.178	2.435	2.126	1.830	1.532	1.496												
10	0.31	1.884	1.571	1.776	0.797	1.840	1.796	2.691	2.261	2.028	2.536	1.546											
11	0.33	1.987	1.993	2.536	1.309	1.756	1.693	2.524	3.087	1.728	2.556	1.941	0.735										
12	0.24	1.928	2.807	1.313	1.313	2.261	1.809	0.776	1.756	1.830	2.411	2.477	1.683	2.700									
13	0.39	1.767	0.883	0.735	1.276	1.616	3.531	2.598	1.592	1.529	1.052	2.028	1.946	2.158	2.020								
14	0.48	1.610	2.536	1.282	1.598	2.290	0.779	1.406	2.147	2.623	1.496	1.797	1.147	0.789	1.487	1.158							
15	0.33	1.912	2.852	2.824	0.867	1.318	1.776	1.592	2.093	1.641	2.431	1.725	1.886	2.233	2.222	1.345	1.867						
16	0.37	1.698	2.196	1.886	1.766	1.569	2.972	2.477	1.345	1.420	2.419	0.791	2.009	1.249	1.821	1.830	0.804	0.612					
17	0.34	1.815	2.290	1.886	1.509	1.844	1.886	1.916	1.073	0.811	1.616	1.649	2.222	1.365	2.623	2.426	2.477	1.895	1.365				
18	0.34	1.838	1.756	2.329	2.076	2.290	1.468	2.844	2.598	0.779	1.006	1.365	1.276	1.420	2.904	1.450	1.654	2.076	2.477	1.325			
19	0.43	1.660	1.496	2.529	1.844	1.300	1.303	2.233	2.212	1.406	0.796	1.982	1.946	2.147	1.787	1.693	1.073	1.776	0.580	1.895	1.546		
20	0.28	1.815	1.756	0.641	1.546	1.017	1.575	2.536	3.265	1.450	2.329	2.700	1.496	1.686	2.222	2.545	2.076	2.147	2.196	0.612	0.951	1.546	
21	0.53	1.887	2.891	2.161	1.718	2.365	2.573	1.592	2.222	1.654	1.288	2.076	3.265	2.411	0.964	1.546	1.720	0.860	1.707	2.196	0.926	1.713	1.776
			1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***

Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Distances Between Clusters NA: Locomotion

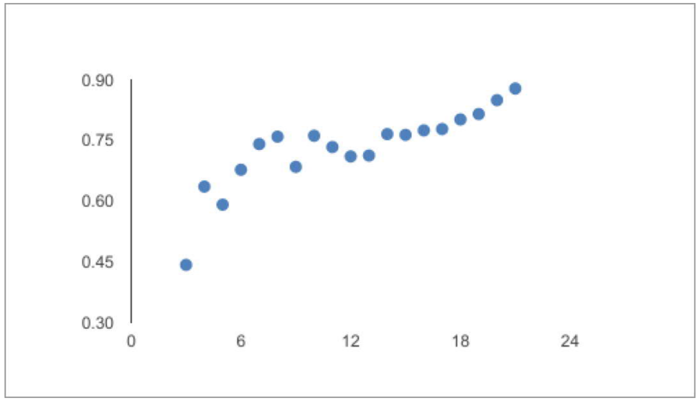
Euclidean distances between trait distributions (chi-distances)

Individual differcences are "partial disparities", the distance between cluster distribution and the distribution for all NA mammals. The "Mean" is the average distance between the clusters and the NA mean.

P-values are the probability that the distance betwen clusters and the NA distribution is greater than expected by chance. To calculate trait data were randomized between clusters 1000 times and distances recalculated. P is the proportion of the mean distances among randomized clusters that are smaller than the observed.

Locomotion (North America)

Total points in NA = 9699



Cluster Num	**P**	**Var**																				
3	0.07	0.44	0.64	0.34	0.34																	
4	**0.01**	0.64	0.36	0.64	0.59	0.95																
5	**0.00**	0.59	0.34	0.55	0.38	0.54	1.16															
6	**0.00**	0.68	1.23	0.34	0.81	0.58	0.38	0.72														
7	**0.00**	0.74	0.33	1.15	0.86	0.62	0.40	0.58	1.25													
8	**0.00**	0.76	0.87	0.40	0.38	0.62	1.12	0.40	1.13	1.16												
9	**0.00**	0.69	0.43	0.54	0.41	1.11	0.53	0.86	1.15	0.42	0.72											
10	**0.00**	0.76	0.63	0.65	0.35	0.46	0.44	1.16	0.88	0.63	1.15	1.26										
11	**0.01**	0.73	0.62	1.15	0.43	0.46	0.61	0.84	0.57	0.42	0.89	0.67	1.40									
12	**0.00**	0.71	0.54	1.47	0.41	0.93	0.57	0.34	0.46	0.64	0.78	1.12	0.44	0.83								
13	**0.01**	0.71	0.36	0.75	0.42	0.58	0.69	1.11	0.68	0.48	1.42	0.81	0.86	0.44	0.67							
14	**0.00**	0.77	0.93	0.41	1.29	1.10	0.82	0.59	0.78	0.62	0.41	0.48	0.92	0.37	0.56	1.43						
15	**0.00**	0.76	1.06	0.69	0.35	0.46	1.34	0.57	0.55	0.70	0.57	0.47	0.74	1.07	1.34	0.66	0.87					
16	**0.00**	0.78	1.25	1.29	0.46	0.56	0.58	1.13	0.66	0.43	0.75	0.35	0.72	0.39	1.14	0.72	1.22	0.76				
17	**0.00**	0.78	1.10	1.19	0.39	1.16	0.83	1.05	0.34	0.36	0.58	0.47	1.34	0.44	0.58	0.53	0.95	0.51	1.41			
18	**0.00**	0.80	0.46	1.34	0.73	1.10	0.52	0.64	0.96	0.36	1.19	0.68	0.43	1.48	0.51	0.61	0.72	0.84	0.77	1.11		
19	**0.00**	0.82	0.64	0.60	0.54	0.46	1.08	1.07	0.73	0.66	0.34	0.79	0.69	1.40	0.48	0.54	0.34	2.12	0.72	0.81	1.49	
20	**0.00**	0.85	0.57	0.39	0.69	0.45	0.74	0.73	0.63	1.14	0.97	0.65	0.64	0.46	0.81	0.91	1.62	1.40	1.07	0.81	1.06	1.26	
21	**0.00**	0.88	0.59	0.53	0.53	0.73	0.52	0.72	0.91	0.72	0.43	0.84	0.83	1.09	1.27	1.26	0.59	0.35	0.43	1.25	1.34	1.40	2.12
			1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***

Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Distances Between Clusters Europe: Body Mass

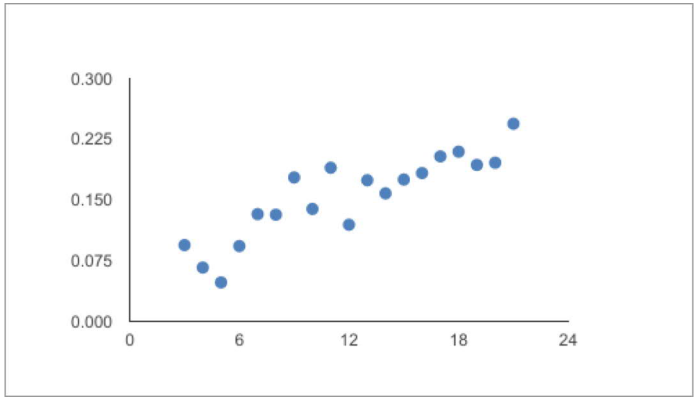
Euclidean distances between trait distributions (chi-distances)

Individual differcences are "partial disparities", the distance between cluster distribution and the distribution for all European mammals. The "Mean" is the average distance between the clusters and the European mean.

P-values are the probability that the distance betwen clusters and the European distribution is greater than expected by chance. To calculate trait data were randomized between clusters 1000 times and distances recalculated. P is the proportion of the mean distances among randomized clusters that are smaller than the observed.

Body Mass (Europe)

Total points in Europe = 2670



Cluster Num	**P**	**Var**																				
3	0.99	0.094	0.025	0.116	0.141																	
4	1.00	0.067	0.052	0.126	0.039	0.049																
5	1.00	0.048	0.041	0.026	0.110	0.038	0.025															
6	1.00	0.093	0.046	0.215	0.068	0.066	0.054	0.110														
7	1.00	0.133	0.096	0.057	0.067	0.225	0.293	0.053	0.137													
8	1.00	0.132	0.057	0.225	0.137	0.204	0.182	0.070	0.098	0.082												
9	0.99	0.178	0.353	0.225	0.123	0.316	0.049	0.187	0.167	0.104	0.077											
10	1.00	0.139	0.350	0.055	0.225	0.057	0.102	0.180	0.071	0.125	0.133	0.091										
11	0.94	0.190	0.057	0.132	0.206	0.106	0.082	0.091	0.057	0.226	0.391	0.367	0.374									
12	1.00	0.119	0.073	0.077	0.063	0.167	0.062	0.103	0.226	0.085	0.102	0.128	0.210	0.138								
13	1.00	0.174	0.095	0.184	0.386	0.074	0.364	0.211	0.222	0.082	0.110	0.101	0.116	0.205	0.118							
14	0.99	0.158	0.078	0.067	0.085	0.128	0.288	0.201	0.237	0.119	0.110	0.057	0.222	0.353	0.079	0.191						
15	1.00	0.175	0.069	0.091	0.127	0.105	0.082	0.313	0.238	0.365	0.081	0.149	0.101	0.093	0.122	0.339	0.352					
16	1.00	0.183	0.263	0.078	0.134	0.153	0.358	0.118	0.114	0.164	0.119	0.324	0.149	0.270	0.099	0.171	0.128	0.292				
17	1.00	0.204	0.190	0.094	0.131	0.303	0.100	0.129	0.363	0.202	0.097	0.140	0.119	0.304	0.137	0.256	0.118	0.354	0.429			
18	1.00	0.210	0.102	0.095	0.365	0.215	0.093	0.103	0.140	0.318	0.298	0.354	0.169	0.119	0.437	0.271	0.092	0.141	0.119	0.344		
19	1.00	0.193	0.249	0.352	0.118	0.119	0.092	0.220	0.131	0.358	0.171	0.352	0.078	0.107	0.136	0.228	0.093	0.152	0.354	0.138	0.227	
20	1.00	0.196	0.202	0.354	0.080	0.152	0.110	0.119	0.120	0.243	0.104	0.110	0.105	0.361	0.344	0.322	0.242	0.090	0.365	0.085	0.280	0.134	
21	1.00	0.244	0.105	0.202	0.119	0.200	0.078	0.365	0.321	0.226	0.127	0.325	0.114	0.405	0.286	0.118	0.219	0.344	0.305	0.304	0.349	0.300	0.318
			1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***

Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Distances Between Clusters Europe: Diet

Euclidean distances between trait distributions (chi-distances)

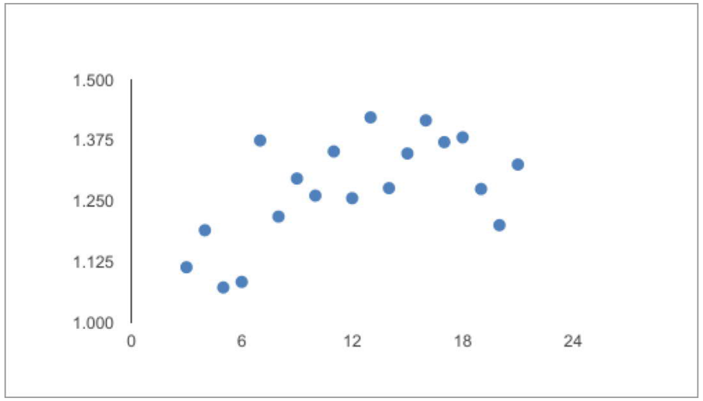
Individual differcences are "partial disparities", the distance between cluster distribution and the distribution for all European mammals. The "Mean" is the average distance between the clusters and the European mean.

P-values are the probability that the distance betwen clusters and the European distribution is greater than expected by chance. To calculate trait data were randomized between clusters 1000 times and distances recalculated. P is the proportion of the mean distances among randomized clusters that are smaller than the observed.

Diet Level 3 (Europe)

Total points in Eur = 2670

Cluster Num	P	Var																					
3	0.52	1.114	1.019	1.097	1.225																		
4	0.49	1.190	1.151	1.517	1.025	1.068																	
5	0.55	1.072	1.261	1.000	1.068	0.788	1.243																
6	0.60	1.084	1.091	0.934	1.324	1.247	0.913	0.993															
7	0.47	1.375	1.272	1.022	1.295	1.237	1.891	1.139	1.770														
8	0.53	1.218	1.165	1.237	1.844	1.004	1.272	1.091	1.191	0.942													
9	0.58	1.297	1.423	1.237	1.636	1.338	1.139	1.462	1.148	1.272	1.014												
10	0.51	1.261	1.517	1.025	1.237	1.165	1.253	1.316	0.877	1.191	1.517	1.517											
11	0.47	1.353	1.068	1.230	0.877	1.380	0.942	1.517	1.165	1.286	2.112	1.517	1.785										
12	0.57	1.256	1.299	1.032	1.247	1.148	1.406	1.316	1.286	0.919	1.154	1.636	1.441	1.191									
13	0.49	1.423	0.844	1.575	2.349	1.307	1.517	1.148	1.394	0.831	1.561	1.154	1.785	1.599	1.433								
14	0.52	1.277	0.942	1.165	0.780	1.735	1.394	1.338	1.517	1.517	1.608	0.965	1.394	1.423	0.783	1.316							
15	0.61	1.348	1.165	1.253	1.134	1.338	1.474	1.441	1.247	1.032	1.154	1.411	1.785	0.877	1.657	1.863	1.394						
16	0.55	1.417	1.139	1.247	1.362	0.934	1.891	1.608	1.338	2.168	1.517	1.517	1.411	1.441	0.514	2.007	1.770	0.803					
17	0.55	1.372	1.191	1.338	1.469	1.371	0.851	1.041	2.134	1.046	1.127	1.462	1.517	1.247	1.316	1.453	1.735	1.286	1.735				
18	0.63	1.382	1.299	1.158	1.620	1.286	1.127	0.965	1.462	0.965	1.139	1.735	1.636	2.076	1.423	1.191	1.474	1.688	1.517	1.107			
19	0.63	1.275	1.371	1.191	0.385	1.517	1.478	1.127	1.191	2.274	1.230	1.107	1.247	0.965	1.154	1.307	0.938	1.636	1.735	1.411	0.965		
20	0.67	1.201	1.068	1.286	1.276	1.272	1.462	0.355	1.770	1.371	0.851	1.423	1.933	1.394	1.107	1.423	1.091	0.913	1.032	1.191	0.759	1.032	
21	0.61	1.326	0.645	1.701	1.517	1.770	1.218	1.032	1.688	1.338	1.022	1.371	0.396	1.394	2.601	1.338	0.851	1.107	2.007	1.423	1.191	1.261	0.965
			1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***



Lintulaakso et al., 2018: Supplementary material S3.

Cluster sizes and species trait statistics for clusters - Distances Between Clusters Europe: Locomotion

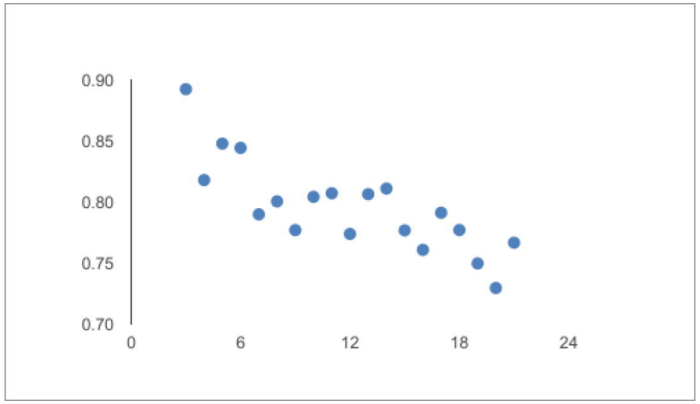
Euclidean distances between trait distributions (chi-distances)

Individual differcences are "partial disparities", the distance between cluster distribution and the distribution for all European mammals. The "Mean" is the average distance between the clusters and the European mean.

P-values are the probability that the distance betwen clusters and the European distribution is greater than expected by chance. To calculate trait data were randomized between clusters 1000 times and distances recalculated. P is the proportion of the mean distances among randomized clusters that are smaller than the observed.

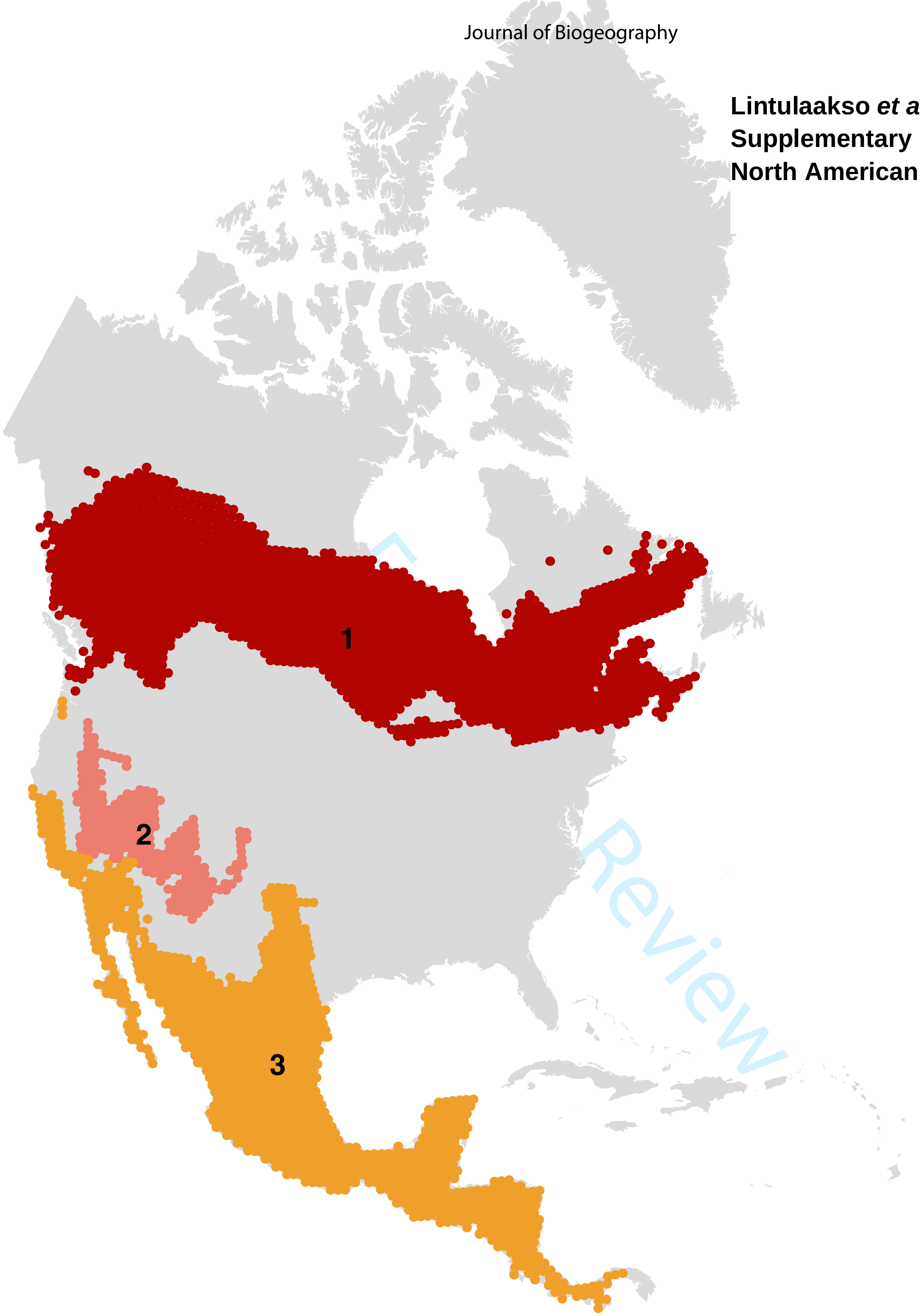
Locomotion (Europe)

