Facilitation is one of many processes that determine the distribution and abundance of species and the organization of communities. Ragan Callaway

Therefore, it is important to explicitly consider how facilitation works in the context of the other processes. I will review examples of how competitive and facilitative mechanisms operate at the same time to create "net" effects, and how understanding this balance of interactions can contribute to predicting when and where different facilitative and competitive net effects or mechanisms might predominate in alpine system. Such experimental evidence for conditionality in interaction intensity and importance helps us to better conceptualize how interactions might affect species coexistence and community diversity. Other empirical evidence for the importance of facilitation on biodiversity has emerged convincingly in the last decade, much of it from alpine systems. Continuing to expand our understanding of facilitation in the context of other ecological processes provides new insight into mechanisms that sustain diversity and that determine the effects of diversity on ecosystem functions.

VOLVER/RETURN

Climatic control of zonal vegetation in northern Asia with special accent to the continentality-oceanicity gradient. Pavel V. Krestov

Introduction. Large-scale vegetation studies are one of the fundamental aspects of ecology and biogeography and a key to the clarification of modern as well as past processes in vegetation cover. The understanding of vegetation changes that follow the climatic fluctuation in different time scales has became the one of the most important question for the simulation and prediction of biota development in conditions of global climatic fluctuations. This study focuses at the problem of indication of climatic gradients by vegetation complexes at local and regional scales and aims to quantify the local and regional scale relations of vegetation units, their complexes and climatic parameters within boreal vegetation zone in Northeast Asia and North America.

Material and methods. The problem is approached by analysis of extensive phytosociological (over 5000 releves) and climatic (2200 climatic stations) databases.

Identification of bioclimates was made in accordance with Rivas-Martínez et al. (1999) approach using different climatic parameters that include Kira's warmth (WK) and coldness (CK) indices, continentality index (CI), ombro-evapotranspirational (OEI) index and winter precipitation (WP). General multiple slope linear regression models were developed to predict bioclimatic indices on the basis of geographical variables: latitude, longitude and elevation. Because of numerous compensational effects of edaphic or local climatic factors on community development (over-moisture, over-droughts, high insolation, temperature inversions) the finding the relationships between community types and a regional climate is possible by comparison of communities on the sites, which are equal in environmental characters. A link between regional climate (Major 1963) and vegetation units can be found with an aid of a concept of zonal site suggested by Krajina (1960) and formulated by Pojar et al (1987). Bioclimatic diagnoses for northeast Asian vegetation units were compared with those of boreal vegetation units of North America identified by Rivas-Martínez et al. (1999).

Results. Analysis of indices calculated with an aid of developed models showed the significant differences of vegetation units of the order rank in bioclimatic ranges. WK decreases from values over 75 in the middle temperate zone (Saso-Fagetalia, Aceri-Quercetalia) to the values less than 20 in subarctic zone. Among boreal vegetation units the orders of Betulo-Ranunculetea have the lowest warmth index in the circumboreal zone that can be explained by cool summer in conditions of oceanic climate. CK varies between values of -25 and -150 within boreal and temperate zones with prevalence of deciduous broadleaved, mixed and evergreen broadleaved forests. The boreal orders Lathyro-Laricetalia and Ledo-Laricetalia representing boreal deciduous coniferous forests are characterized by very low values of coldness index that, in this case, is comparable to that of subarctic orders.

The ranges of orders along the continentality gradient are reflected by changes of vegetation types within a zone with proximity to the ocean. In boreal zone the lowest values of CI are characteristic to the forestless and not yet described class of Aleutian meadows, followed by *Alnus fruticosa* scrub and *Betula ermanii* forests of the class Betulo-

Ranunculetea. Highest values belong to deciduous coniferous orders Lathyro-Laricetalia and Ledo-Laricetalia, which are developed in conditions of maximum for the whole circumboreal zone continentality. Vegetation of subarctic zone is characterized by moderate values of CI due to the influence of Arctic Ocean.

The relationships of vegetation units with snow cover become significant in the conditions of continental climate in the northern subzone of temperate zone, where lack of snow in winter causes a shortage of moisture in spring and early summer, and in oceanic regions of boreal zone, where the strong accumulation of snow causes 2-3 week delay of its melting and a considerable shortening of growing season. The communities of *Betula ermanii*, *Alnus fruticosa* and tall-forb meadows are characteristic to the regions with slower-melting heavy snow deposits.

