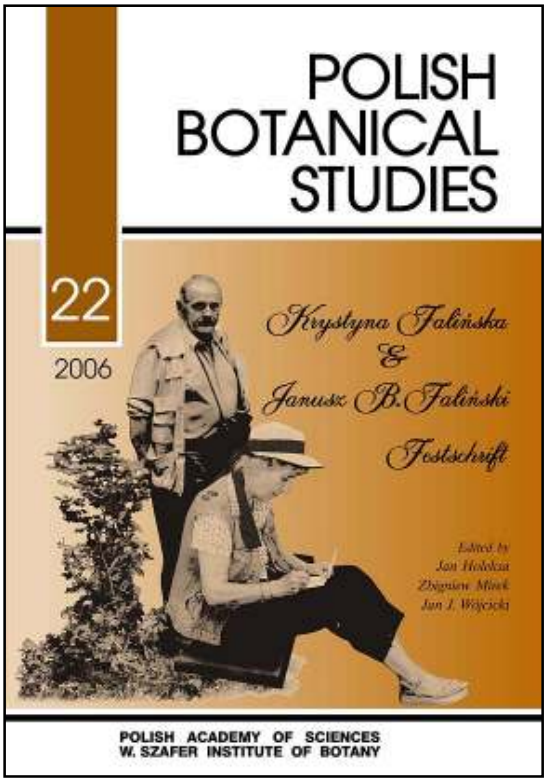

Polish Botanical Studies 22
(2006)

KRYSTYNA FALIŃSKA & JANUSZ B. FALIŃSKI FESTSCHRIFT

Edited by:

Jan Holeksa, Zbigniew Mirek, Jan J. Wójcicki

CONTENTS

ABSTRACTS

Polish Botanical Studies 22: 35–44, 2006

EXPANSION OF NATIVE ORCHIDS IN ANTHROPOGENOUS HABITATS

WOJCIECH ADAMOWSKI

Abstract. The Orchidaceae, believed endangered as a group, are surprisingly often found in manmade habitats. The author suggests some explanations of apophytism amongst orchids on the basis of his own studies and a review of similar cases reported in the literature. The most common colonizers of secondary habitats in temperate Europe are helleborines and dactylorrhizas, species with short life cycles and broad ecological amplitudes. Substrate rich in $CaCO_3$, high light availability, and diminished competition resulting from disturbance of the upper soil level are common properties of habitats colonized by orchids.

Key words: Orchidaceae, manmade habitats, population dynamics, apophytism

Wojciech Adamowski, Białowieża Geobotanical Station, Warsaw University, Sportowa 19, PL-17-230 Białowieża, Poland; e-mail: w.adamowski@uw.edu.pl

Polish Botanical Studies 22: 45–52, 2006

IMPORTANCE OF SEGETAL HABITAT PRESERVATION FOR THE BIODIVERSITY OF KAMPINOS NATIONAL PARK

ANNA BOMANOWSKA

Abstract. The segetal flora of cultivated farmland in Kampinos National Park (KNP) was investigated in 1994–1999. These studies have shown that despite fallowing, abandonment and afforestation of fields, agrocoenoses deserving protection (for scientific as well as historical and cultural reasons) still exist within the area of KNP. Six sites have been selected as the most valuable, because their preservation is sufficient for protection of the whole segetal flora and will not disturb biocoenotic relations within the Park area. The best way to preserve the traditional agricultural landscape is to include these sites in the system of landscape protection zones to be created under the KNP Protection Plan. It is important to develop a suitable strategy allowing active protection of agrophytocoenoses while not violating the regulations that apply in national parks. To accomplish this goal, farming activities should be conducted according to the principles of environment-friendly agriculture. This will make it possible to effectively protect agrocoenoses against degradation and to preserve the natural values of Kampinos National Park against the negative effects of agriculture.