Total points in Europe = 2670



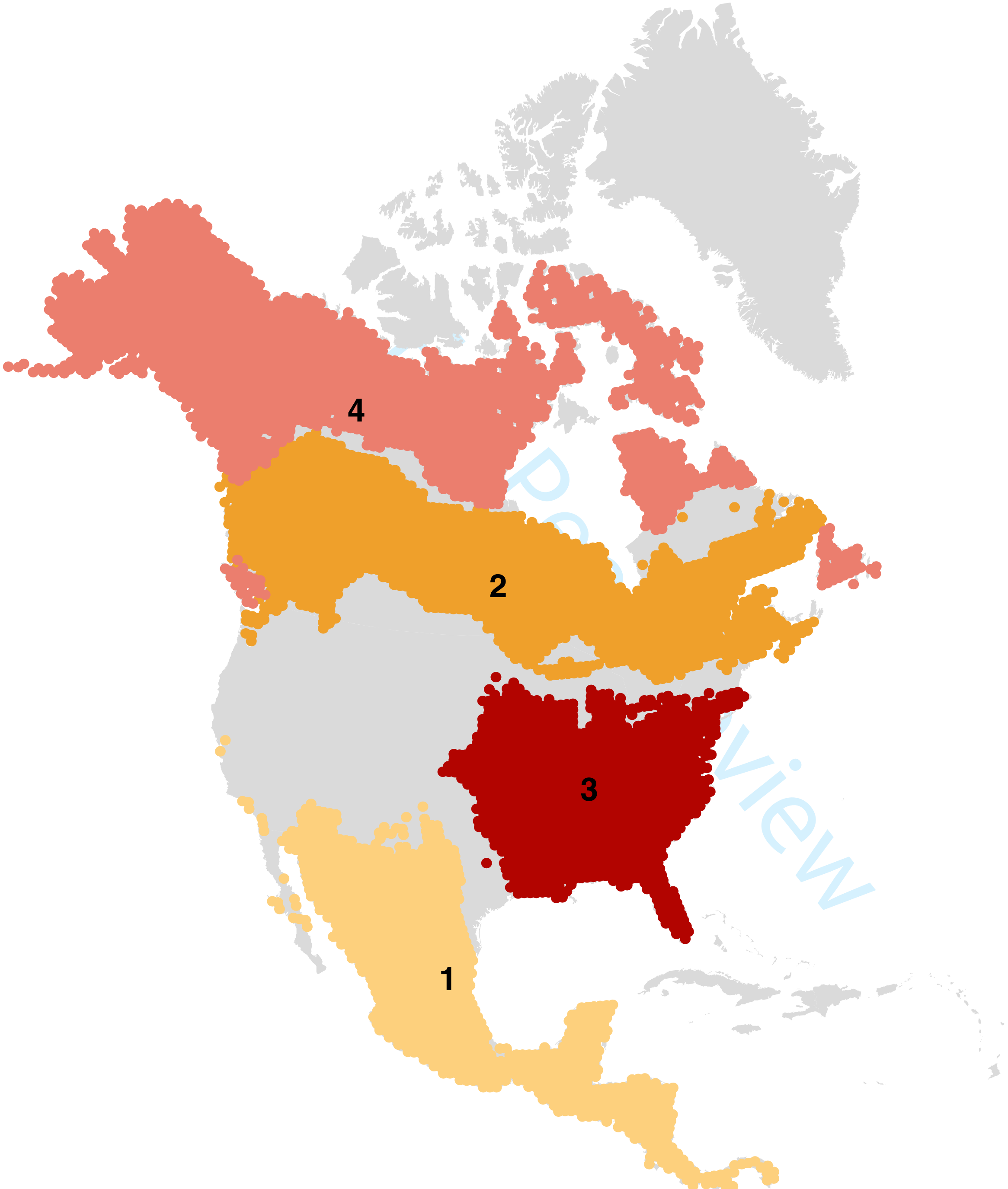
Cluster Num	**P**	**Var**																				
3	0.56	0.89	0.90	0.87	0.90																	
4	0.56	0.82	0.87	0.80	0.85	0.75																
5	0.57	0.85	0.92	0.89	0.80	0.78	0.85															
6	0.55	0.84	0.81	0.84	1.04	0.86	0.67	0.84														
7	0.64	0.79	0.75	0.68	1.02	0.74	0.71	0.80	0.83													
8	0.64	0.80	0.81	0.74	0.77	0.71	0.82	0.86	0.77	0.92												
9	0.63	0.78	0.89	0.74	0.77	0.80	0.84	0.77	0.57	0.75	0.87											
10	0.64	0.80	0.80	0.81	0.74	0.81	0.83	0.92	0.91	0.65	0.71	0.86										
11	0.63	0.81	0.84	0.66	0.67	0.80	0.92	0.86	0.81	0.77	0.96	0.66	0.92									
12	0.68	0.77	0.75	0.90	0.91	0.57	0.74	0.77	0.77	0.85	0.75	0.77	0.66	0.84								
13	0.61	0.81	0.78	0.74	1.06	0.90	0.80	0.57	0.74	0.68	0.82	0.82	0.86	0.72	1.01							
14	0.64	0.81	0.81	0.91	0.78	0.90	0.83	0.64	0.71	0.87	0.84	0.83	0.74	0.89	0.78	0.84						
15	0.71	0.78	0.86	0.78	0.98	0.84	0.84	0.66	0.76	0.70	0.69	0.75	0.86	0.67	0.73	0.80	0.74					
16	0.67	0.76	0.71	0.86	0.80	0.59	0.71	0.77	0.77	0.83	0.87	0.69	0.75	0.76	0.71	0.85	0.83	0.68				
17	0.67	0.79	0.58	0.98	0.77	0.83	0.71	0.95	0.80	0.59	0.83	0.77	0.87	0.67	0.84	0.68	0.82	0.85	0.90			
18	0.70	0.78	0.75	0.74	0.70	0.62	0.83	0.82	0.77	0.66	0.71	0.90	0.77	0.75	0.89	0.76	0.97	0.88	0.87	0.61		
19	0.74	0.75	0.63	0.65	0.48	0.87	0.83	0.83	0.96	0.70	0.73	0.75	0.86	0.55	0.63	0.70	0.80	0.69	0.90	0.82	0.85	
20	0.71	0.73	0.59	0.85	0.88	0.68	0.70	0.44	0.74	0.83	0.60	0.82	0.74	0.74	0.61	0.89	0.68	0.78	0.70	0.96	0.65	0.70
21	0.70	0.77	0.66	0.88	0.87	0.74	0.90	0.70	0.88	0.64	0.74	0.83	0.50	0.92	0.96	0.77	0.71	0.61	0.91	0.63	0.80	0.80	0.66
			1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***	***21***

Lintulaakso *et al*., 2018:
Supplementary material S4.
North American Core Clusters 3-21



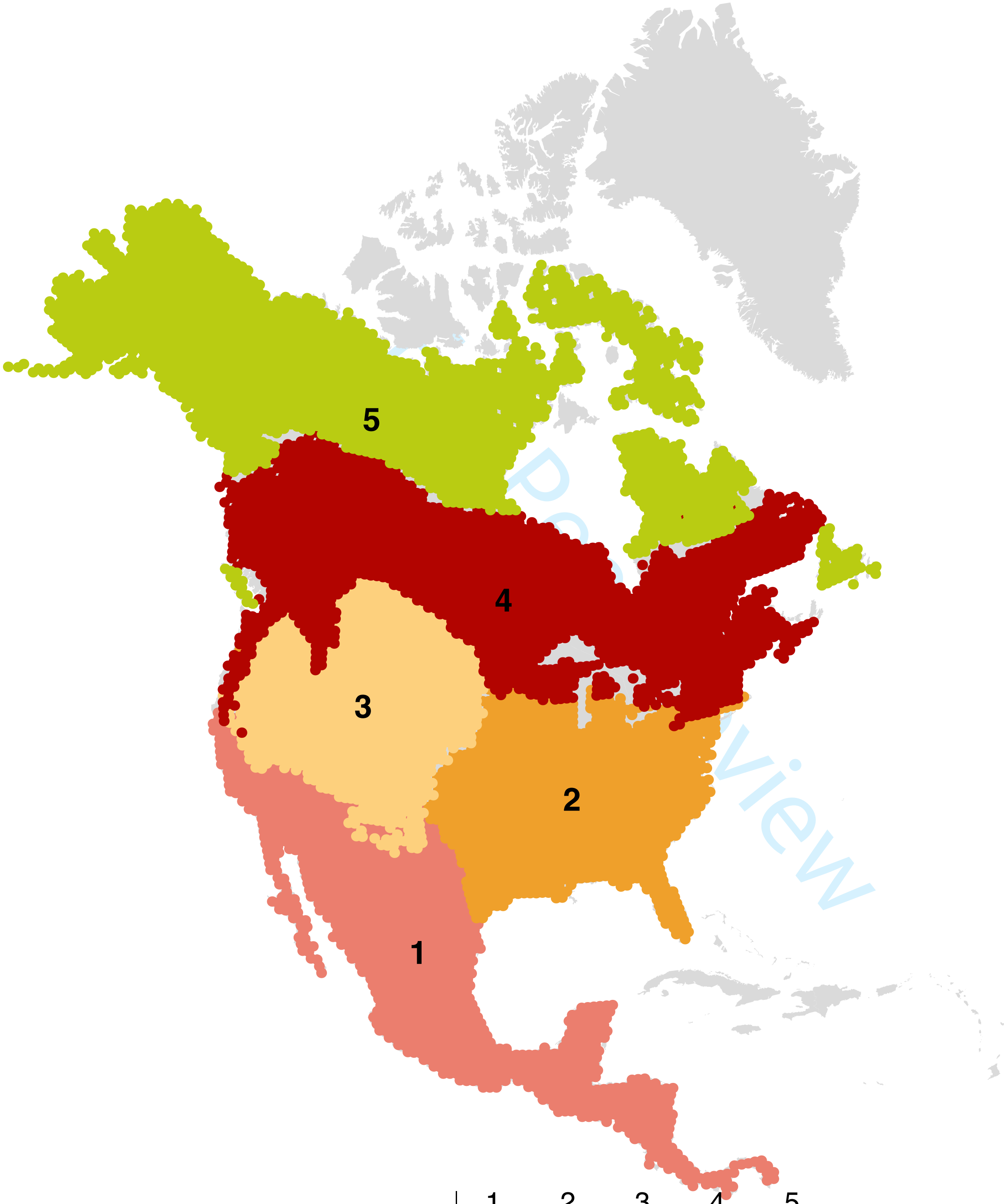
	1	2	3
Num Species	122	160	413
Num Ubiquitous	1	6	0
Prop Ubiquitous	0.01	0.04	0.00
Num Endemics	42	24	280
Prop Endemics	0.34	0.15	0.68
Num Ubiq Endemics	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00

Core Clusters: 4



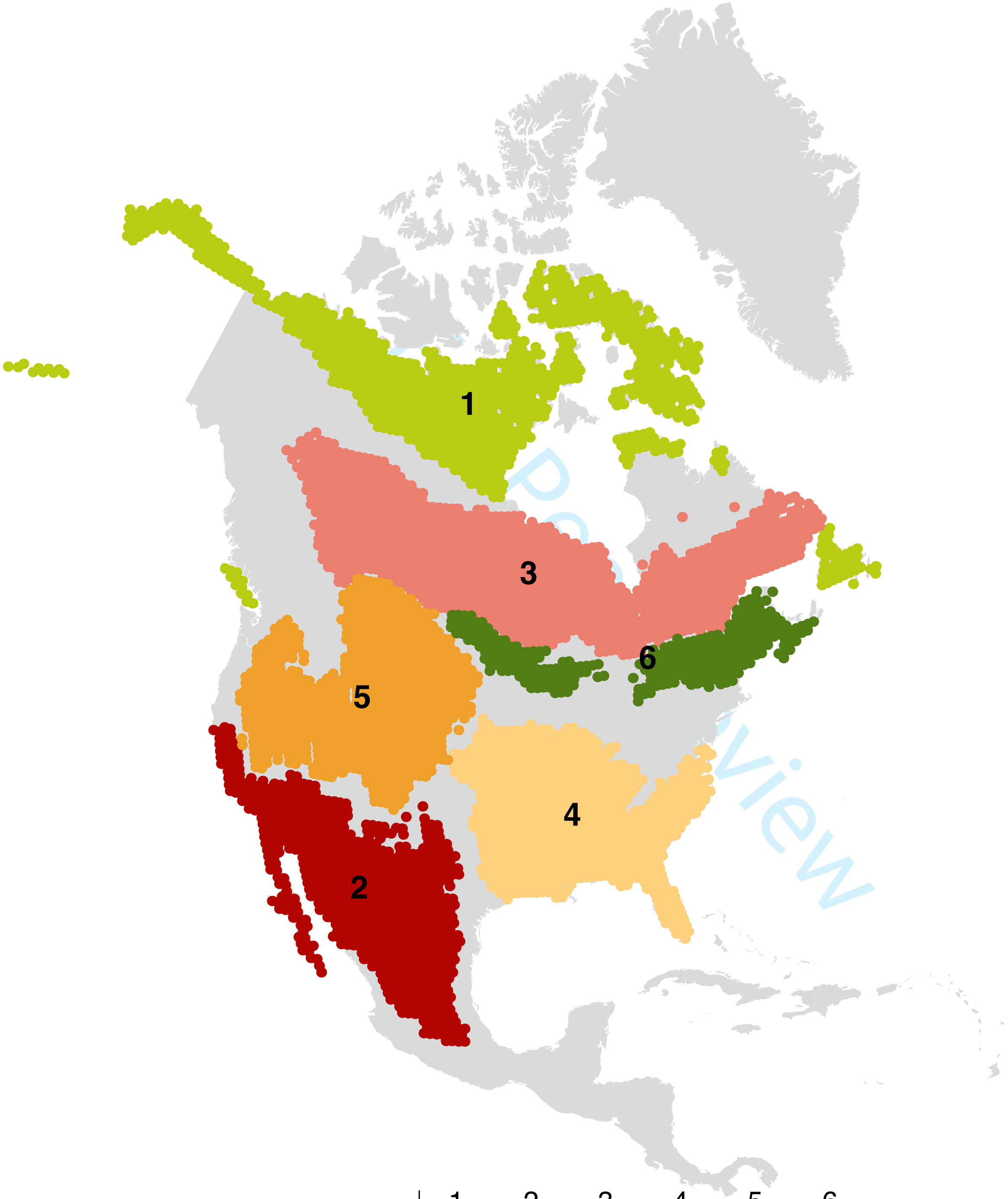
	1	2	3	4
Num Species	390	119	104	79
Num Ubiquitous	0	1	2	0
Prop Ubiquitous	0.00	0.01	0.02	0.00
Num Endemics	320	16	17	11
Prop Endemics	0.82	0.13	0.16	0.14
Num Ubiq Endemics	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00

Core Clusters: 5

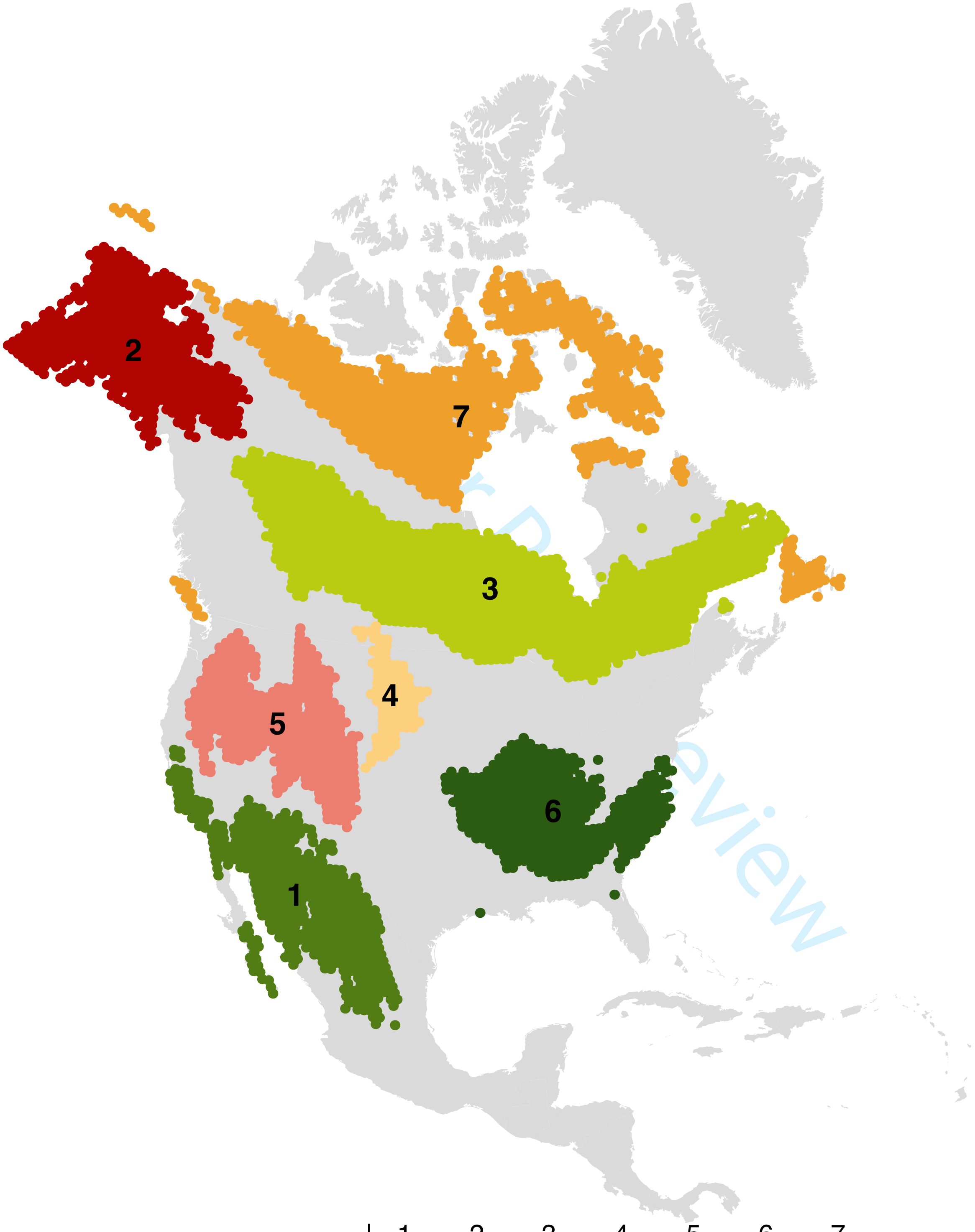


	1	2	3	4	5
Num Species	442	143	215	162	68
Num Ubiquitous	0	2	2	0	0
Prop Ubiquitous	0.00	0.01	0.01	0.00	0.00
Num Endemics	268	14	12	3	11
Prop Endemics	0.61	0.10	0.06	0.02	0.16
Num Ubiq Endemics	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00

Core Clusters: 6

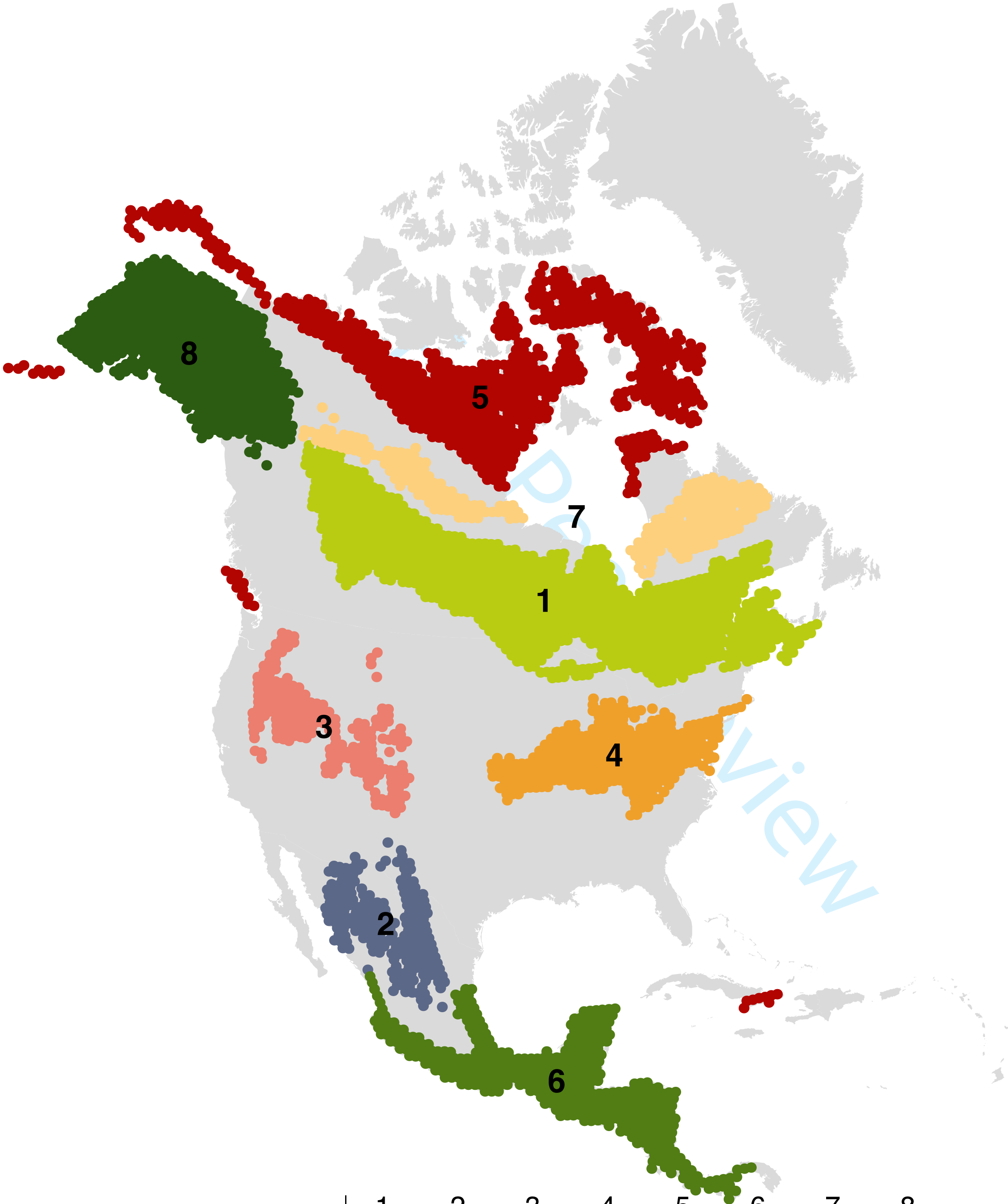


	1	2	3	4	5	6
Num Species	55	270	84	98	189	73
Num Ubiquitous	1	3	3	2	3	8
Prop Ubiquitous	0.02	0.01	0.04	0.02	0.02	0.11
Num Endemics	12	137	0	16	34	2
Prop Endemics	0.22	0.51	0.00	0.16	0.18	0.03
Num Ubiq Endemics	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00