Comparative floristic analysis showed that southern and coastal floras as well as floras of mountainous regions include the most of taxa of northern and continental floras. Zonal subarctic vegetation is represented by communities of provisional class Betuletea glanduloso-divaricatae composed of species complexes of Pacific coastal mountainous regions. In boreal zone, vegetation of Asian ultracontinental to maritime sectors is represented by communities of Vaccinio-Piceetea, Asian suboceanic to hyperoceanic sectors – by communities of Betulo-Ranunculetea. The boreal classes were likely differentiated in Pre-Pleistocene time due to the well developed floristic centres under the different climatic situations.

Acknowledgements. This study was supported by Russian foundation for basic research (13-04-01453) and Far Eastern Branch of Russian Academy of Sciences (the program "The Far East").

VOLVER/RETURN

Mapping and assessment of the ecosystems and their services. Carlo Blasi

Objective 2 of the European Strategy for Biodiversity aims to restore and maintain the full functionality of ecosystems and their services.

In particular the European Strategy for Biodiversity is aimed to achieve the following results: “By 2020, preserving and enhancing ecosystems and their services through green infrastructures and restoring at least 15% of degraded ecosystems”.

After a short summary of the history of Phytosociology in Europe and in Italy, is presented the Map of the Ecosystems of Italy. This is a new map realized at national scale obtained by the integration of the Map of Vegetation Series of Italy with the Corine Land Cover and additional information on the biogeographic and bioclimatic topics.

The applied methodology is particularly suitable for countries with a high flora and vegetation biodiversity. In these wide geographical areas cannot be adequate to use the III level of the Corine Land Cover, as well as in several other Central European countries.

VOLVER/RETURN

Natural Biodiversity of China. Richard Pott, Hannover

China is well known for its unique nature with highly diversified plant species richness. Up to now there are described more than 18.000 plant species, more than 50 percent of China´s total and more than 1.800 vertebrate species living alone in Yunnan. About 150 rare and endangered plant species and nearly 300 priority protected wild animals are the resources of Yunnan´s biodiversity. About 15 percent are species endemic to Yunnan. In a phytogeographical perspective Yunnan combines the East-Asian Flora with the Himalayan Flora. That´s why it is from a globally point of view a “Epicentre of Biodiversity”. In addition, Yunnan has many paleo- and neoendemic genera and species, its flora and fauna is ancient and modern, it ranks first in the Northern Hemisphere in terms of its biodiversity.

Key words: Yunnan´s biodiversity, Paleo- and Neo-Endemism, Vegetation types of China.

VOLVER/RETURN

Plant Communities of Cape Verde Islands. José Carlos Costa

According to Woldwilde bioclimatic classification proposed by Rivas-Martínez, Cape Verde bioclimate ranges from tropical desertic (pluvioserotin) to tropical pluvioseasonal (pluvioserotin). Concerning bioclimatic belts, thermotypes range from the upper infratropical to the upper thermotropical, and ombrotypes vary from the upper hyperarid to the low humid. The Braun-Blanquet approach already used to study the vegetation of Azores, Madeira and Canarias Islands is now applied to Cape Verde Islands in order to complete the studies for Macaronesia Islands. Field studies enabled to recognise the new classes *Cocculo penduli-Sarcostemmetea daltonii*, *Zygophyllo waterlotii-Suaedetea caboverdeanae, Heteropogonetea contorti, Arthrocnemetea paleotropicalis, Zygophylletea simplicis*. The first one is endemic, comprises Cape Verdean Xeromorphic small open woodland climatic desertic shrubland formation and have two orders are included in first class: *Euphorbio tuckyanae-Sarcostemetalia daltonii* (scrublands) and *Dichrostachyo platycarpae-Acacietalia caboverdeanae* (forest, thermotropical, arid to semiarid). The first one comprises the alliances: *Asparago squarrosi-Sarcostemmion daltonii* (communities on lithosoils, thermotropical, desertic to dry belt) and *Globulario amygdalifoliae-Artemision gorgoni* (mountain communities', low thermotropical a mesotropical and dry to humid bioclimate), and the second one is formed by three alliances: *Fico gnaphalocarpae-Acacion caboverdeanae* (savannahs), *Phoenicion atlanticae* (palm tree formations) and *Tamaricion senegalensis* (tamarisk forests). The *Heteropogonetea contorti* represent afrotropical xeromorfic perennial grassland savannah formations. The Capverdean xeromorphic dwarf-shrub coastal sand dune and rocky division is inserting in *Zygophyllo waterlotii-Suaedetea caboverdeanae.* The *Arthrocnemetea paleotropicalis Arthrocnemetea paleotropicalis, Sesuvietalia sesuioidis* are the coastal African tropical desertic saltwater marsh vegetation formation. The Afrotropical xeromorphic annual grassland savannah formation is include in *Zygophylletea simplicis*. We also refer the communities of the new alliances *Adiantion trifidi* (*Adiantetea*), *Adiantion inciso-philippensis* (*Parietarietea judaicae*) and *Kickxion elegantis* (*Kickxietalia elegantis, Asplenietea trichomanes*).