Key words: biodiversity, protection, segetal flora, Kampinos National Park, biosphere reserve

Anna Bomanowska, Department of Geobotany and Plant Ecology, University of Łódź, Banacha 12/16, PL-90-237 Łódź, Poland; e-mail: knopikaa@biol.uni.lodz.pl

Polish Botanical Studies 22: 53–62, 2006

DISTRIBUTION AND PHYTOCOENOTIC CHARACTERISTICS OF RELICT POPULATIONS OF *RHODODENDRON MYRTIFOLIUM* (ERICACEAE) IN THE UKRAINIAN CARPATHIANS

ADAM BORATYŃSKI, MARCIN PIWCZYŃSKI, YAKIV P. DIDUKH,
LIDIA TASENKEVICH, ANGEL ROMO & HALINA RATYŃSKA

Abstract. *Rhododendron myrtifolium* Schot & Kotschy is a high-mountain plant dispersed at several relict Pleistocene localities in isolated massifs of the

Carpathians and in the Balkan mountains. The East Carpathians of Ukraine are the northernmost part of its range. This study assessed the current distribution and status of the species by surveying most of its Ukrainian localities. *R. myrtifolium* grows in subalpine and alpine belts of the mountains, reaching the uppermost position at 2020 m a.s.l. on Pietros Mt. and at 2030 m a.s.l. on Hoverla Mt. in the Chornokhora Mts. In the subalpine vegetation belt it forms the association *Rhododendretum myrtifolii* or enters other closely related communities, mostly from the *Rhododendro-Vaccinion* alliance. Isolated localities outside the Chornokhora range are few and endangered, especially in the case of overgrazing. One of them has disappeared and four others have not been found in the field in recent decades. The species is threatened by global warming, especially at the lowest localities.

Key words: *Rhododendretum myrtifolii,* plant conservation, plant geography, chorology, ecology, phytocoenology, threat, Ericaceae

Adam Boratyński, Polish Academy of Sciences, Institute of Dendrology, Parkowa 5, PL-62-035 Kórnik, Poland; e-mail: borata@man.poznan.pl
Marcin Piwczyński, Nicolaus Copernicus University, Institute of Biology, Gagarina 9, PL-87-100 Toruń, Poland
Yakiv P. Didukh, National Academy of Sciences of Ukraine, M. G. Kholodny Institute of Botany, Tereschenkivska 2, 01601 Kyiv, Ukraine; e-mail: didukh@botan.kiev.ua
Lidia Tasenkevich, State Museum of Natural History, Teatralna 18, 290008 Lviv, Ukraine; e-mail: tasen@mail.lviv.ua
Angel Romo, Consejo Superior de Investigaciones Científicas, Instituto Botánico, Av. dels Muntanyans s/n, Parc de Montjuďc, 08030 Barcelona, Spain; e-mail: a.romo@ibb.csic.es
Halina Ratyńska, Pedagogical University, Institute of Biology and Environmental Conservation, Chodkiewicza 30, PL-80-064 Bydgoszcz; e-mail: harat@ukw.edu.pl

Polish Botanical Studies 22: 63–70, 2006

THE EFFECT OF EXPERIMENTAL DISTURBANCES ON THE FLORISTIC COMPOSITION OF VEGETATION IN ABANDONED MEADOWS

LIDIA BORKOWSKA

Abstract. Changes in the species composition of vegetation as a result of experimental disturbances were studied in 1995–1998 on abandoned meadow in the Uroczysko Reski range in the Białowieża National Park. In the fourth year of the experiment, the changes in species composition were greater in the experimental than in the control plots. Four years after the introduction of disturbances, in the experimental plots the species richness was greater than before the experiment, except in the plot in the patch dominated by willow trees.

Key words: abandoned meadow, floristic composition, experimental disturbances, Białowieża National Park

Lidia Borkowska, Department of Botany, Institute of Biology, University of Podlasie, B. Prusa 12, PL-08-110 Siedlce, Poland; e-mail: lidiabor@ap.siedlce.pl

Polish Botanical Studies 22: 71–80, 2006

GENETIC STRUCTURE OF RARE *EPIPACTIS ATRORUBENS* POPULATIONS FROM TWO NATIONAL PARKS IN NORTHEAST POLAND

EMILIA BRZOSKO, IZABELA TAŁAŁAJ & ADA WRÓBLEWSKA

Abstract. Four *Epipactis atrorubens* (Hoffm.) Besser populations from Biebrza and Wigry National Parks were analyzed by starch gel electrophoresis to measure genetic and genotypic diversity. A total of 22 loci were analyzed, of which only two were polymorphic for the species. All populations had low levels of genetic variation (mean proportion of polymorphic loci, P = 9.09%; mean number of alleles per locus, A = 1.12; average observed heterozygosity, H_o = 0.037). However, a considerable overabundance of homozygotes within the Wigry populations was detected (F_{IS} = 0.081–0.415); in one Biebrza population only an excess of heterozygotes was observed (F_{IS} = –0.299). Genotypic diversity within *E. atrorubens* populations from the two regions was also relatively low. Only seventeen multilocus genotypes were identified among 441 samples taken from all populations. The proportion of distinguishable genotypes (0.12) and Simpson's diversity index (0.79) also indicated that the populations consisted of a few, more or less abundant genets. Genetic differentiation of populations between Biebrza and Wigry was high (F_{ST} = 0.265). Population substructuring (*ca* 1–6 km) was found at a small spatial scale among the Wigry populations, which were only moderately differentiated (F_{ST} = 0.071), suggesting either that there is substantial gene flow between populations or that they have not been isolated long enough for the effects of genetic drift to be detectable.