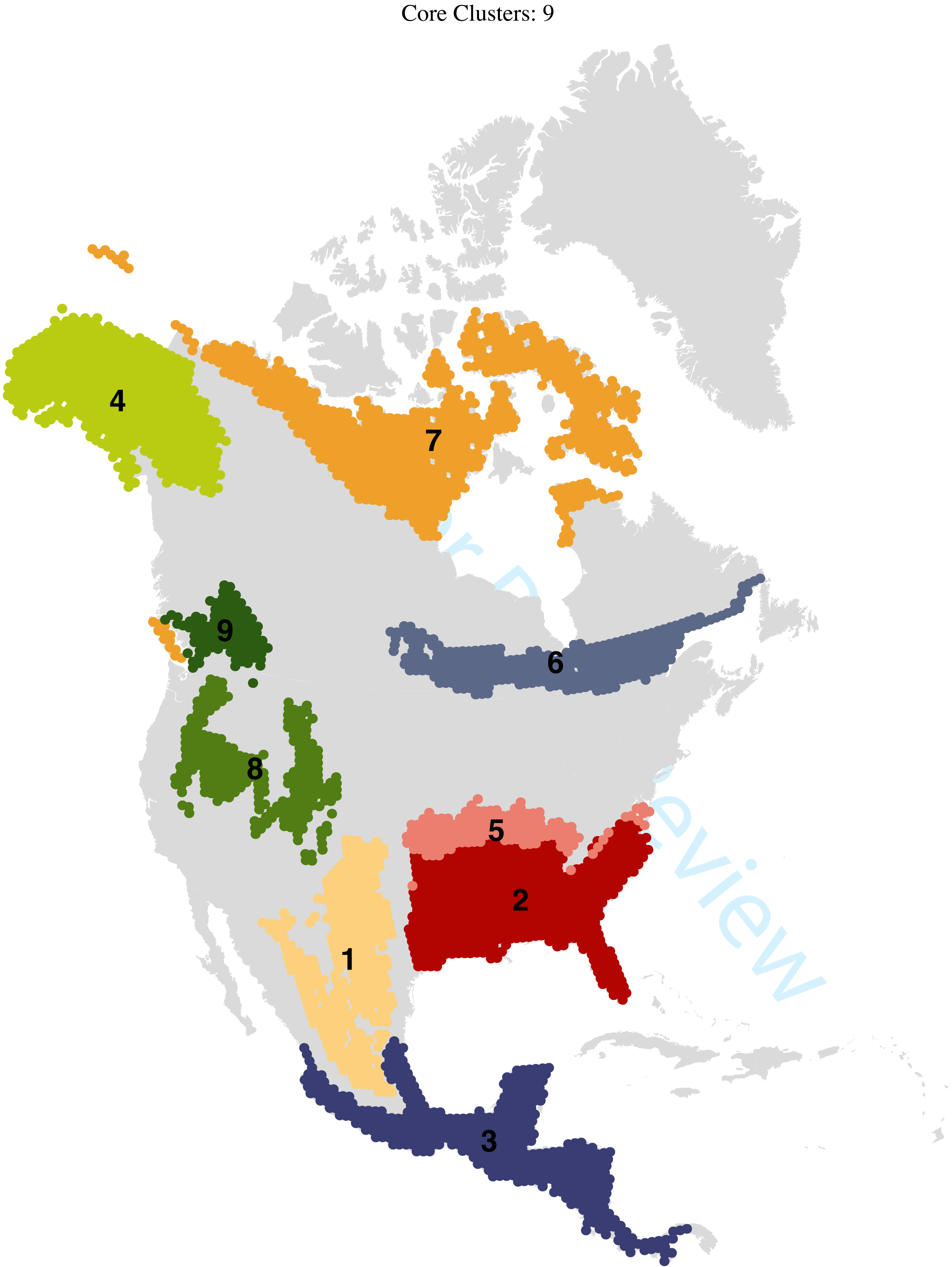

Core Clusters: 7

	1	2	3	4	5	6	7
Num Species	209	55	84	74	174	81	48
Num Ubiquitous	3	11	3	18	8	6	1
Prop Ubiquitous	0.01	0.20	0.04	0.24	0.05	0.07	0.02
Num Endemics	101	4	1	0	44	16	2
Prop Endemics	0.48	0.07	0.01	0.00	0.25	0.20	0.04
Num Ubiq Endemics	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 8



	1	2	3	4	5	6	7	8
Num Species	81	140	150	78	58	248	49	57
Num Ubiquitous	5	8	8	11	0	4	5	10
Prop Ubiquitous	0.06	0.06	0.05	0.14	0.00	0.02	0.10	0.18
Num Endemics	1	33	56	11	8	175	0	2
Prop Endemics	0.01	0.24	0.37	0.14	0.14	0.71	0.00	0.04
Num Ubiq Endemics	0	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



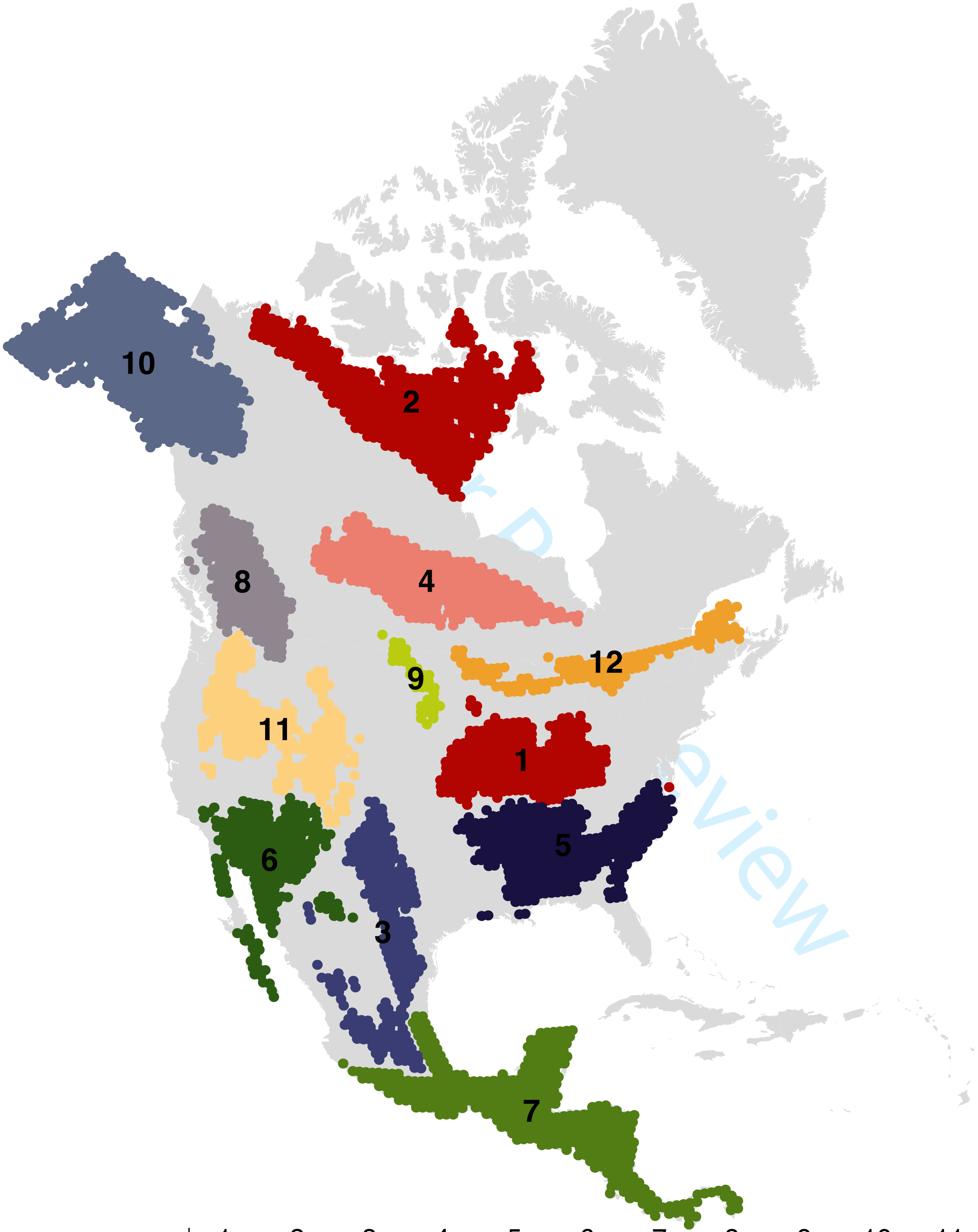
	1	2	3	4	5	6	7	8	9
Num Species	157	92	250	54	79	55	44	151	82
Num Ubiquitous	6	4	5	13	9	11	4	8	14
Prop Ubiquitous	0.04	0.04	0.02	0.24	0.11	0.20	0.09	0.05	0.17
Num Endemics	30	8	169	4	1	0	5	43	7
Prop Endemics	0.19	0.09	0.68	0.07	0.01	0.00	0.11	0.28	0.09
Num Ubiq Endemics	0	0	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00


Core Clusters: 10

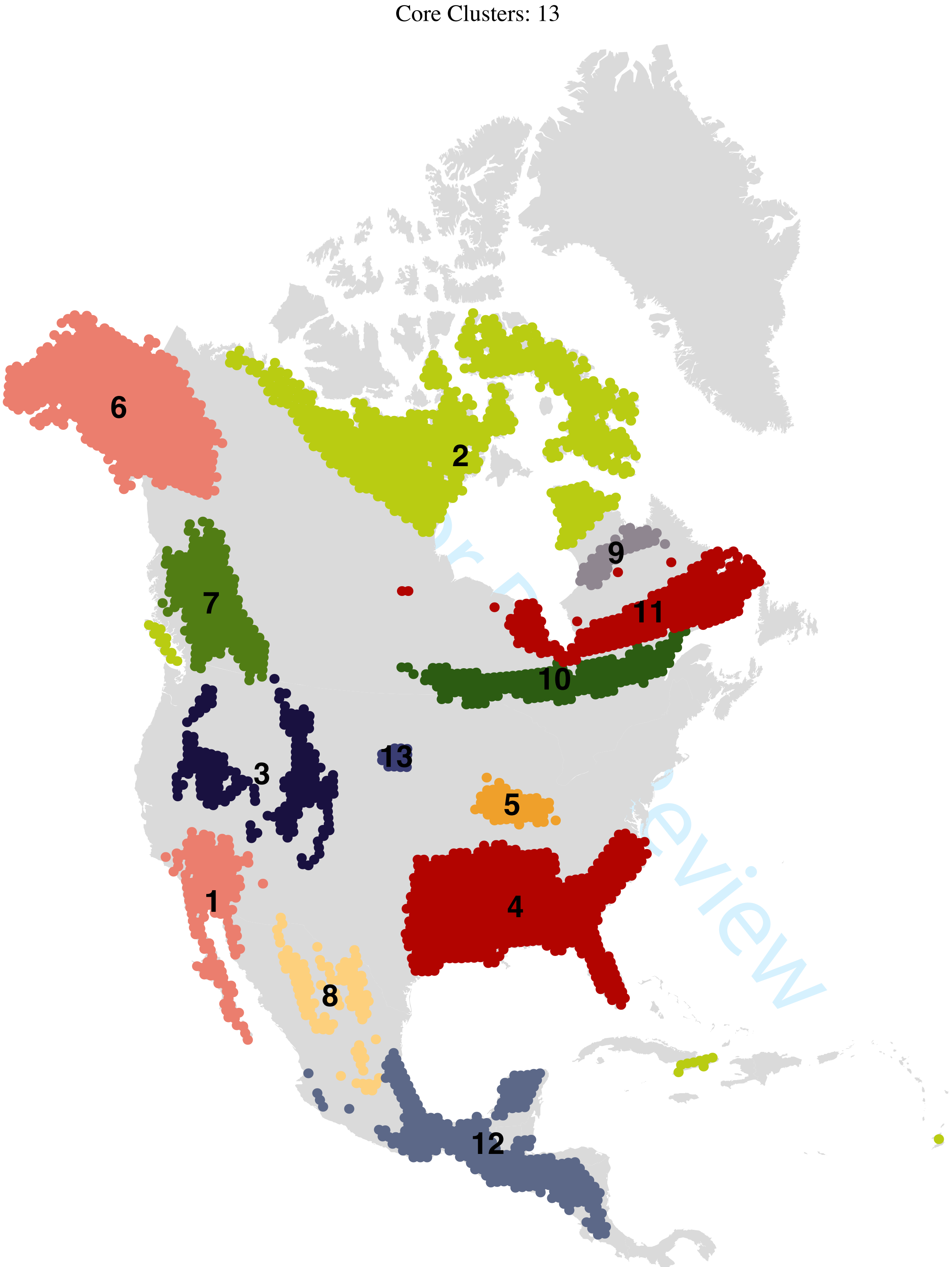
	1	2	3	4	5	6	7	8	9	10
Num Species	80	90	137	149	242	46	75	57	55	50
Num Ubiquitous	4	10	5	8	6	5	7	29	10	0
Prop Ubiquitous	0.05	0.11	0.04	0.05	0.02	0.11	0.09	0.51	0.18	0.00
Num Endemics	20	6	46	29	201	0	0	0	4	6
Prop Endemics	0.25	0.07	0.34	0.19	0.83	0.00	0.00	0.00	0.07	0.12
Num Ubiq Endemics	0	0	0	0	1	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	1	2	3	4	5	6	7	8	9	10	11
Num Species	99	55	160	237	85	69	72	147	41	101	37
Num Ubiquitous	13	10	8	3	4	8	19	8	9	8	0
Prop Ubiquitous	0.13	0.18	0.05	0.01	0.05	0.12	0.26	0.05	0.22	0.08	0.0
Num Endemics	0	5	36	156	11	0	0	31	0	7	7
Prop Endemics	0.00	0.09	0.23	0.66	0.13	0.00	0.00	0.21	0.00	0.07	0.1
um Ubiq Endemics	0	0	0	0	0	0	0	0	0	0	0
rop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 12



	1	2	3	4	5	6	7	8	9	10	11
lum Species	71	34	171	60	72	158	237	88	50	56	150
um Ubiquitous	9	10	7	20	8	4	3	14	23	11	8
op Ubiquitous	0.13	0.29	0.04	0.33	0.11	0.03	0.01	0.16	0.46	0.20	0.05
um Endemics	0	3	25	0	9	34	150	7	0	5	20
op Endemics	0.00	0.09	0.15	0.00	0.13	0.22	0.63	0.08	0.00	0.09	0.13
Ubiq Endemics	0	0	0	0	0	0	0	0	0	0	0
Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

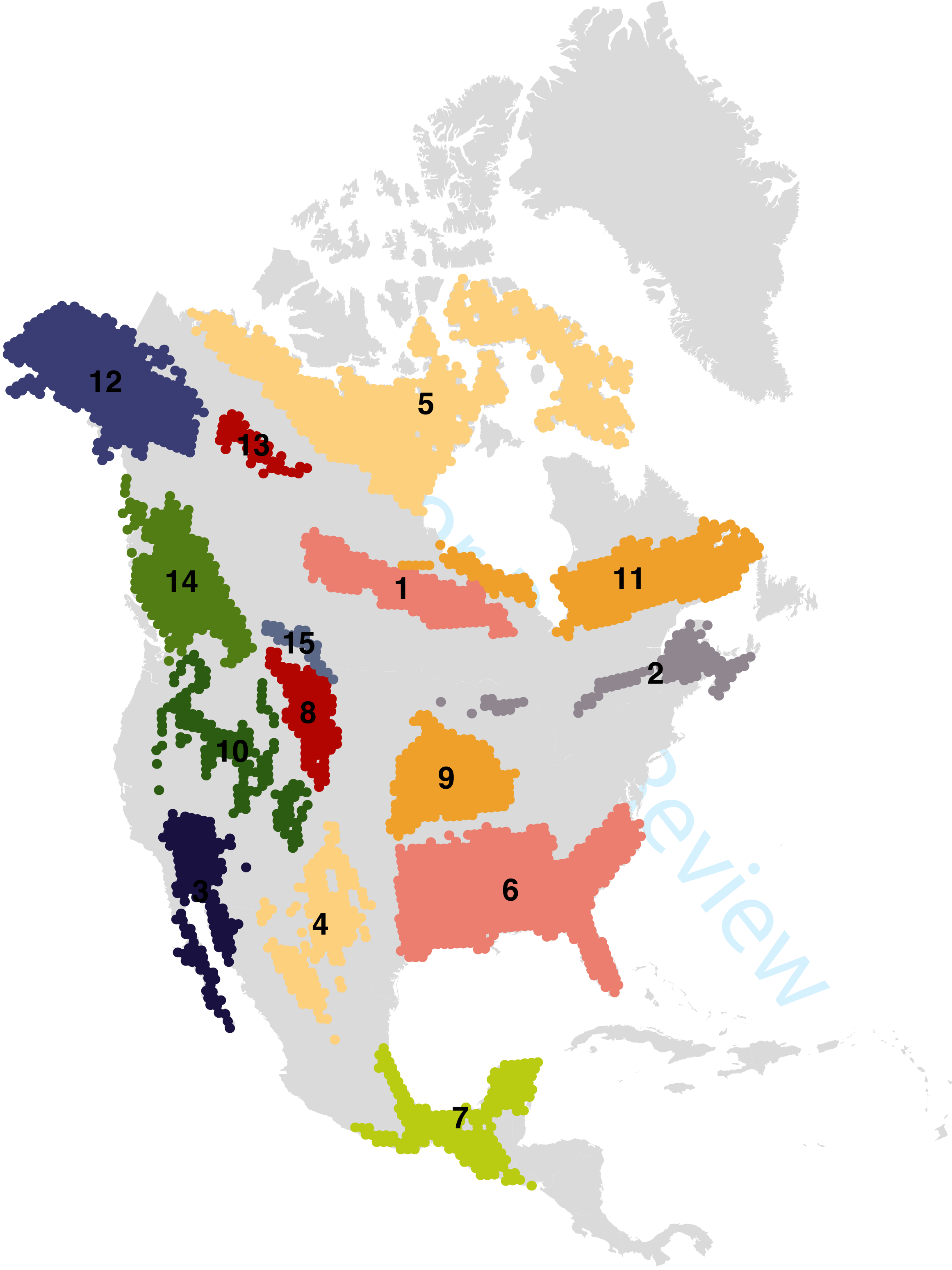


	1	2	3	4	5	6	7	8	9	10	11	12
Species	125	74	139	88	49	54	88	121	27	57	42	20
Ubiquitous	4	0	8	4	29	12	13	12	16	15	10	9
Ubiquitous	0.03	0.00	0.06	0.05	0.59	0.22	0.15	0.10	0.59	0.26	0.24	0.0
Endemics	34	25	17	18	0	4	8	20	0	0	0	12
Endemics	0.27	0.34	0.12	0.20	0.00	0.07	0.09	0.17	0.00	0.00	0.00	0.6
iq Endemics	0	0	0	0	0	0	0	0	0	0	0	0
iq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 14

	1	2	3	4	5	6	7	8	9	10	11	12
pecies	55	128	39	52	70	87	39	68	123	224	63	121
iquitous	24	11	18	20	0	4	8	15	10	9	21	5
iquitous	0.44	0.09	0.46	0.38	0.00	0.05	0.21	0.22	0.08	0.04	0.33	0.04
demics	1	24	1	1	23	11	0	1	10	149	0	31
demics	0.02	0.19	0.03	0.02	0.33	0.13	0.00	0.01	0.08	0.67	0.00	0.26
Endemics	0	0	0	0	0	0	0	0	0	2	0	0
Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00