VOLVER/RETURN

Vegetation of Turkey. Emin Ugurlu

Turkey (Asiatic part called Anatolia) lies from East to West 26^0 to 56^0 degree of longitude (1 600 km) and North-South with a latitude from 36^0 to 42^0 N(600 km). Total land area is 780, 576 km^2 3 % of which is in Europe. Mountains cover more than half of the area above 1,000m, 30 % between 1,000-1,500 m, 16 % between 1,500-2,000 m and 10 % over 2,000 m. The Vegetation of Turkey is a product of such factors as geological, anthropological, climatic and historical factors. That is why it displays a great variety and complexity of types. Turkey has 7 geographic regions namely Marmara, Central Anatolian, Aegean, Mediterranean, Black Sea, South East Anatolian and East Anatolian. According to the plant geographical division of the world into floristic realms, regions and provinces by TACHTADZIAN (1978), Turkey belongs to Holoarctic realm at the intersection of three floristic regions. These are the South –Eurosiberian, the Mediterranean, and Irano-Turanian floristic regions. The geographical pattern of the main vegetation types reflects biogeographical subdivision of the country with elements of the Euro-Siberian region prevealing in the Black Sea Region and Marmara region. Mediterranean elements can be found in Aegean and Mediterranean Region and Irano-Turanian elements can be observed in Central and East Anatolia. This biogeographical division also reflects the main climatic factors of these regions; the Mediterranean Climate in South and West, the oceanic climate in the Black Sea region and the Continental climate of the interior. Moreover Turkey`s position at the intersection of three major landmasses results in her being traversed by important travel and migration routes, particularly of humans and birds. This is also another reason for the diversity of vegetation types floristic history of Turkey from early tertiary to present time. Because of all of this, Turkey has a lot of different vegetation types . Forest Vegetation is the dominant vegetation type in Turkey and it cover 60-70 % of the total vegetation of the country. Other vegetation type are shrub, coastal and steppe vegetations. There is no syntaxonomical synopsis of Turkey for the vegetation types. Numerous associations of Turkish forests, steppes, coastal and shrub areas have been defined. But little work is conducted critical evaluation of described units. Forest Vegetation of Turkey has mainly 3 vegetation classes : *Quercetea ilicis*, *Quercetea pubescentis* and *Querco – Fagatea* classes. Inner

Anatolian steppes has dominant characteristic species of *Thero-Brachypodieta*, *Chenopodieta* and *Astragalo-Brometea* classes. Main Classes of Dune Vegetation in Turkey *Ammophiletea, Tuberarietea guttatea*. This speech is an informative summary of Turkish Vegetation Types.