Key words: allozyme, anthropogenic disturbances, clonal diversity, genetic variation, orchid

Emilia Brzosko, University of Białystok, Institute of Biology, Department of Botany, Świerkowa 20B, 15-950 Białystok, Poland; e-mail: emilka@uwb.edu.pl

Polish Botanical Studies 22: 81–93, 2006

MACROFUNGI IN THE *CALTHO-ALNETUM* ASSOCIATION ON THE NORTHERN SLOPES OF THE BABIA GÓRA MASSIF (WEST CARPATHIANS)

ANNA BUJAKIEWICZ

Abstract. Mycocoenological studies of five permanent plots in phytocoenoses of the grey alder bog forest *Caltho-Alnetum* association in the Babia Góra National Park are reported. The ecological amplitude of several rare species of macrofungi (e.g., *Gyrodon lividus*, *Paxillus filamentosus*) is discussed, and some threatened species are noted (e.g., *Calyptella capula*, *Hydropus marginellus*, *Phaeomarasmius erinaceus*).

Key words: macrofungi, mycocoenology, grey alder bog forest, Babia Góra massif, Poland

Anna Bujakiewicz, Department of Plant Ecology and Environmental Protection, Adam Mickiewicz University, Al. Niepodległości 14, PL-61-713 Poznań, Poland; e-mail: ascom@amu.edu.pl

Polish Botanical Studies 22: 95–122, 2006

FOREST REGENERATION PATTERNS IN NEW ZEALAND'S TURBULENT ENVIRONMENTS

COLIN J. BURROWS

Abstract. New Zealand's remaining areas of indigenous evergreen forests are disturbed at intervals by major windstorms, river flooding, earthquakes, landslides, volcanic eruptions and other destructive events such as tornadoes or snowstorms. Forest damage is further exacerbated by attacks by native invertebrates, fungal pathogens and introduced mammal browsers, as well as by human activities including logging and burning. This article describes post-disturbance regeneration in forests where tall angiosperm trees (*Nothofagus* spp., *Beilschmiedia tawa, Metrosideros robusta, M. umbellata, M. excelsa, Weinmannia racemosa*) and gymnosperm trees (*Agathis australis, Dacrycarpus dacrydioides, Podocarpus totara, Prumnopitys taxifolia*) are prominent. Many other species are mentioned. Among those particularly important in forest regeneration are small angiosperm trees (e.g., *Aristotelia serrata, Griselinia littoralis, Pittosporum tenuifolium)*; shrubs such as *Leptospermum scoparium and Coriaria arborea*; the tall shrub or tree *Kunzea ericoides*; the tree fern *Dicksonia squarrosa* and the ground fern *Pteridium esculentum*. Many indigenous New Zealand trees, shrubs and ferns have properties that fit them for rapid colonisation of disturbed areas. These include effective dispersal of seeds (or spores); quick seed germination which gives rise to dense populations of juveniles that preempt sites; fast growth to adulthood of many colonists; and the ability to resprout from damaged stems. Some of the longest-lived species that form high forest are among the relatively early colonisers; juveniles are unable to establish beneath the intact parental canopy of some of these. Other species that behave as colonists are also able to persist in canopy or understorey roles in mature forest, through relative shade tolerance, or by regenerating in treefall gaps. Frequent disturbance appears to have been an important selective force for the forest flora. This paper ends by outlining the rationale for replacing the too-rigid 'succession to climax' paradigm of vegetation dynamics with the more flexible 'kinetic' conceptual framework. The latter is recommended for investigating and describing situations such as those evident in New Zealand's turbulent environments.