Core Clusters: 15

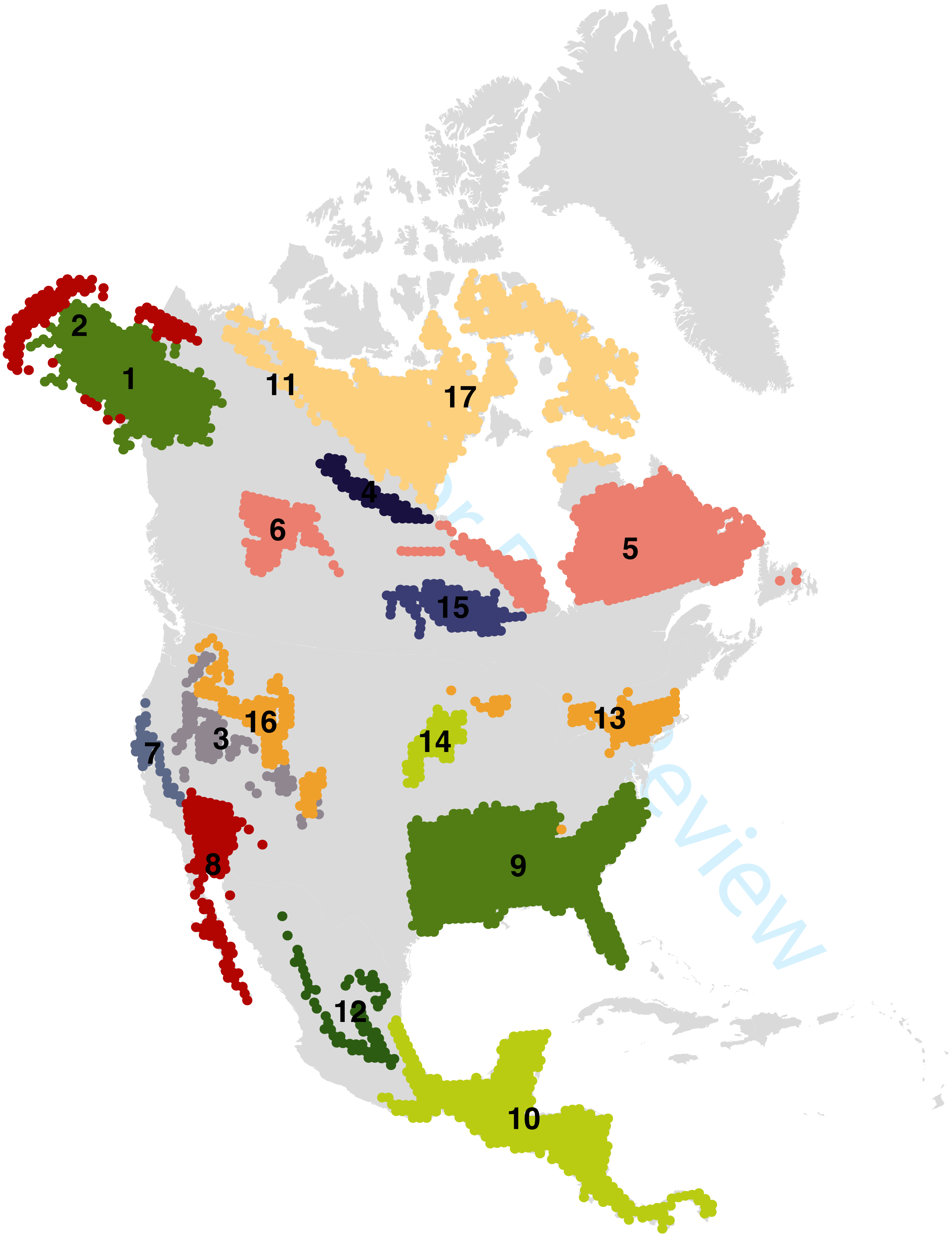


	1	2	3	4	5	6	7	8	9	10	11	12	13
cies	44	57	127	113	36	89	160	86	72	138	43	53	38
itous	24	25	4	8	7	4	16	22	11	9	8	18	23
itous	0.55	0.44	0.03	0.07	0.19	0.04	0.10	0.26	0.15	0.07	0.19	0.34	0.6
mics	0	1	36	19	3	13	114	0	0	16	1	4	0
mics	0.00	0.02	0.28	0.17	0.08	0.15	0.71	0.00	0.00	0.12	0.02	0.08	0.0
demics	0	0	0	0	0	0	4	0	0	0	0	0	0
demics	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 16

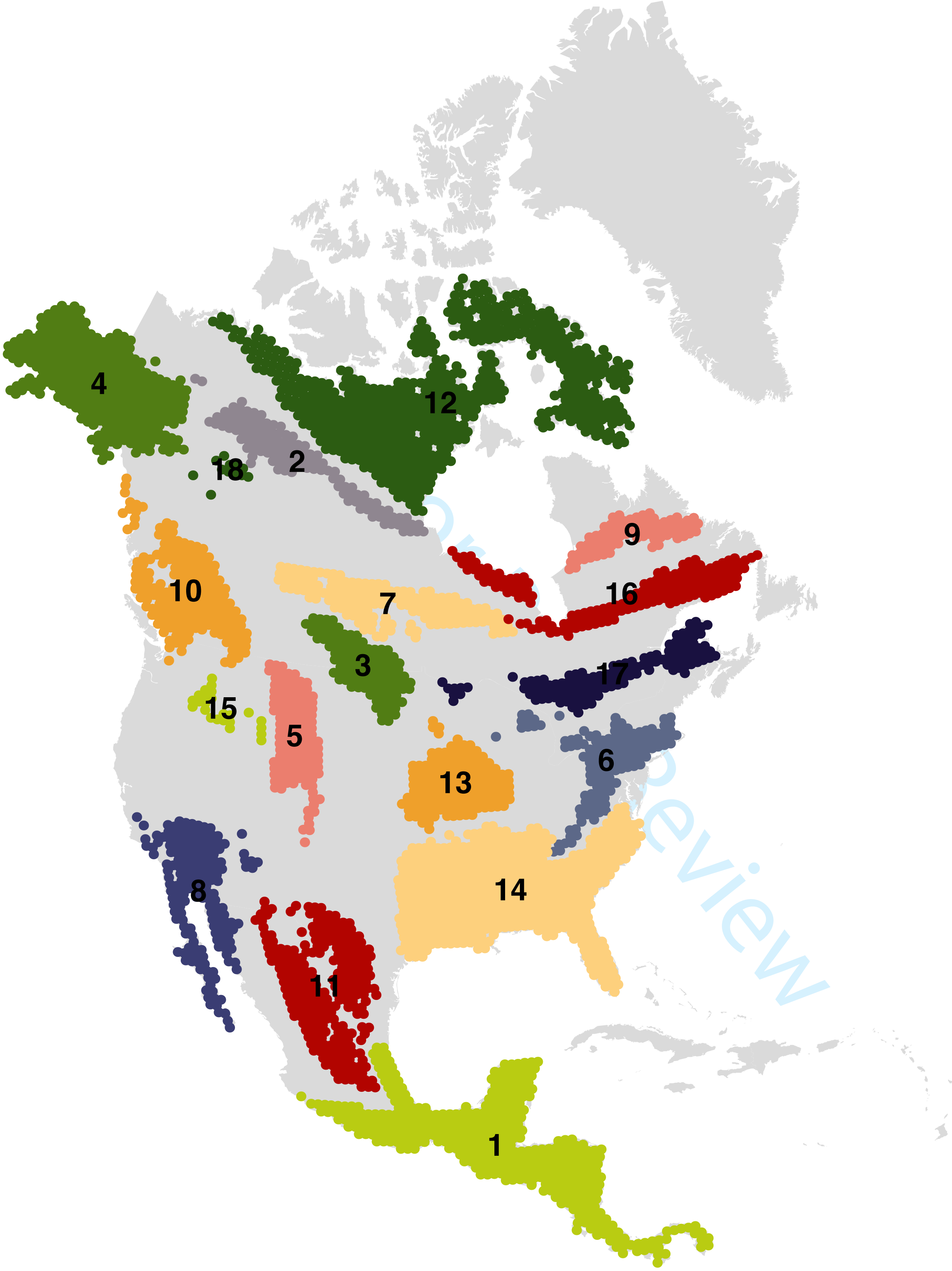
	1	2	3	4	5	6	7	8	9	10	11	12	13
	46	43	236	90	68	49	89	129	57	138	82	106	53
ıs	13	18	7	4	14	19	12	7	18	5	22	15	24
ıs	0.28	0.42	0.03	0.04	0.21	0.39	0.13	0.05	0.32	0.04	0.27	0.14	0.45
s	0	2	171	14	0	1	9	27	1	41	1	8	0
s	0.00	0.05	0.72	0.16	0.00	0.02	0.10	0.21	0.02	0.30	0.01	0.08	0.00
nics	0	0	1	0	0	0	0	0	0	0	0	0	0
nics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 17



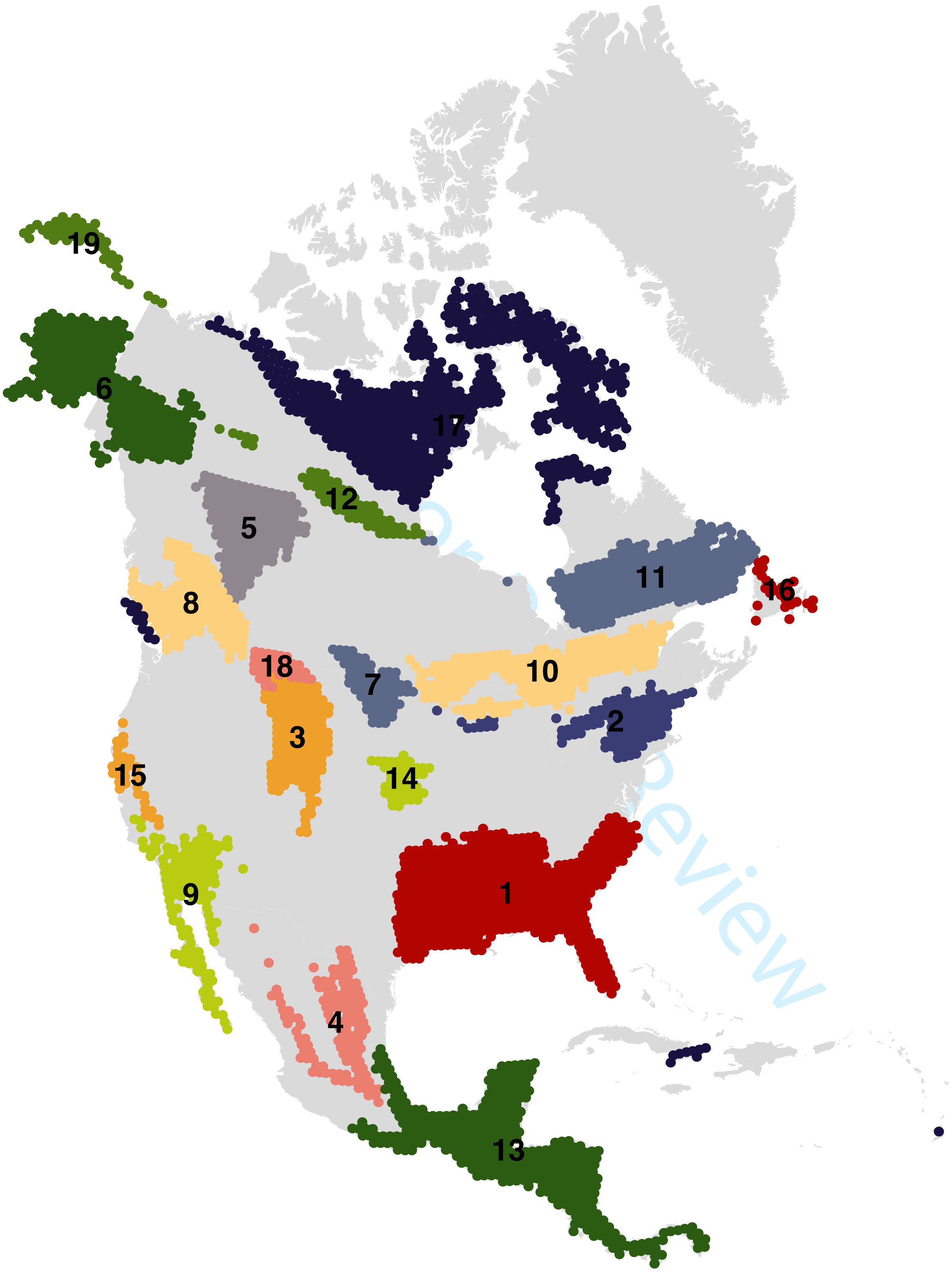
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	52	43	112	35	43	51	93	118	88	220	38	122	68	64
	20	19	11	20	2	27	12	6	4	3	12	10	12	3
	0.38	0.44	0.10	0.57	0.05	0.53	0.13	0.05	0.05	0.01	0.32	0.08	0.18	0.4
	2	1	2	0	0	0	23	21	12	151	0	28	1	1
	0.04	0.02	0.02	0.00	0.00	0.00	0.25	0.18	0.14	0.69	0.00	0.23	0.01	0.0
s	0	0	0	0	0	0	0	0	0	0	0	0	0	0
s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 18



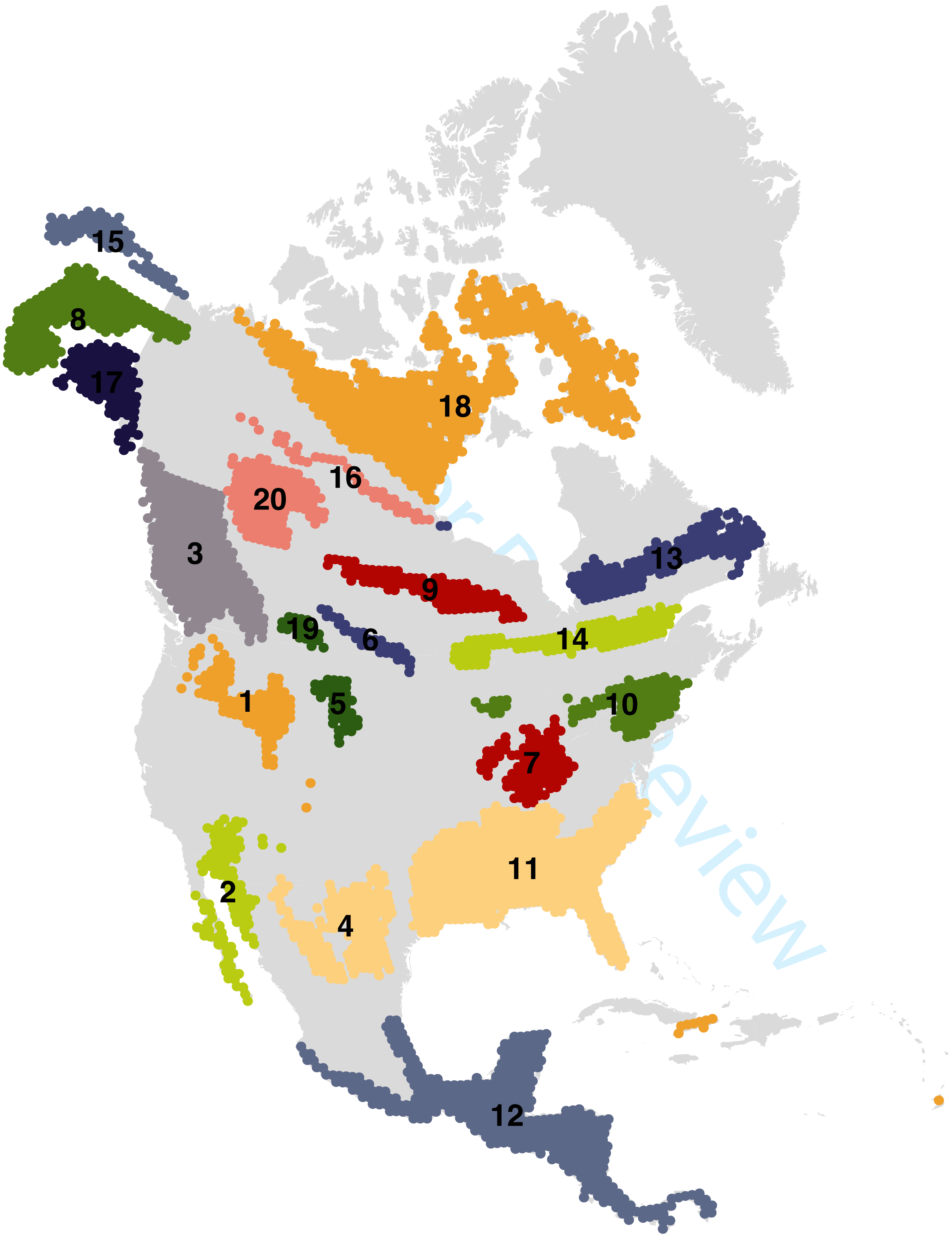
1	2	3	4	5	6	7	8	9	10	11	12	13	14
237	44	64	52	104	64	54	140	28	88	140	32	63	85
3	14	21	21	15	10	24	5	8	12	10	8	17	4
0.01	0.32	0.33	0.40	0.14	0.16	0.44	0.04	0.29	0.14	0.07	0.25	0.27	0.05
168	0	0	2	4	1	0	49	1	11	33	1	0	10
0.71	0.00	0.00	0.04	0.04	0.02	0.00	0.35	0.04	0.13	0.24	0.03	0.00	0.12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 19

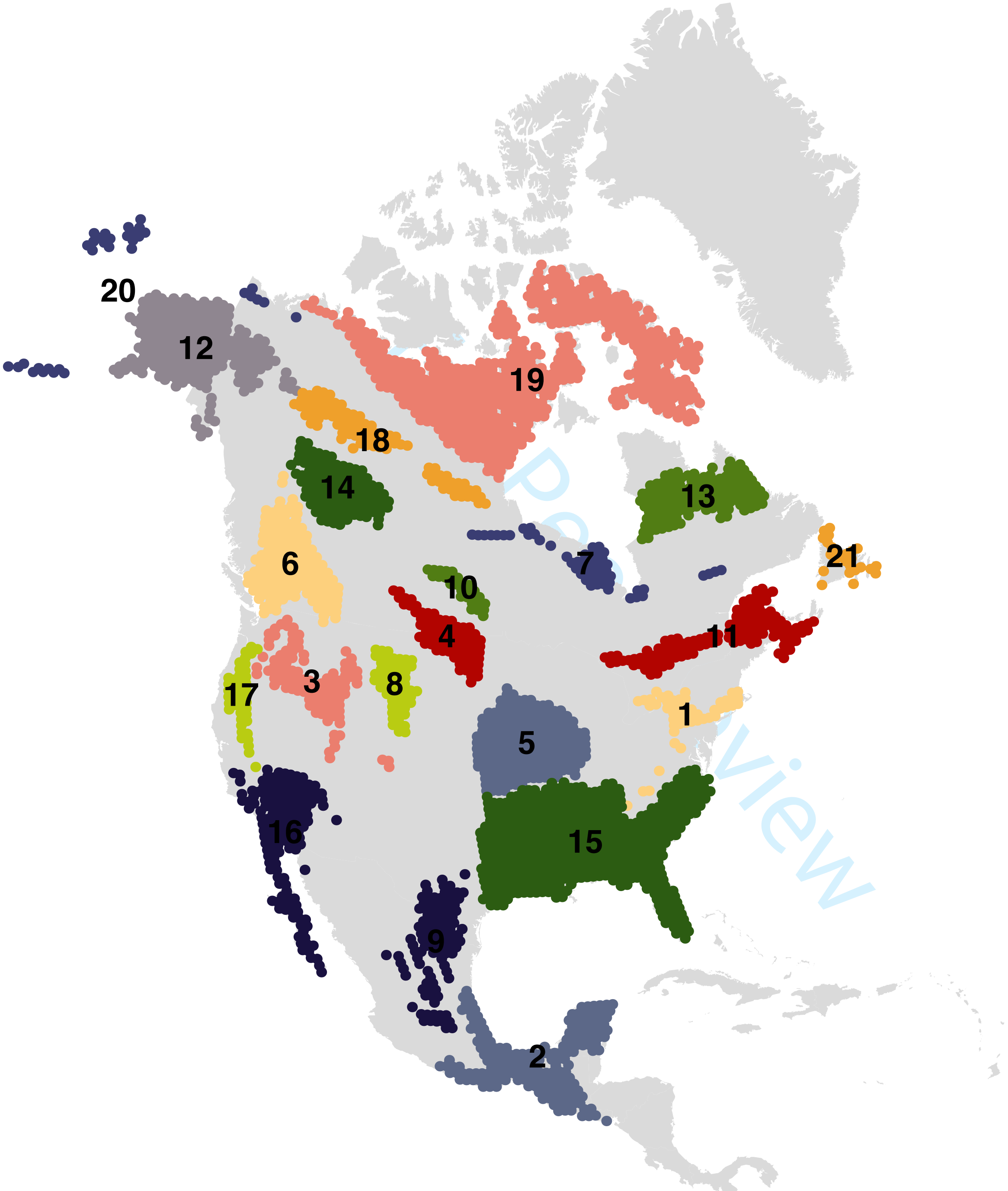


2	3	4	5	6	7	8	9	10	11	12	13	14	15
62	105	138	57	53	61	86	120	58	42	39	225	56	93
13	13	11	25	20	25	14	4	21	8	17	3	31	12
0.21	0.12	0.08	0.44	0.38	0.41	0.16	0.03	0.36	0.19	0.44	0.01	0.55	0.1
1	8	30	0	2	0	4	30	0	0	0	138	0	15
0.02	0.08	0.22	0.00	0.04	0.00	0.05	0.25	0.00	0.00	0.00	0.61	0.00	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 20