VOLVER/RETURN

Lichen communities in harsh Mediterranean habitats: coexistence and cooperation vs. competence between microorganisms. Eva Barreno

Lichens originate from mutualistic and cyclical symbiotic associations, involving at least a heterotrophic fungus "mycobiont" -dominant partner- and one or several photosynthetic autotrophs "photobionts" –primary producers- either unicellular green algae, cyanobacteria or both. Recent molecular studies showed that lichens harbour specific bacterial communities which seem to be involved in nitrogen resources, mineral ions recycling, hormones, etc. Thalli are unique symbiogenetic phenotypes of specific biological organization –holotypes- and complex physiology which rely upon the functional and genetic interactions among the symbionts, and are considered as micro-ecosystems (microbiomes, microcosmos). Lichen thalli exemplify the emergence of ecological and evolutionary novelties through physical associations between different types of organisms. Lichenization allows the partners to thrive in extreme environmental habitats (even outer space) that would otherwise be unavailable to either one on its own.

Additional complexity was discovered by our team in a lichen of wide distribution, *Ramalina farinacea,* where the coexistence of two algal species (*Trebouxia lynnae*, *T. jamesii*) appears as a consistent character among the populations of this lichen from California to the Canary Islands and Europe (Casano et al. 2011). More recently (Molins et al. 2013), was detected in *Parmotrema pseudotinctorum*, a foliose and successful lichen in colonizing rocks under extreme environmental habitats in the Canary Islands, the coexistence with at least three algal species of different genera (*Trebouxia* and *Asterochloris*), and the lower cortex is coated with diverse bacterial communities forming a biofilm-like structure. Similar outcomes occur in vagrant lichens adapted to extreme continental and cold conditions. Therefore, coexistence of physiologically different algal species and bacteria could be explained by an increased fitness in particular habitats or under specific environmental conditions, and might be a more common phenomenon in ecologically adaptive lichens.

There is some evidence that lichens thriving in stressful habitats can adjust their algal partner according to their presence in different habitats, following the concept of “habitat-adapted symbiosis”. Recent studies have discovered that switching among green algal strains is also a common phenomenon in lichens, and the number of selectable algal partners is variable among fungal species. In maritime sand dunes, the fruticose lichens (*Seirophora villosa, Ramalina lacera*) growing on most exposed twigs of *Juniperus turbinata,* select the same ecophysiological adapted microalga. In the communities on biological soil crusts (BSC) of several semiarid Miocene gypsum localities (Madrid, Monegros, Almería, Alicante), lichens and lichenicolous lichens -that begin its growth on *Diploschistes diacapsis* becoming independent later- were analysed in terms of algal specificity and selectivity. Every one of the studied lichen and lichenicolous species allocates the same two algal *Trebouxia* strains, suggesting that they can share and steal its phycobionts in an event called algal switching from *D diacapsis*. In summary, both events of coexistence and algal switching together seem to be influenced by habitat conditions. In adition, the molecular analyses of *Buellia zoharyi* symbionts -which also colonize calcareous soils in Canary Islands-, reveals a pattern of possible simultaneous evolution of both partners, even between islands, something similar to the behaviour of *Ramalina farinacea* populations (Printzen et al. 2012; del Campo et al. 2013).

It is possible to hypothesize that extreme environmental conditions in the habitat could influence in both symbiotic partners and could select their algal strains according to its tolerance and physiological complementarities to the local conditions. In terms of ecological theory, lichen thalli and/or lichen communities seem to be good examples of how facilitative –positive- interactions between species might be a key mechanism by which complex biodiversity affects the efficiency and productivity of ecosystems, leading to non-additive changes, and allowing diverse assemblages to capture a greater fraction of the resources.

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VOLVER/RETURN

Numerical approaches for plot-based classification of vegetation: ideals and reality.

Miquel de Cáceres

Numerical approaches started to be used in plot-based classification of vegetation in the late 1960’s, with the advent of computers. Obviously, the adoption of numerical classification procedures provided a number of advantages with respect to classical phytosociology, most importantly the formalisation of classification criteria and the ability to handle large data sets. Nevertheless, adopting numerical approaches also involves some drawbacks and cannot, by itself, lead vegetation scientists to automatically converge or agree in how classification of vegetation should be conducted. After several decades of computer availability, plot-based classification of vegetation still suffers from a lack of consensus in practices, which contributes to the generalized perception that the information generated by this activity relies too much on arbitrary decisions. Continuing with the work of Mucina & van der Maarel (1989) and Mucina (1997), the aim in this talk is to review some pervasive problems in classification of vegetation, indicating for each of them whether, in my opinion, developments in numerical methods can be of help or, instead, whether other kind of (e.g. conceptual or organisational) developments are more needed. The discussion will be structured following the set of tasks involved in classification of vegetation and the set of requirements that users of classification systems commonly ask. Hopefully, this analysis should help identifying gaps in this field and stimulate the discussion of future activities to be fostered from the IAVS Vegetation Classification Committee.

VOLVER/RETURN

Estado actual y perspectivas futuras de las bases de datos de vegetación: la base de datos SIVIM. Xavier Font

El SIVIM (Sistema de Información de la Vegetación Ibérica y Macaronésica) es un sistema de información diseñado para recopilar, publicar, y facilitar el análisis de todos los inventarios de vegetación levantados en el territorio considerado. En la actualidad ofrece acceso en línea y gratuito a cerca de 150.000 inventarios de vegetación, a sus tablas originales, a los datos florísticos (más de 2.500.000 de registros) y a la bibliográfica original. El sistema también ofrece un paquete de programas (B-VegAna) para la edición y análisis de los datos de vegetación. En el Global Index of Vegetation-Plot Databases (GIVD) hay registradas 197 bases de datos con inventarios de vegetación, teniendo en cuenta el número de datos recopilados SIVIM es la cuarta mayor base de datos a nivel mundial

En http://www.sivim.info es posible realizar numerosas y variadas consultas a los datos, entre las cuales podemos destacar la cartografía corológica de taxones y sintaxones y los listados de información sobre un territorio determinado. Entre las nuevas herramientas de análisis, desarrolladas recientemente, podemos mencionar el cálculo en línea de la fidelidad de las especies a los sintáxones y una herramienta para modelar la distribución potencial de los taxones y sintaxones (basada en el algoritmo MAXENT) y sus tendencias futuras en respuesta al cambio climático (proyecciones para los años 2020 , 2050 y 2080). En último lugar, podemos destacar la integración de SIVIM en la aplicación para dispositivos móviles ZamiaDroid, que permite la consulta de la información florística de SIVIM en dispositivos tipo teléfonos y tabletas con sistema operativo Android.

Desde el punto de vista científico, ya es posible abordar objetivos de envergadura como: proyectos de revisión de los sintaxones a gran escala mediante métodos estadísticos, estudios sobre el cambio global, etc.

El portal nació en el año 2007 y ha sido financiado por dos proyectos de investigación (GL2006-13421-C04 y CGL2009-13317-C03) de forma consecutiva. Desgraciadamente desde el año 2012 no disponemos de financiación alguna y su continuidad y mantenimiento están comprometidos. En cuanto a las acciones futuras, pretendemos desarrollar un sistema experto en línea con el fin de determinar inventarios vegetales y abrir SIVIM a proyectos participativos, especialmente los relacionados con las observaciones florísticas y la la fotografía de plantas y vegetación. Para mantener el portal y realizar estas acciones habrá que encotrar en breve fuentes alternativas de financiación.

El proyecto SIVIM supone una pequeña aportación a la tarea de liberalizar y difundir datos básicos sobre biodiversidad para su utilización extendida. Con ello esperamos conseguir un mayor uso de los inventarios de vegetación; un tipo de información ecológica que consideramos muy valiosa, tanto por su fiabilidad como por su gran repartición geográfica.

VOLVER/RETURN

Shipwrecked on the rock: the flora and vegetation of the dolomiticoutcrops of south of Spain. Juan F. Mota

Botanists have always been fascinated by the emergence of peculiar floras growing on unusual substrates. The disruption caused by the impact of rocky soils on the vegetation is probably the most remarkable feature of this phenomenon. From a floristic point of view some rocks have a large number of characteristic floristic elements, endemic in many cases and exclusively associated with the different kinds of outcrops. The relationship of a relict and endemic flora with rocks like the serpentines or the gypsum has been a primary driver of numerous scientific investigations. The serpentines have probably been the most investigated unusual substrate. In fact, there are several monographs, congresses and scientific societies focused on serpentines. Although researchers have also studied othertypes of unusual bedrocks such as gypsum outcrops, little work has been done on dolomites(carbonate rock composed of calcium magnesium carbonate). This is surprising because dolomites share certain features with serpentines (they are both rocks rich in Mg).As gypsums and serpentines, dolomites also impose severe environmental constraints on the development of vegetation (Medina-Cazorla et al. 2010a), particularly when these rocks are heavily fragmented (process called cataclasis). However, unlike serpentines and gypsum, the cataclastic dolomites outcrops are not clearly mapped from a geological point of view and they are not easily distinguishable from pure limestone areas (Mota el al., 2008). Therefore, it is difficult to identify a ‘‘dolomitophilous’’ flora. The transition from limestones to dolomites is not quite obvious and geologicalmapping has paid no serious attention to the issue (different categories are frequently grouped together inthe same unit).