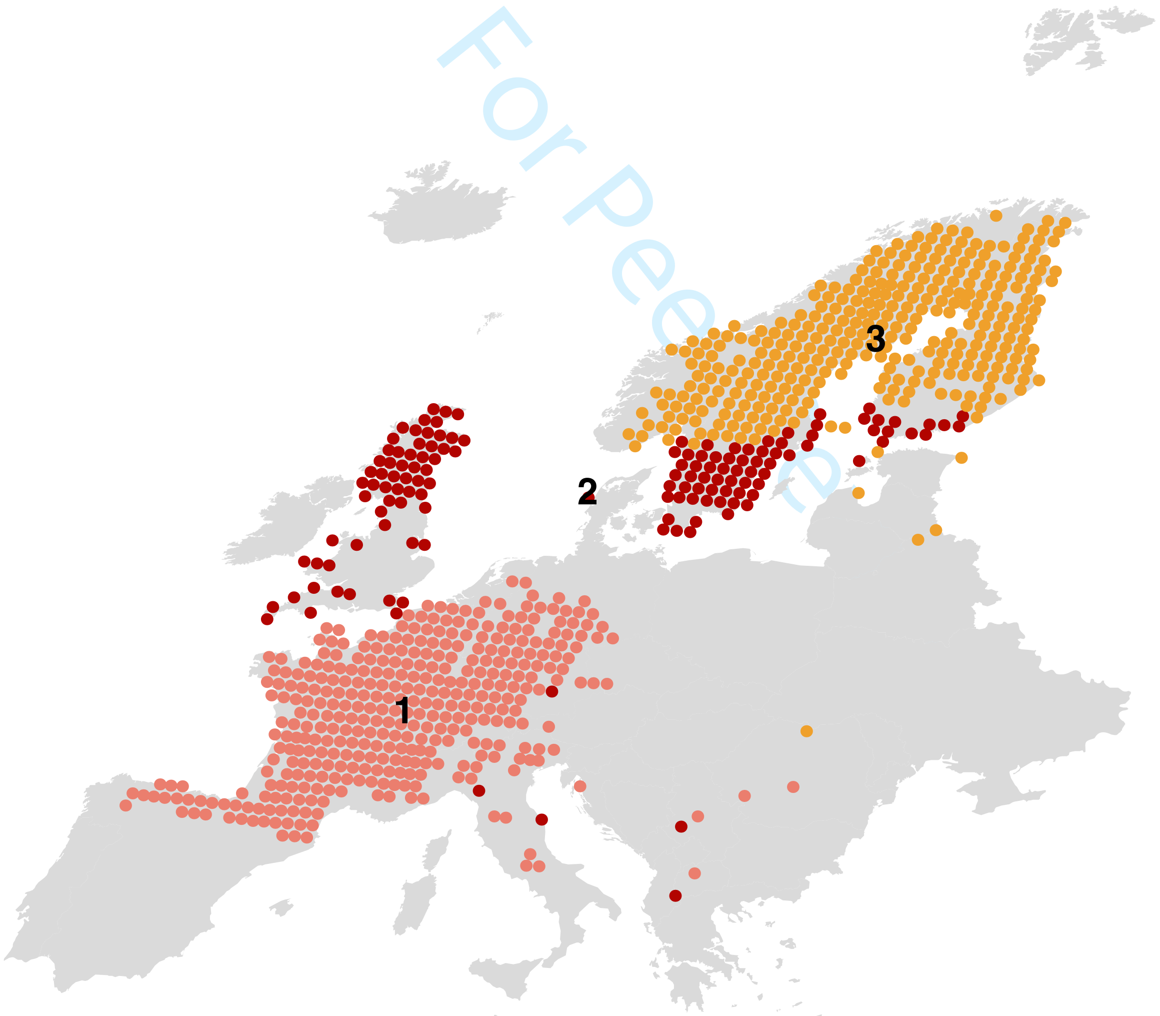
2	3	4	5	6	7	8	9	10	11	12	13	14	15
107	90	112	69	55	52	42	44	59	83	235	38	48	32
6	12	13	31	28	24	20	31	13	4	3	8	29	17
.06	0.13	0.12	0.45	0.51	0.46	0.48	0.70	0.22	0.05	0.01	0.21	0.60	0.53
26	3	21	0	0	0	0	0	1	11	176	1	0	0
.24	0.03	0.19	0.00	0.00	0.00	0.00	0.00	0.02	0.13	0.75	0.03	0.00	0.00
0	0	0	0	0	0	0	0	0	0	0	0	0	0
.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00


Core Clusters: 21

	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	120	58	69	88	38	76	116	48	51	50	29	50	84	12
	12	22	12	14	25	29	12	28	29	18	11	29	4	4
9	0.10	0.38	0.17	0.16	0.66	0.38	0.10	0.58	0.57	0.36	0.38	0.58	0.05	0.0
4	10	0	0	1	0	1	24	0	1	3	1	0	10	38
3	0.08	0.00	0.00	0.01	0.00	0.01	0.21	0.00	0.02	0.06	0.03	0.00	0.12	0.3
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

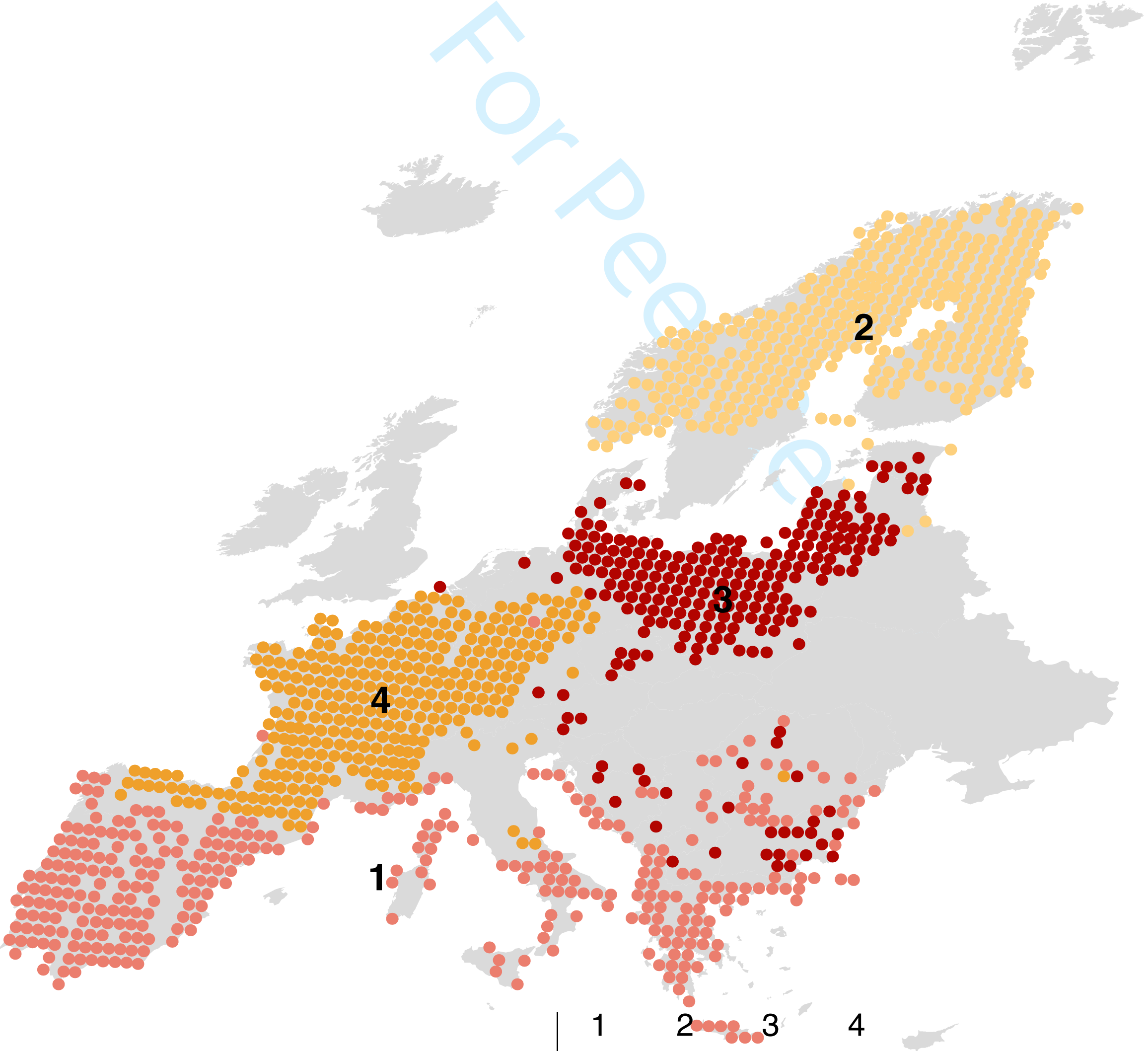
Lintulaakso *et al.*, 2018: Supplementary material S5. European Core Clusters 3-21

Core Clusters: 3



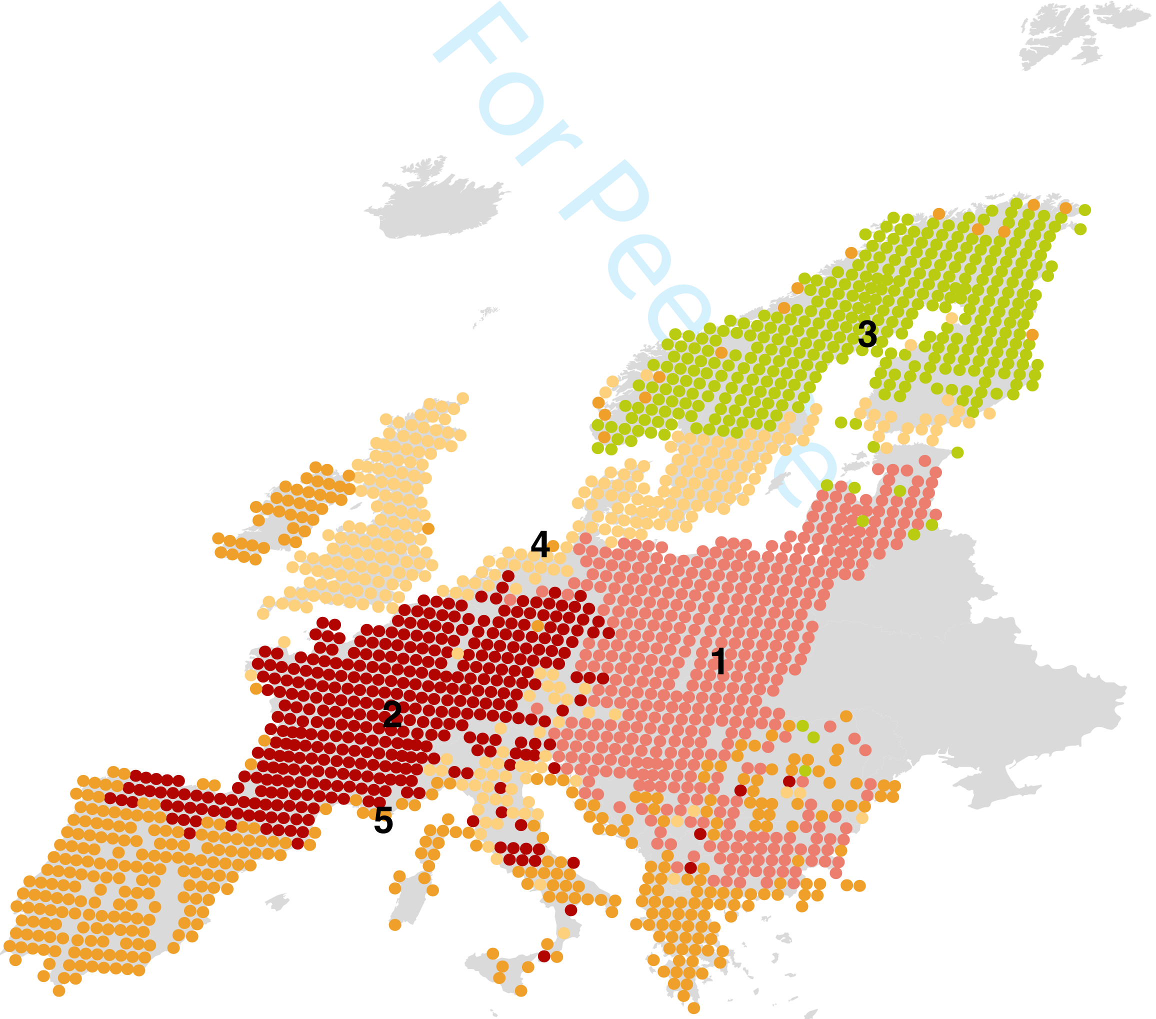
	1	2	3
Num Species	86	60	57
Num Ubiquitous	0	1	0
Prop Ubiquitous	0.00	0.02	0.00
Num Endemics	29	0	9
Prop Endemics	0.34	0.00	0.16
Num Ubiq Endemics	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00

Core Clusters: 4

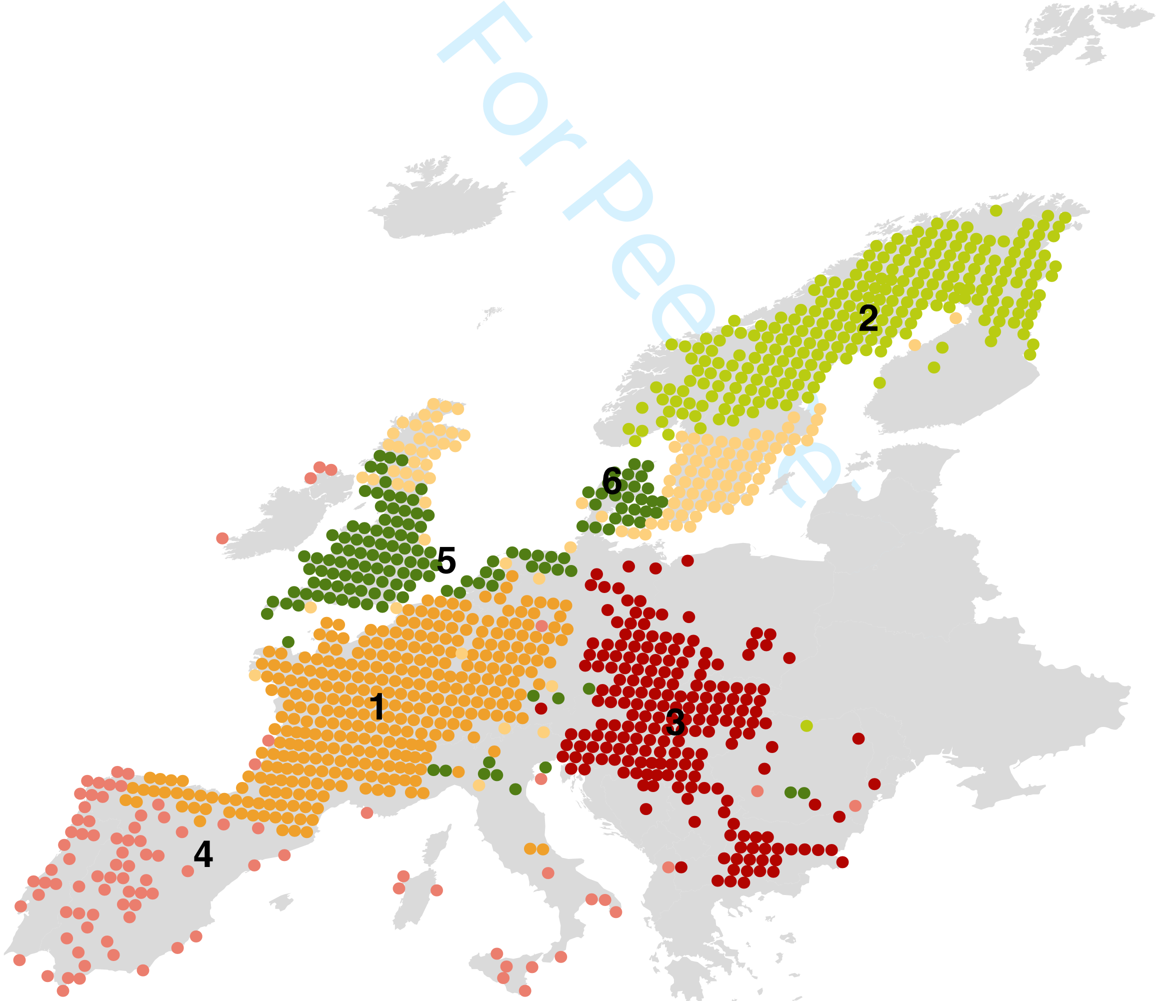


	1	2	3	4
Num Species	95	50	79	76
Num Ubiquitous	0	0	0	0
Prop Ubiquitous	0.00	0.00	0.00	0.00
Num Endemics	13	9	2	3
Prop Endemics	0.14	0.18	0.03	0.04
Num Ubiq Endemics	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00

Core Clusters: 5

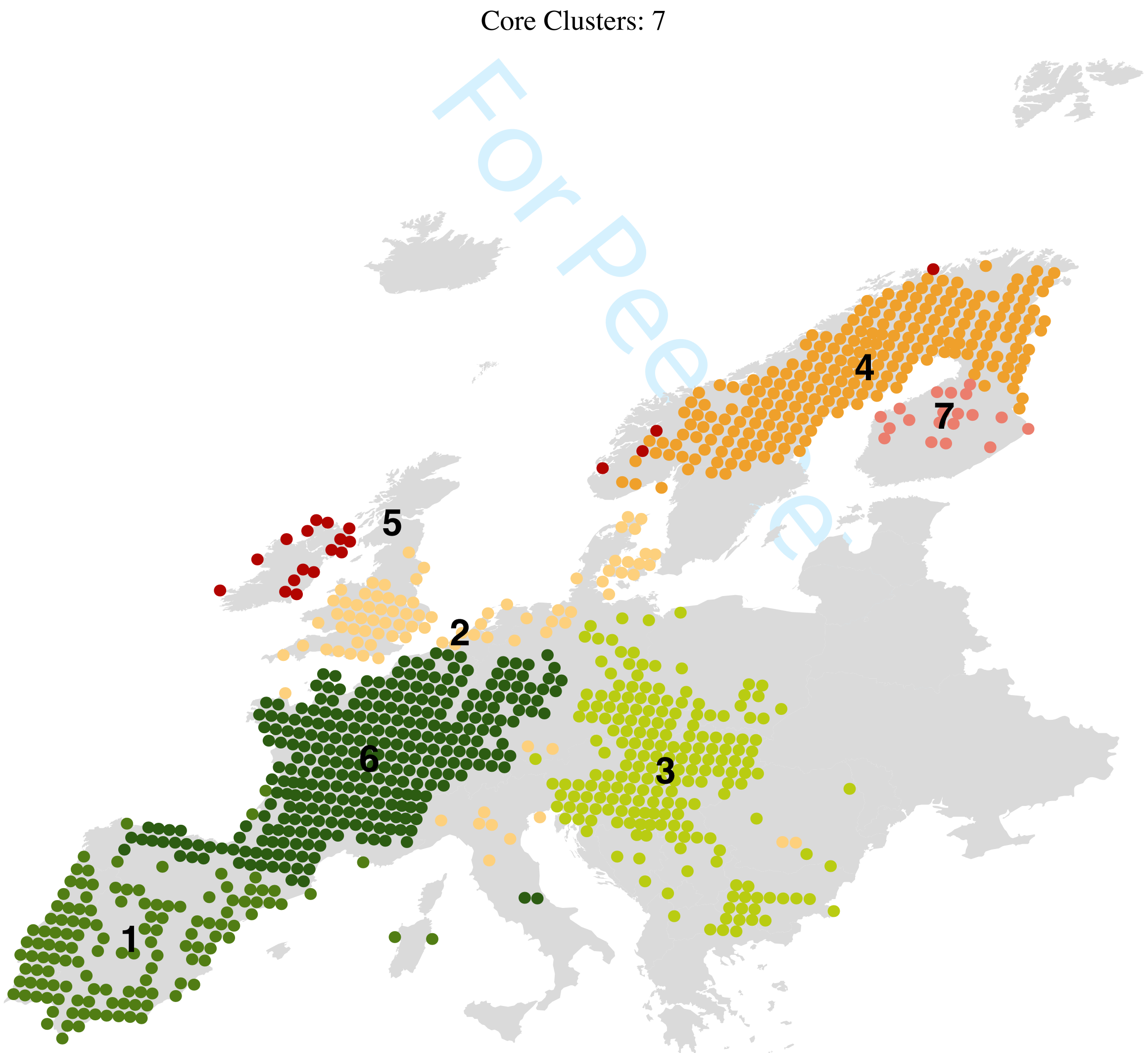


	1	2	3	4	5
Num Species	83	87	62	84	111
Num Ubiquitous	0	0	0	0	0
Prop Ubiquitous	0.00	0.00	0.00	0.00	0.00
Num Endemics	2	0	1	0	10
Prop Endemics	0.02	0.00	0.02	0.00	0.09
Num Ubiq Endemics	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00



Core Clusters: 6

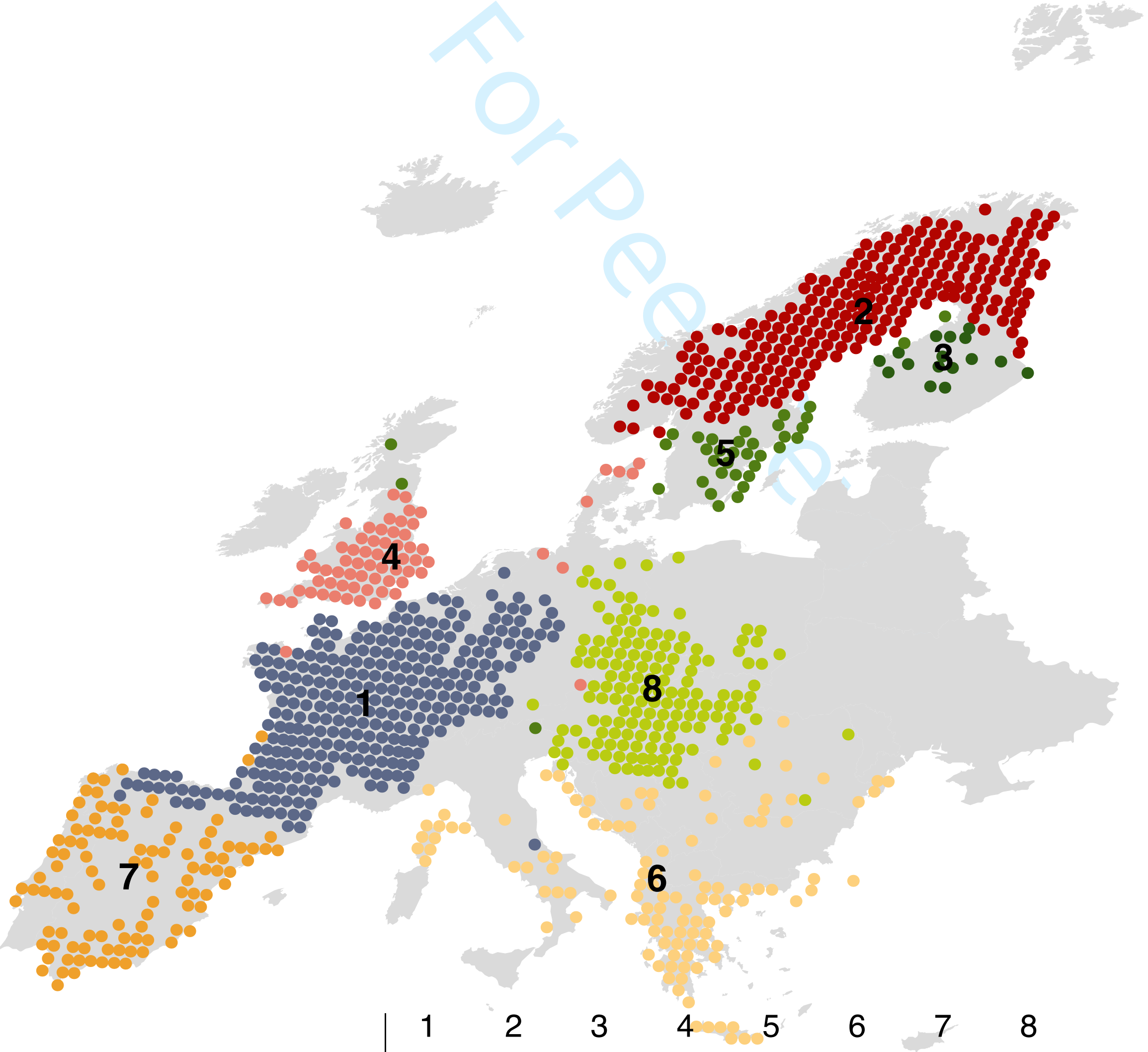
	1	2	3	4	5	6
Num Species	75	51	74	69	59	57
Num Ubiquitous	1	0	0	0	0	1
Prop Ubiquitous	0.01	0.00	0.00	0.00	0.00	0.02
Num Endemics	3	8	10	4	1	0
Prop Endemics	0.04	0.16	0.14	0.06	0.02	0.00
Num Ubiq Endemics	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00



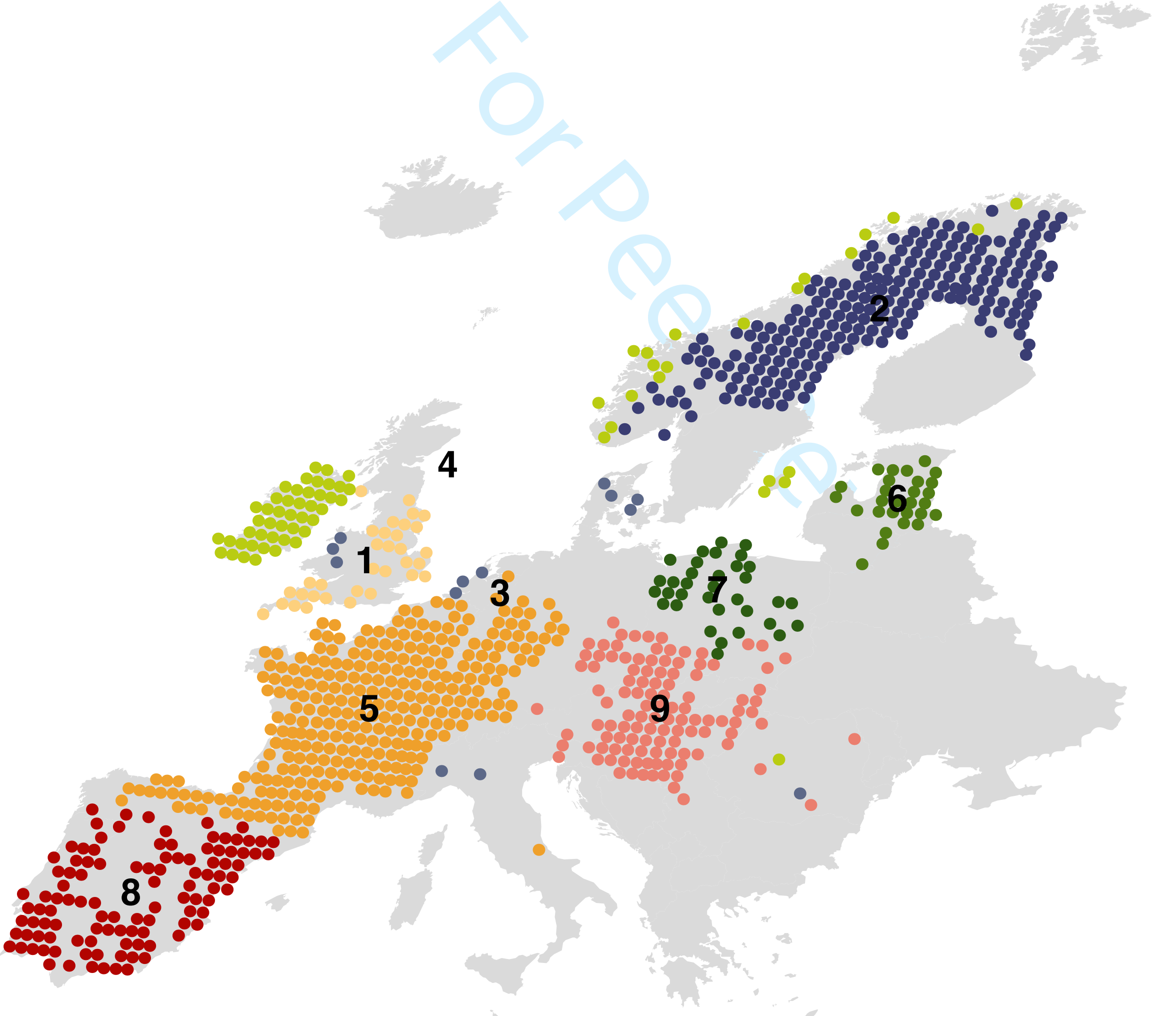
Core Clusters: 7

	1	2	3	4	5	6	7
Num Species	48	55	75	43	26	73	40
Num Ubiquitous	0	0	1	0	0	2	17
Prop Ubiquitous	0.00	0.00	0.01	0.00	0.00	0.03	0.43
Num Endemics	4	1	18	1	0	5	0
Prop Endemics	0.08	0.02	0.24	0.02	0.00	0.07	0.00
Num Ubiq Endemics	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 8



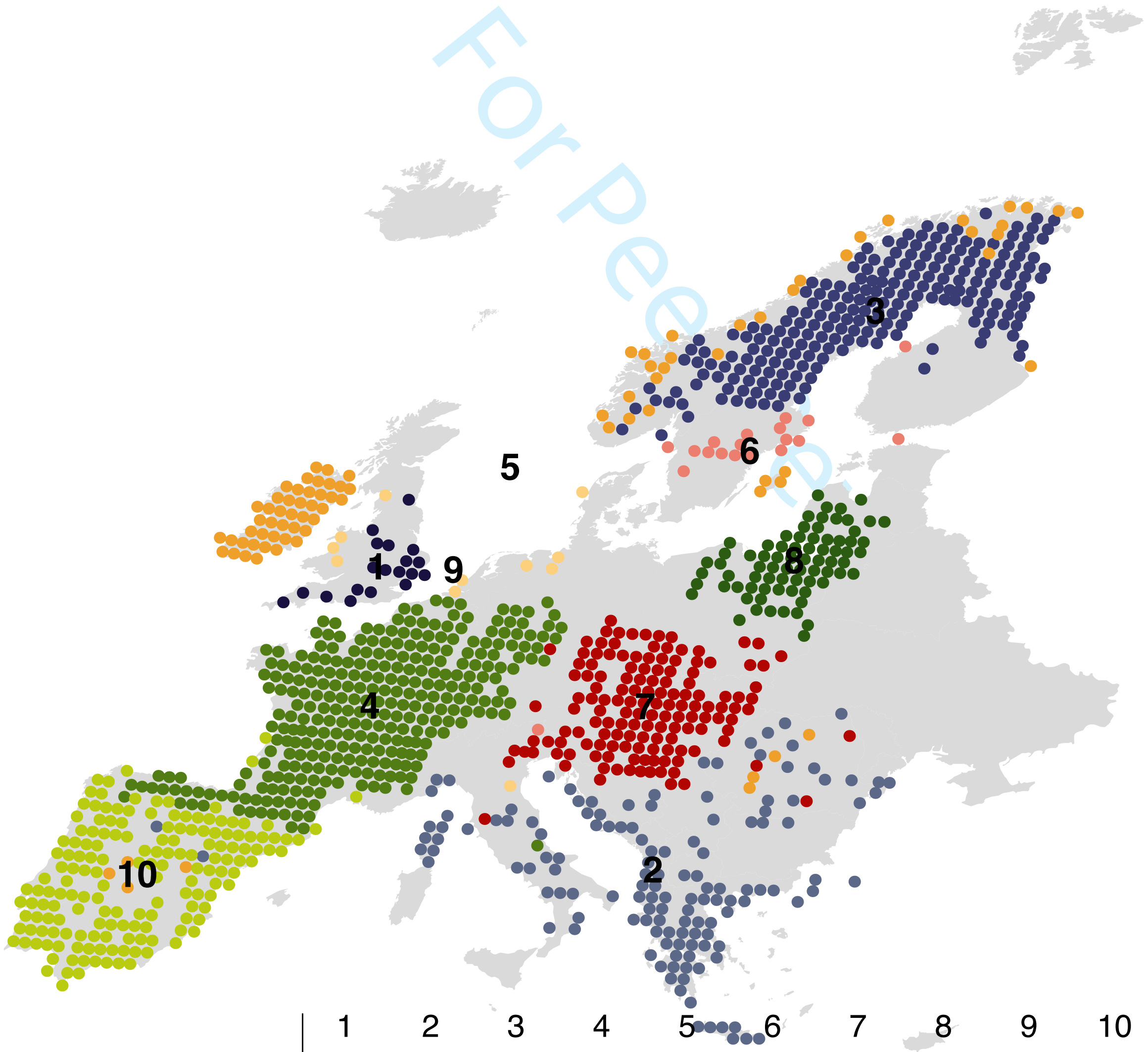
	1	2	3	4	5	6	7	8
Num Species	72	43	39	39	48	76	50	67
Num Ubiquitous	2	0	17	4	7	0	0	1
Prop Ubiquitous	0.03	0.00	0.44	0.10	0.15	0.00	0.00	0.01
Num Endemics	2	3	0	0	0	13	3	3
Prop Endemics	0.03	0.07	0.00	0.00	0.00	0.17	0.06	0.04
Num Ubiq Endemics	0	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Core Clusters: 9

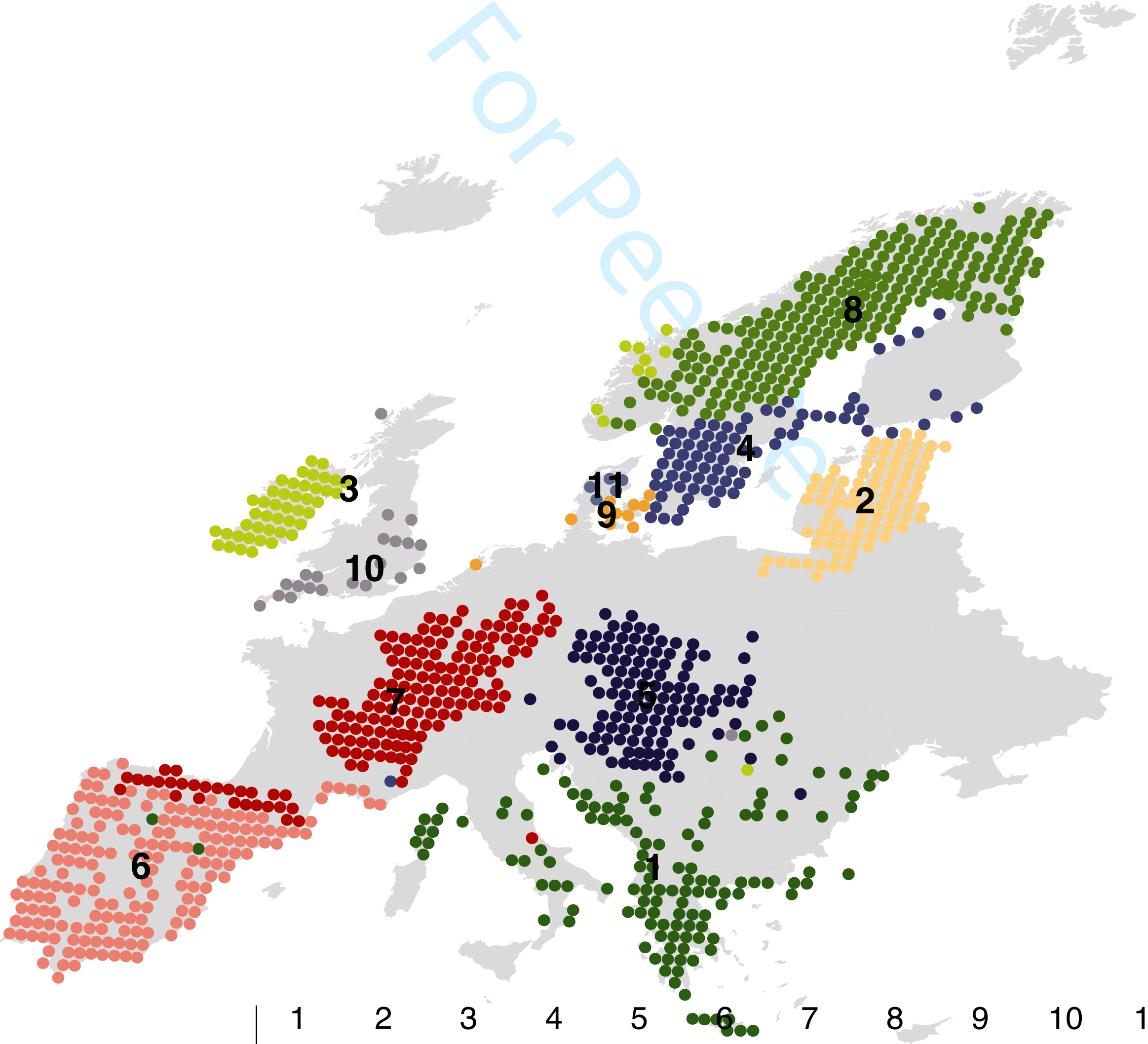
	1	2	3	4	5	6	7	8	9
Num Species	25	43	41	39	73	44	44	48	64
Num Ubiquitous	12	0	5	0	2	19	19	0	4
Prop Ubiquitous	0.48	0.00	0.12	0.00	0.03	0.43	0.43	0.00	0.06
Num Endemics	0	3	0	0	5	1	1	2	8
Prop Endemics	0.00	0.07	0.00	0.00	0.07	0.02	0.02	0.04	0.13
Num Ubiq Endemics	0	0	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 10



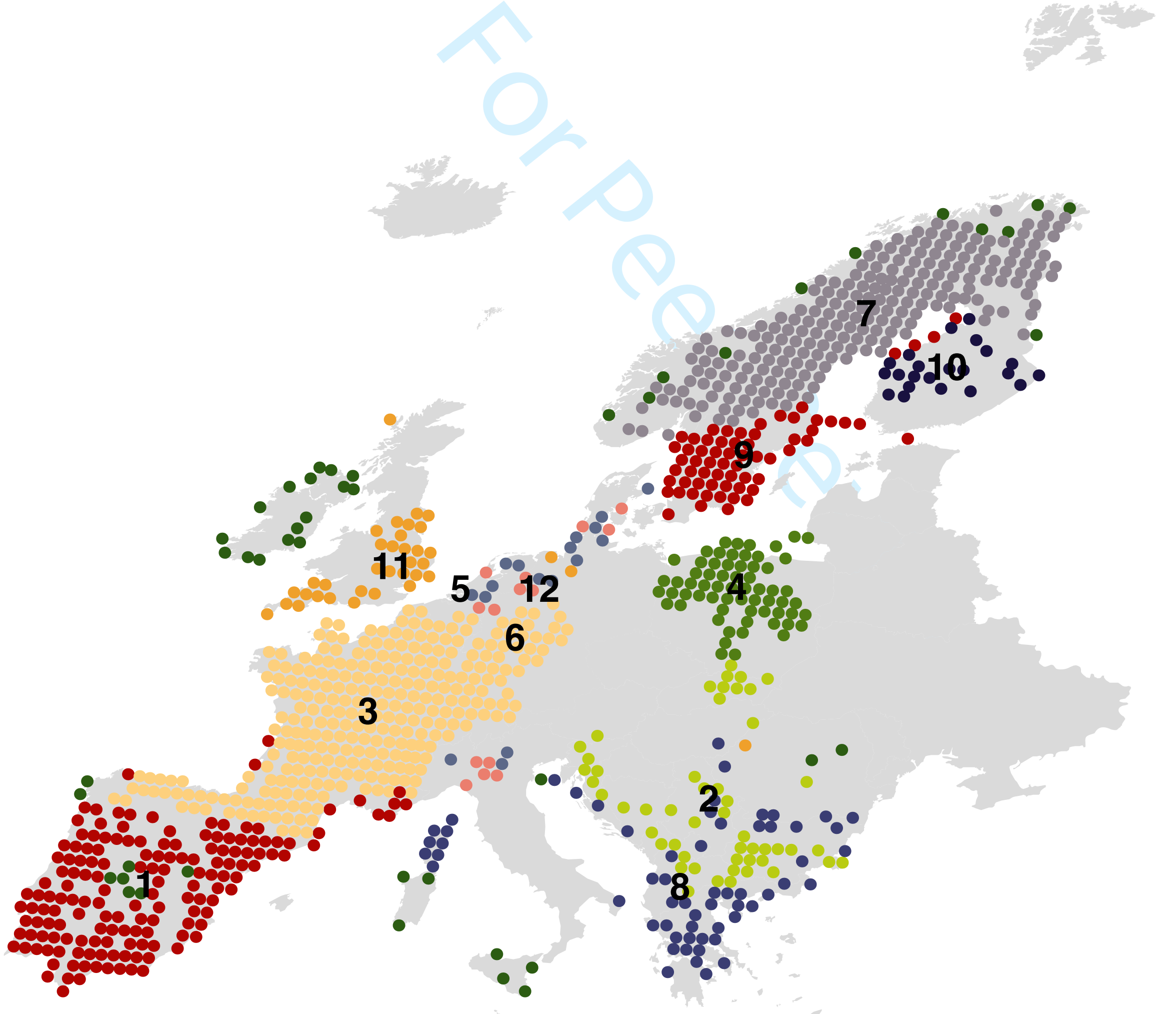
	1	2	3	4	5	6	7	8	9	10
Num Species	24	79	43	72	62	47	70	50	36	55
Num Ubiquitous	17	0	0	2	0	14	1	8	8	0
Prop Ubiquitous	0.71	0.00	0.00	0.03	0.00	0.30	0.01	0.16	0.22	0.00
Num Endemics	0	13	1	0	0	0	2	1	0	2
Prop Endemics	0.00	0.16	0.02	0.00	0.00	0.00	0.03	0.02	0.00	0.04
Num Ubiq Endemics	0	0	0	0	0	0	0	0	0	0
Prop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 11