The first references to the flora occurring on this peculiar substrate date back to the 19th century when Boissier described a large number of the flora growing on dolomitic sands in Sierra Nevada. Although the sandy areas of Trevenque and Los Alayos, in Sierra Nevada, are the best examples, these kinds of communities extend throughout the territories of the Betic ranges of Andalusia, Albacete and Murcia (Medina-Cazorla et al., 2010b). These kinds of communities are usually easily recognizable as a result of the physiognomy and adaptations shown by their species.This flora, extremely rich in endemic taxa, gives rise to very scattered shrublands dominated by prostate species provided with dense, sericeous indumenta (Mota et al., 1993).

It has been frequently noted that the flora on dolomites mainly occurs on topographical ridges, on steep mostly south-facing slopes or when the rock is finely crushed (cataclasites or kakiritized dolomites).In many respects, these outcropsbehave like “ecological islands”,Soils generated from dolomites are similar, in some aspects, to those generated from serpentines. Dolomites and serpentines tend to produce superficial soils with low water retentive capacity; furthermore, these soils have a low Ca content or, more precisely, low Ca/Mg ratio. A plausible explanation forthe occurrence of these special floras could be the xericity of the substrate and the high proportion of magnesium (Mota et al., 1993; Salmerón et al., 2014).

This lecture deals with the florapeculiar to the dolomites of the Baetic Ranges, one of the richest territories in Europe as far as flora is concerned. However, many botanists have recognized this peculiar geobotanical phenomenon, that might be called dolomitophily, all over the world (Mota et al, 2008).

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VOLVER/RETURN

Síntesis fitosociológica de la vegetación de Chile: presente y futuro. Javier Amigo

Chile es un territorio más extenso que la Península Ibérica, con una situación geográfica y bioclimática peculiares, que participa de los bioclimas Tropical, Mediterráneo, Templado y Boreal. Se presenta un panorama de los conocimientos actuales sobre su vegetación, sintetizados en las diversas clases fitosociológicas que se han reconocido a lo largo del país. Se enumeran las clases identificables en sus 4 unidades bioclimáticas y se compara con las de la Península Ibérica, como territorio parcialmente homólogo del hemisferio norte. Se concluye que en Chile hay un claro déficit de prospección de su vegetación.

VOLVER/RETURN

Bioclimatology and vegetation of Mexico: towards a new paradigm of classification. Joaquín Giménez de Azcárate

The main attributes of Mexican vegetation and the classification proposals more used are introduced; this includes a critical review, where are highlighted the virtues and limitations of them. A new classification scheme based on the global bioclimatic system by Rivas-Martínez is proposed. In it has been incorporated the more solid and coherent geobotanical aspects of the different systems used in the country, with the purpose of contribute to clarify and systematize the Mexican vegetation. In this process a serie of exercises in different territories and scales were carried out. As reference data, both, information from meteorological stations and vegetation relevés were considered. The preliminary results of the bioclimatic diagnosis (bioclimates and isobioclmates) were linked with its potential natural vegetation, making emphasis on its structure, composition and geographical distribution.