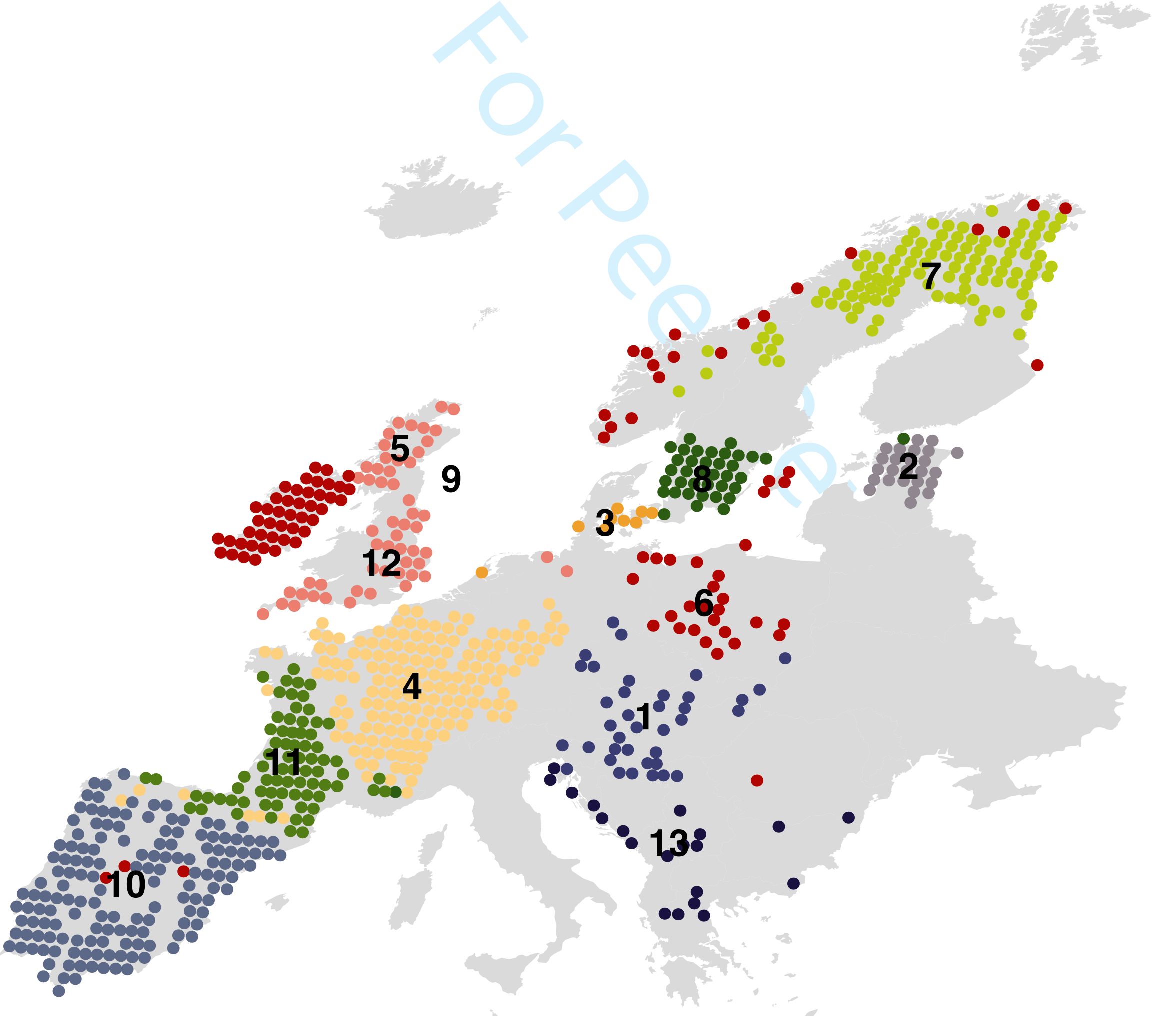
	1	2	3	4	5	6	7	8	9	10	11
Num Species	77	49	34	53	66	55	72	42	29	24	27
Num Ubiquitous	0	7	0	4	3	0	5	0	16	8	24
Prop Ubiquitous	0.00	0.14	0.00	0.08	0.05	0.00	0.07	0.00	0.55	0.33	0.8
Num Endemics	14	0	0	0	2	2	1	3	0	0	0
Prop Endemics	0.18	0.00	0.00	0.00	0.03	0.04	0.01	0.07	0.00	0.00	0.0
um Ubiq Endemics	0	0	0	0	0	0	0	0	0	0	0
rop Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 12



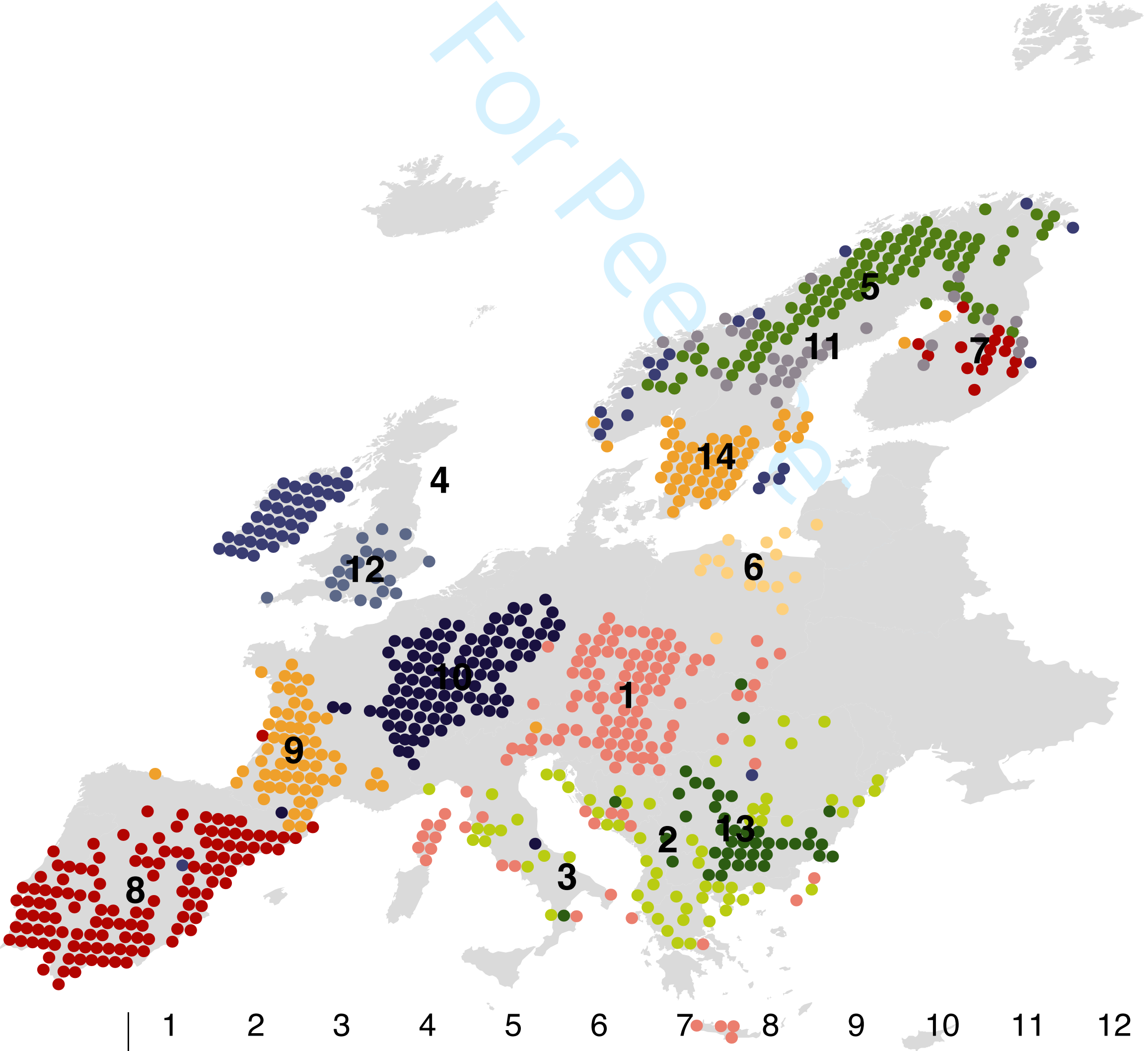
	1	2	3	4	5	6	7	8	9	10	11
lum Species	54	71	69	44	64	47	42	68	52	42	31
um Ubiquitous	0	2	2	13	0	11	0	0	4	15	3
op Ubiquitous	0.00	0.03	0.03	0.30	0.00	0.23	0.00	0.00	0.08	0.36	0.10
um Endemics	1	1	2	0	4	1	0	6	0	0	0
rop Endemics	0.02	0.01	0.03	0.00	0.06	0.02	0.00	0.09	0.00	0.00	0.00
Ubiq Endemics	0	0	0	0	0	0	0	0	0	0	0
Ubiq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 13



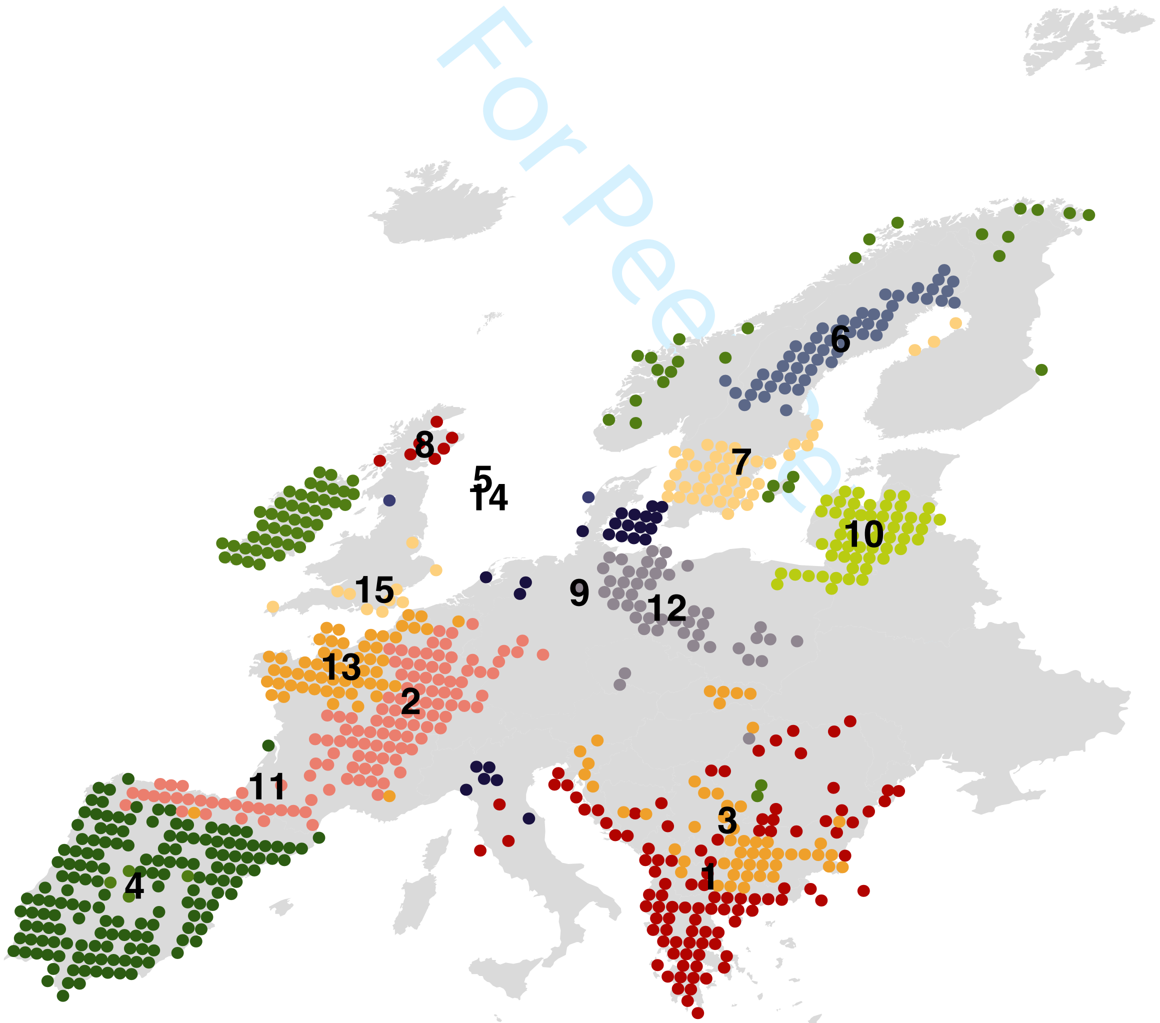
	1	2	3	4	5	6	7	8	9	10	11	12
Species	62	42	27	67	24	44	40	46	53	51	55	29
Ubiquitous	11	15	19	3	14	18	2	9	0	0	8	6
Ubiquitous	0.18	0.36	0.70	0.04	0.58	0.41	0.05	0.20	0.00	0.00	0.15	0.2
Endemics	1	0	0	3	0	0	2	0	1	2	0	0
Endemics	0.02	0.00	0.00	0.04	0.00	0.00	0.05	0.00	0.02	0.04	0.00	0.0
iq Endemics	0	0	0	0	0	0	0	0	0	0	0	0
iq Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 14



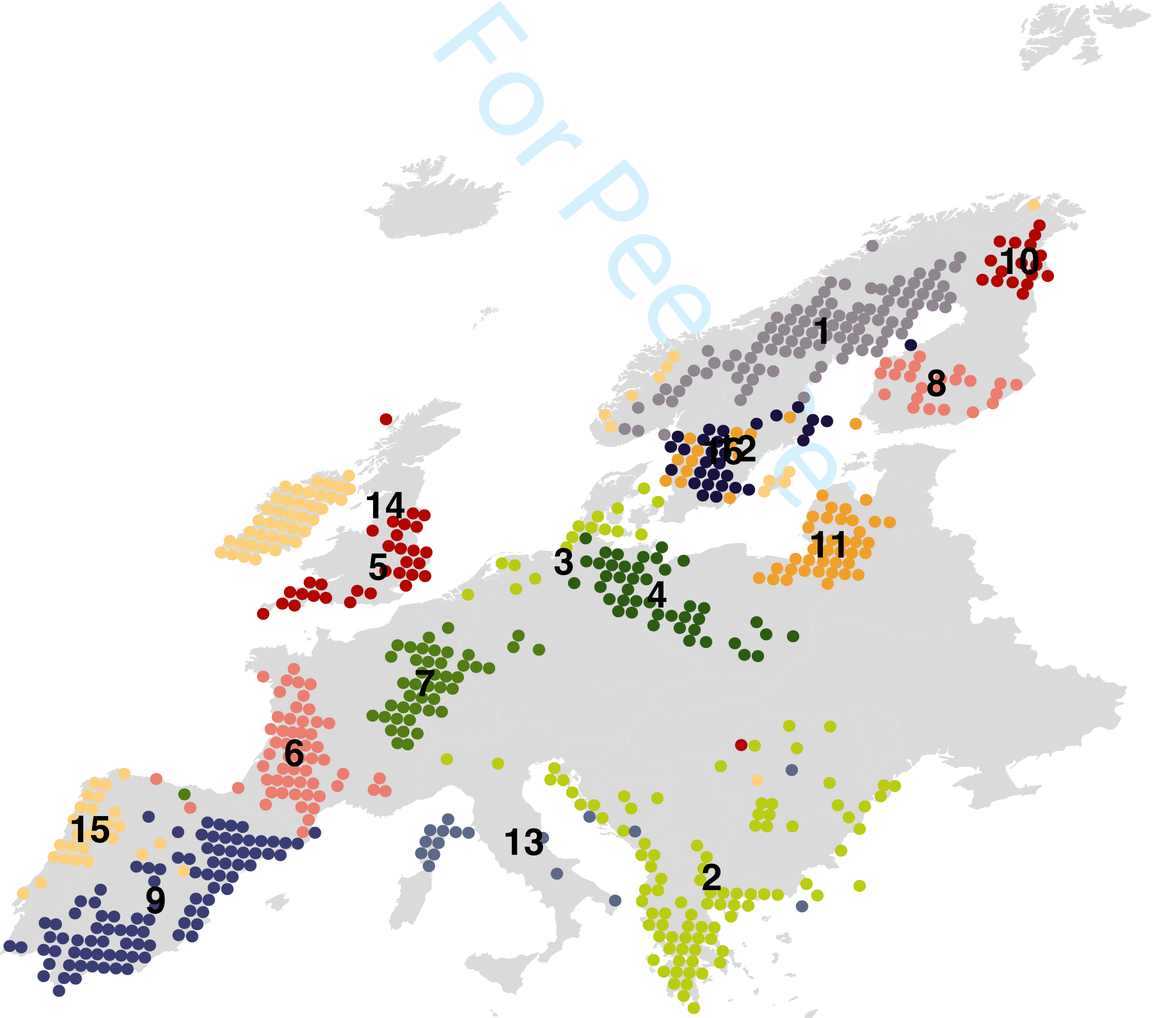
	1	2	3	4	5	6	7	8	9	10	11	12
pecies	66	73	57	44	40	40	38	49	52	65	40	25
iquitous	1	0	1	0	0	16	18	0	10	9	7	17
iquitous	0.02	0.00	0.02	0.00	0.00	0.40	0.47	0.00	0.19	0.14	0.18	0.68
demics	1	2	3	0	0	0	0	4	0	0	0	0
demics	0.02	0.03	0.05	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
Endemics	0	0	0	0	0	0	0	0	0	0	0	0
Endemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 15



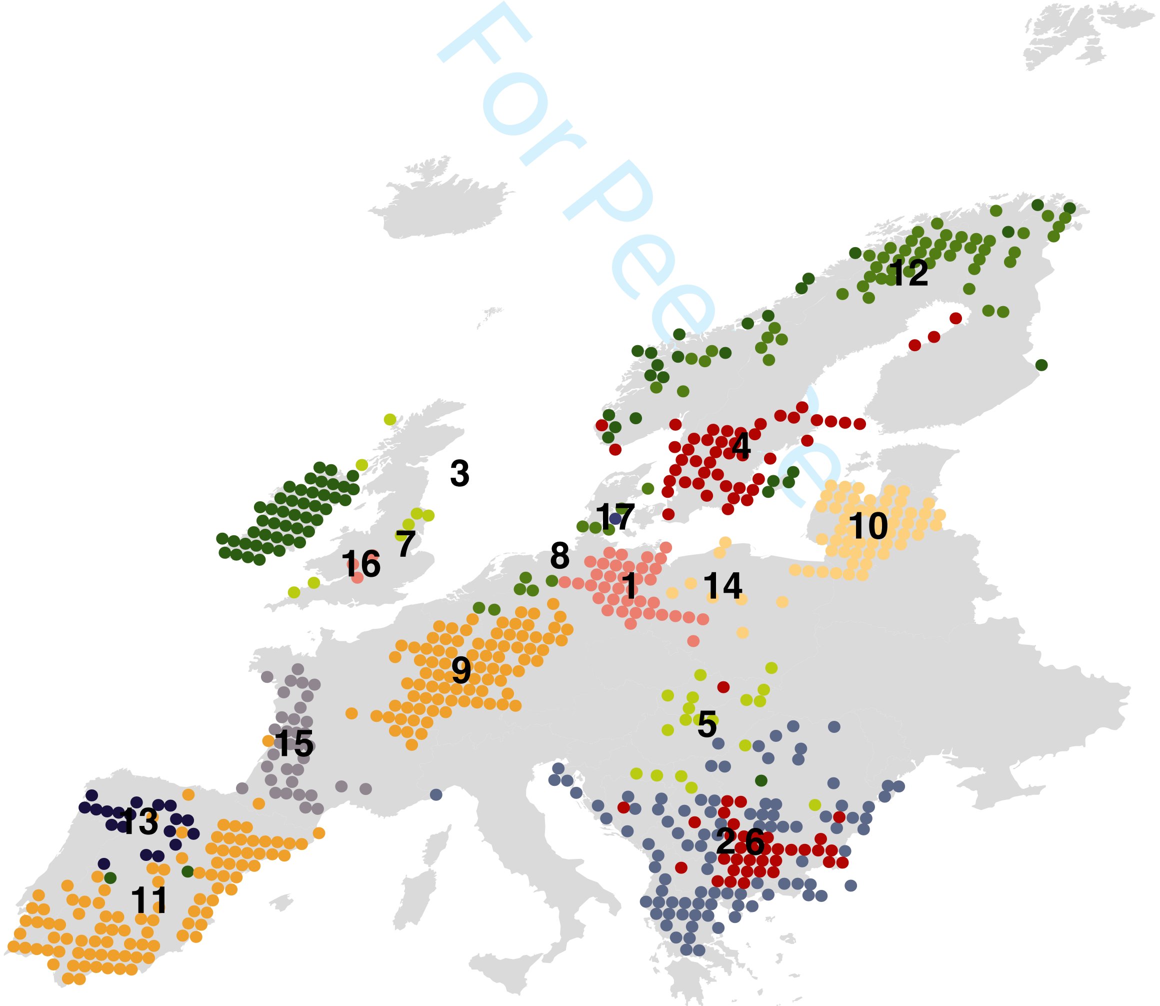
	1	2	3	4	5	6	7	8	9	10	11	12	1
cies	73	62	67	53	56	33	35	23	51	45	55	52	52
itous	0	10	2	0	0	13	8	18	3	11	12	14	1
itous	0.00	0.16	0.03	0.00	0.00	0.39	0.23	0.78	0.06	0.24	0.22	0.27	0.2
mics	7	0	1	2	2	2	0	0	1	0	0	1	0
mics	0.10	0.00	0.01	0.04	0.04	0.06	0.00	0.00	0.02	0.00	0.00	0.02	0.0
demics	0	0	0	0	0	1	0	0	0	0	0	0	0
demics	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 16



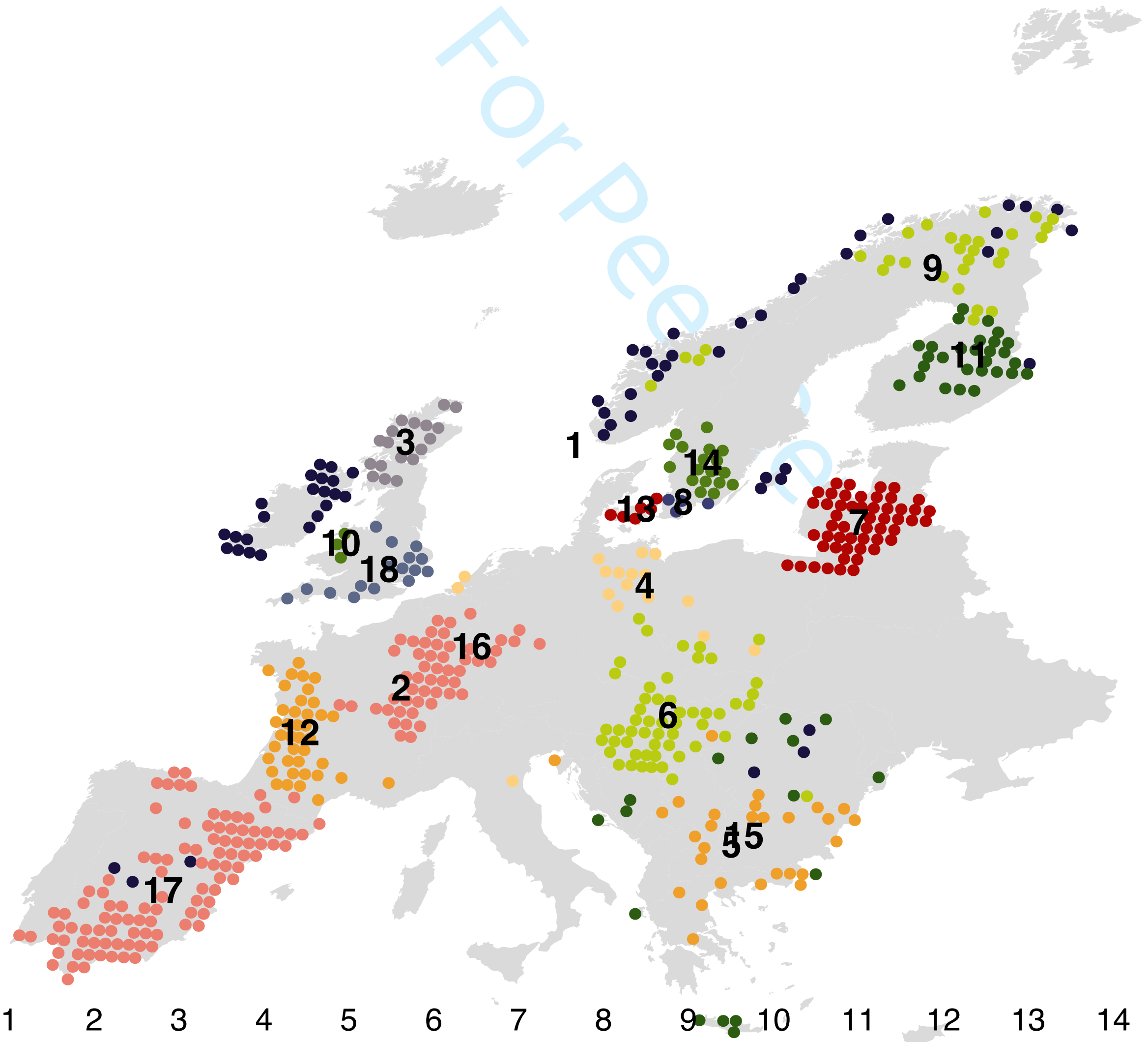
	1	2	3	4	5	6	7	8	9	10	11	12	13
s	38	70	45	50	26	53	53	40	49	32	45	33	51
ıs	0	0	9	16	8	12	16	21	0	10	12	14	0
ıs	0.00	0.00	0.20	0.32	0.31	0.23	0.30	0.53	0.00	0.31	0.27	0.42	0.00
s	0	11	0	1	0	0	1	0	1	0	0	0	3
s	0.00	0.16	0.00	0.02	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.06
nics	0	0	0	0	0	0	0	0	0	0	0	0	0
nics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 17

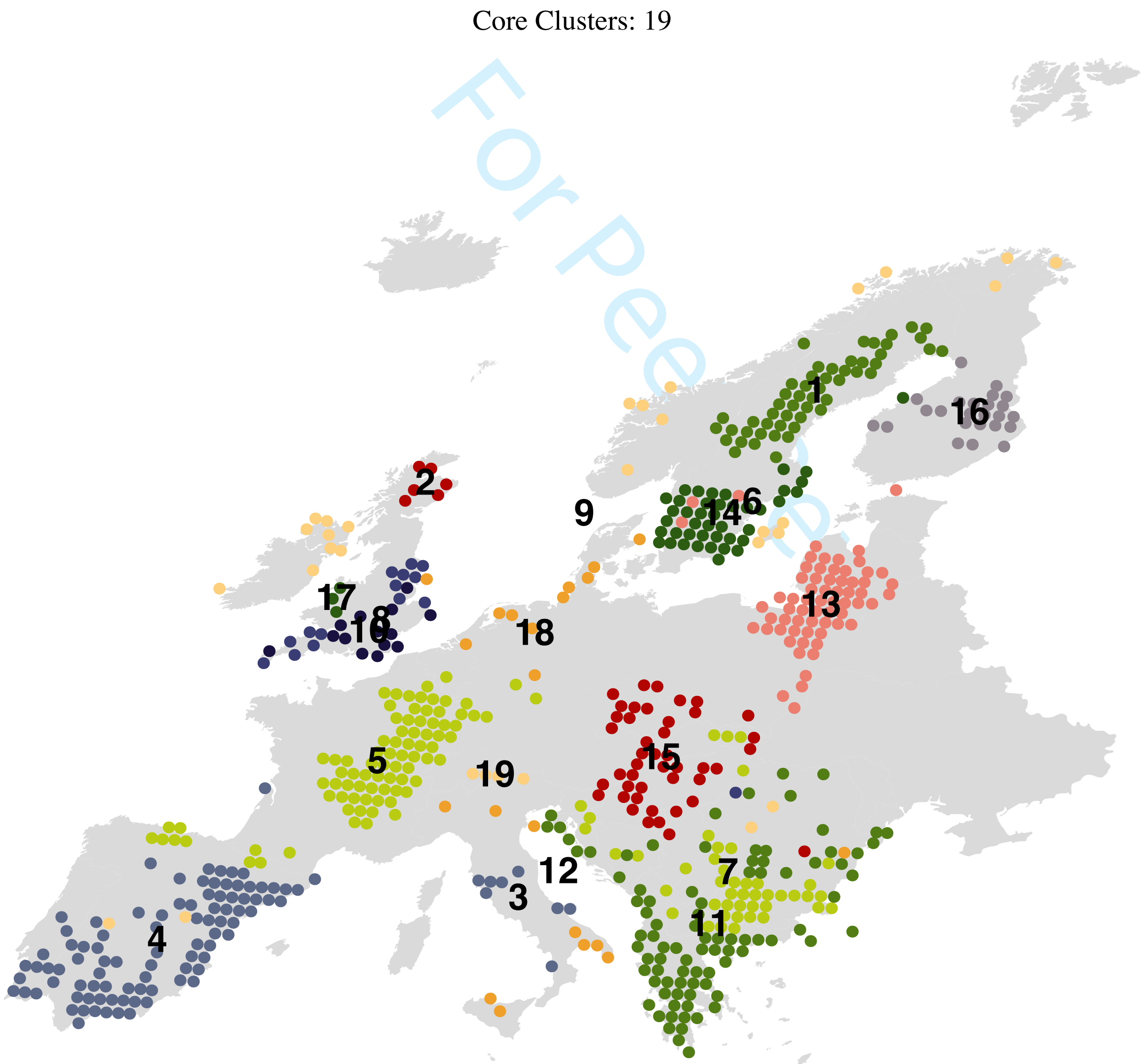


	1	2	3	4	5	6	7	8	9	10	11	12	13	1
	42	67	49	34	53	63	24	38	59	44	49	36	47	3
	18	0	0	4	16	4	7	18	9	10	0	2	4	2
	0.43	0.00	0.00	0.12	0.30	0.06	0.29	0.47	0.15	0.23	0.00	0.06	0.09	0.5
	0	3	0	0	0	1	0	0	1	0	1	1	1	0
	0.00	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.02	0.03	0.02	0.0
s	0	0	0	0	0	0	0	0	0	0	0	0	0	0
s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 18

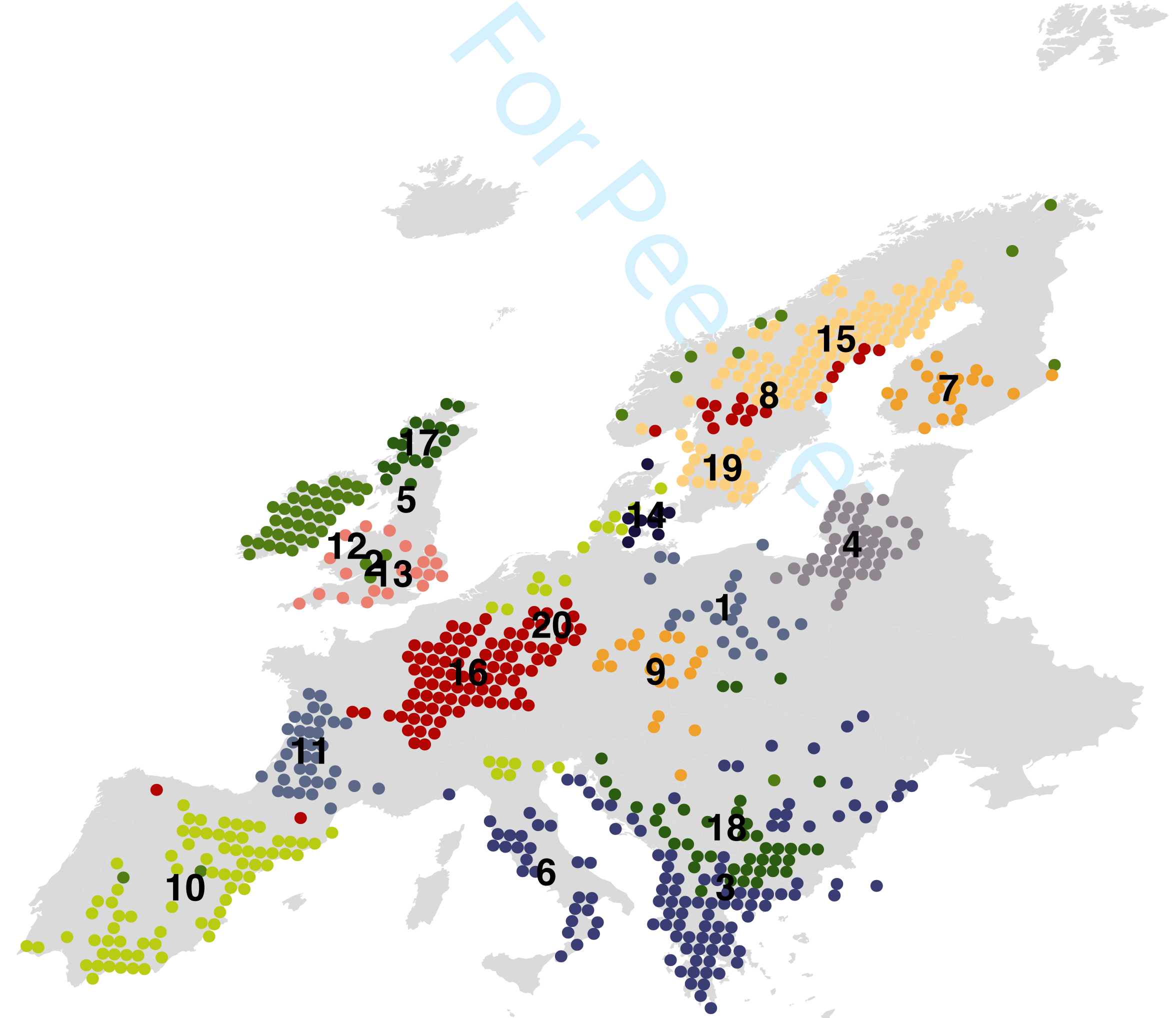


1	2	3	4	5	6	7	8	9	10	11	12	13	14
54	58	23	41	60	57	44	24	37	22	42	44	25	30
0	11	13	25	0	10	15	22	3	21	14	13	22	18
.00	0.19	0.57	0.61	0.00	0.18	0.34	0.92	0.08	0.95	0.33	0.30	0.88	0.60
0	2	0	0	4	1	0	0	0	0	0	0	0	0
.00	0.03	0.00	0.00	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0	0	0	0	0	0	0	0
.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



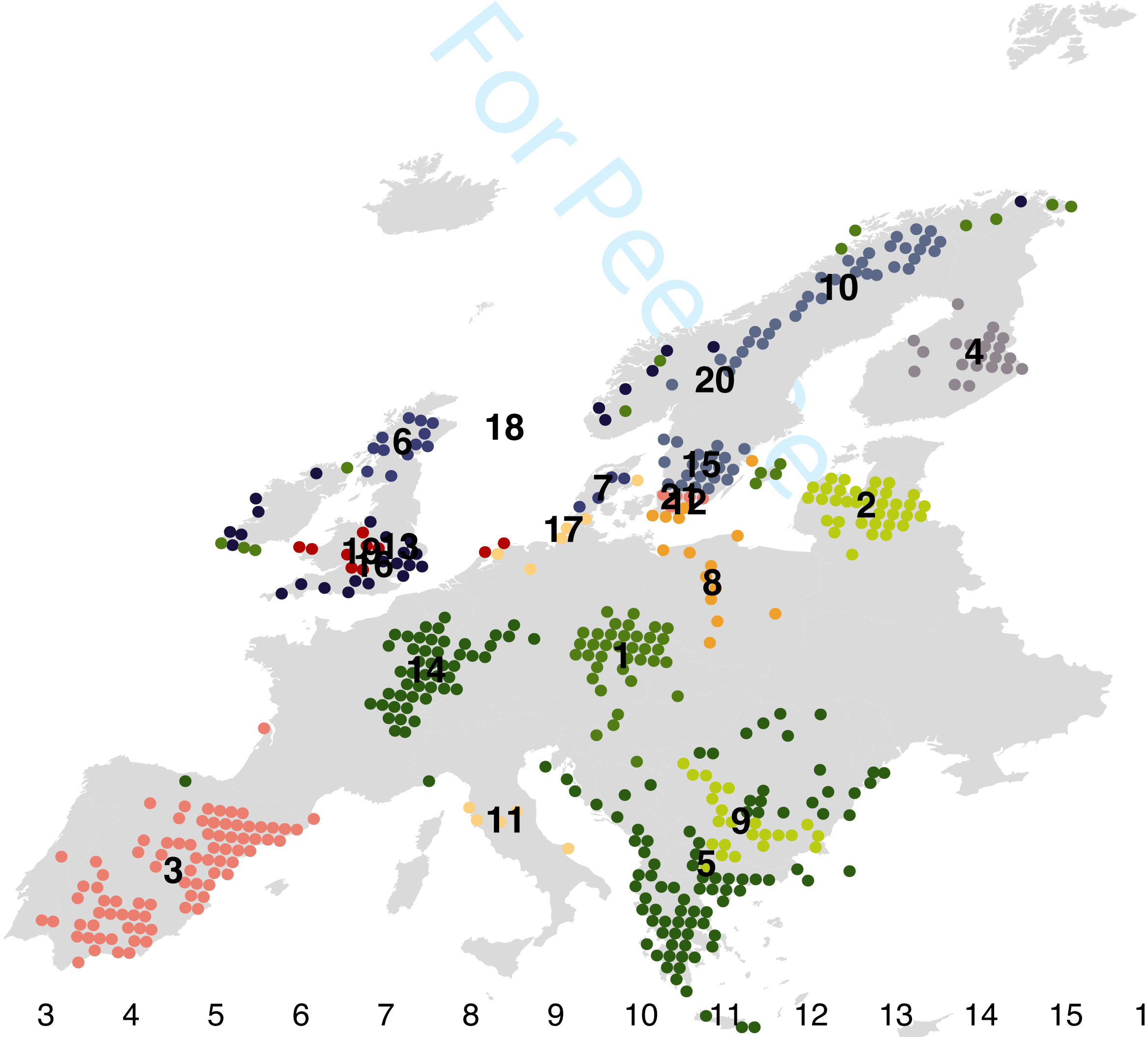
2	3	4	5	6	7	8	9	10	11	12	13	14	15
21	33	49	62	29	65	23	48	22	70	40	51	35	58
17	10	0	9	18	2	9	0	17	0	0	11	11	10
0.81	0.30	0.00	0.15	0.62	0.03	0.39	0.00	0.77	0.00	0.00	0.22	0.31	0.1
0	0	3	1	0	1	0	1	0	6	1	1	0	0
0.00	0.00	0.06	0.02	0.00	0.02	0.00	0.02	0.00	0.09	0.03	0.02	0.00	0.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Core Clusters: 20



2	3	4	5	6	7	8	9	10	11	12	13	14	15
20	69	48	44	37	40	34	52	51	41	19	22	25	39
20	0	16	0	3	17	15	20	2	13	14	18	13	3
1.00	0.00	0.33	0.00	0.08	0.43	0.44	0.38	0.04	0.32	0.74	0.82	0.52	0.08
0	8	0	0	3	0	0	0	3	0	0	0	0	1
.00	0.12	0.00	0.00	0.08	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.03
0	0	0	0	1	0	0	0	0	0	0	0	0	0
.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Core Clusters: 21



3	4	5	6	7	8	9	10	11	12	13	14	15	16
49	40	71	23	28	40	56	34	32	19	21	53	27	22
0	18	0	16	23	25	9	6	14	16	11	16	20	18
0.00	0.45	0.00	0.70	0.82	0.63	0.16	0.18	0.44	0.84	0.52	0.30	0.74	0.8
7	1	10	0	0	0	0	0	4	0	0	1	0	0
0.14	0.03	0.14	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.02	0.00	0.0
0	0	0	0	0	0	0	0	2	0	0	0	0	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.0

Lintulaakso *et al*., 2018: Supplementary material S6. Cenogram of the North American mammal clusters at *k*=8