VOLVER/RETURN

Vegetation Series and Biogeography: The Districtal Modelo of Asturias (Spain). Tomás E. Díaz González

The biogeographic units of Asturias are characterized and delimited using as a basis for updating the latest contributions on Vegetation Series, Permaseries and Geoseries. The eleven basic biogeographic units of Asturias (Cuerano-Suevense, Littoral Ovetense, Northern Asturian, Lucensean, Navian, Picoeuropean, Redesan, Somedan, Babian-Torian, Highnarceensean and Ancarensean Districts) are established according to the 37 dynamic-catenal units of vegetation recognized in the various habitats of the Asturian territory. All these Districts are included in a Region (the Eurosiberian Region), a Province (Atlantic European Province), two Subprovinces (Cantabrian-Atlantic and Orocantabric Subprovinces) and five Biogeografic Sectors: Galician-Asturian, Galician-Portuguese, Picoeuropean-Ubinnean- and Lacian-Ancarensean. Of each basic unit (biogeographic district) its surface area, altitudinal range, the administrative units (councils) which includes, and the number of Series vegetation, endemic plants, endangered plants, invasive plants and protected areas that exist in indicated the district.

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Orophile flora of the Iberian Peninsula: biogeography and diversity. Javier Loidi

Due to the fact taht mountains can be regarded as islands in terms of Biogeography we survey the frigophilic flora and vegetation living in the Iberian Pininsula (IP) main ranges in order to learn about its biogeographical relationships. For that we have studied the taxonomic distinctness measures of diversity (TD) of the frigophilic flora of IP, which attempt to capture phylogenetic diversity existing in a species set rather than only richness. They have the advantage of being independent of the sample size and sampling effort. In this work we (a) explore the taxonomic distinctness patterns of that flora by calculating Average Taxonomic Distinctness (Δ+) and Variation in Taxonomic Distinctness (Λ+) and (b) assess the biogeographic relationships existing among the main mountain systems using the Gamma+ (Γ+) similarity index, which takes into account the taxonomic relationships existing among the species sets. Based on general floras, we selected 999 taxa preferentially growing above 1,600 m a s l across six main groups of Iberian mountains: Pyrenees, Cantabrian Range, Northern Iberian Range, Southern Iberian Range, Central Range and Baetic Range. These frigophilic taxa have been classified into four main floristic elements: Alpine-Boreal (155), European Orophile (250), Endemic (536) and Iberian-North African (58). Additionally, they have been assigned to their preferential habitat. Our results show that, above 1,600 m a s l, frigophilic species richness present a linear positive correlation with area size , which conforms to the general statements of the theory of Islands Biogeography. The largest element is the Endemic one, which finds its highest representation in the Baetic Range (190), followed by the Pyrenees (129). In addition, the number of endemic species shows a significant relationship with the maximum altitude in each range. The relations among the mountain ranges were explored by means of NMDS ordination and by hierarchical agglomerative clustering. The similarity matrix was calculated with Jaccard and Γ+ similarity indices. Both resulting dendrograms are similar, pairing the Pyrenees-Cantabrian Range and Central Range-Northern Iberian Range. Randomization tests on taxonomic distinctness of the mountain ranges, floristic elements and habitat types were performed comparing Δ+ and Λ+ values against expectations from the master taxonomic list of 999 species on a 95% confidence funnel diagram. The results indicate that the northern ranges (Pyrenees and Cantabrian Range) have higher TD values than expected. Regarding the floristic elements, the Alpine-Boreal element shows a clear positive deviation from expected TD in all the mountain ranges. As regards habitats, patterns of TD differ depending on the index used. Psicroxerophilous grasslands show lower Δ+ values than expected and rocks and hygrophilous habitats higher Λ+ values than expected. Thus, the Alpine-Boreal element contributes mainly to the taxonomic diversity of the cold adapted flora in the Iberian mountains. This floristic element shows strong association with hygrophilous habitats. The vegetation type mainly represented in this frigophilic flora is that related with rocks and screes (Thlaspietea and Asplenietea). Migration events, particularly those happened during Pleistocene climatic oscillations, have shaped the distribution patterns of this flora in the IP mountains. Several connection ranges have been identified amont the six main ranges and with the rest of the European continent and North Africa. Those connecting ranges have been the pathways of this frigophilic flora during cold phases of this period and now are still inhabited by a remnant set of this species group. The Endangered flora established by the Red List is preferently represented in the Endemic Element and thus in the Baetic Range. The rocks and scress and the hygrophilous habitats benefit from a higher proportion than expected of endangered taxa then the other habitats

Acknowledgements: Funds from the project IT299-10 for research groups of the Basque Government have been used for this survey.

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