Key words: indigenous, evergreen, forest dynamics, frequent disturbance, direct replacement, succession, cyclic replacement, fluctuation, no stable endpoint, individualistic properties, 'kinetic' model

Colin J. Burrows, School of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch, New Zealand

Polish Botanical Studies 22: 123–135, 2006

STRUCTURAL AND DYNAMIC VARIABLES IN REGENERATING AND PRIMARY PHYTOCOENOSES OF THE *TILIO-CARPINETUM* COMMUNITY IN BIAŁOWIEŻA NATIONAL PARK

ROBERTO CANULLO & GIANDIEGO CAMPETELLA

Abstract. Old-growth and adjacent regenerating oak-hornbeam forests (*Tilio-Carpinetum* community) were compared in the Białowieża National Park (Poland) to investigate their relative dynamic states and to contribute to further definitions of complex dynamic indices employing derived coenological variables. Two parallel 800 × 20 m transects crossing three clear-cut parallel belts (forest felling in 1910) alternating with primary forest were used to analyze the composition, structure and diversity of tree stands in 1986 and 2003; diversity assessments included the Shannon index and Fisher's *alpha*. The fine-scale spatial pattern of understory vegetation was sampled on four independent transects (150 m); JNP models based on entropy were analyzed on a series of increasing sampling units to depict the scale effect on derived variables. The two stands differed only slightly: the primary stand represents a terminal state, with *Betula* and *Populus* pioneer species as the unique variant in the canopy; the other stand, after 93 years, is marked by an underlying advanced regeneration phase. Structural and diversity analyses of tree and ground layers still revealed significant differences. The fine-scale spatial variability of the understory showed divergent multispecific patterns corresponding to dynamic states. In the complex understory mosaic, the number of species combinations had higher values on regenerating stands, as wider and homogeneous patches allowed a more independent spatial distribution of species than did the old-growth stands. The derived variables florula diversity and associatum proved to be relevant and sensitive coenological descriptors and, expressing the complex interaction between biological and ecological processes, can be used to approximate a comprehensive dynamic index for the vegetation.

Key words: clear-cut forest, diversity, Fisher's *alpha*, JNP models, spatiotemporal changes, understory, florula diversity, local distinctiveness, associatum, dynamic index

Roberto Canullo & Giandiego Campetella, Department of Botany and Ecology, University of Camerino, Via Pontoni, 5, I-62032 Camerino, Italy; e-mail: roberto.canullo@unicam.it, diego.campetella@unicam.it

Polish Botanical Studies 22: 137–148, 2006

THE '*THYMO-FESTUCETUM OVINAE*' COMPLEX AND SIMILAR SUBTHERMOPHILOUS COMMUNITIES IN THE CZECH REPUBLIC

TOMÁŠ ČERNÝ & ZDENKA NEUHÄUSLOVÁ

Abstract. Subthermophilous communities of the alliance *Violion caninae* studied in the Czech Republic (*Diantho deltoidis-Galietum veri* Toman 1977, *Thymo-Festucetum ovinae* auct. bohem., *Campanulo rotundifoliae-Dianthetum deltoidis* Balátová-Tuláčková 1980) and the submontane *Hyperico maculati-Deschampsietum flexuosae* Balátová-Tuláčková 1985 have been revised. Two associations floristically similar to these units, *Polygalo vulgaris-Nardetum strictae* Oberdorfer 1957 from the same alliance and *Jasiono montanae-Festucetum ovinae* Klika 1941 from the alliance *Hyperico perforati-Scleranthion perennis* Moravec 1967, were added for comparison. *Campanulo-Dianthetum* ass. was included as a variant of the association *Diantho-Galietum.* The position of *Jasiono-Festucetum* within *Hyperico perforati-Scleranthion perennis* all. is somewhat ambiguous, since there is an obvious transition to xerothermic grasslands of the class *Festuco-Brometea* (i.e., *Koelerio-Phleion* all.). *Hyperico-Deschampsietum* without its own diagnostic species is redefined to be only a basal, species-poor unit of the alliance *Violion caninae,* yet well distinguished within the material studied. It could be identified with the original description of *Thymo-Festucetum*. Therefore, both of these units should be excluded from the association level. The majority of relevés correspond to *Diantho-Galietum*. This unit is well distinguished in the material studied.

Key words: *Violion caninae*, *Diantho deltoidis-Galietum veri*, *Campanulo rotundifoliae-Dianthetum deltoidis*, *Hyperico maculati-Deschampsietum flexuosae*, *Thymo-Festucetum ovinae*, *Polygalo-Nardetum*, *Jasiono montanae-Festucetum ovinae*, subacidophilous grasslands, phytosociology

Tomáš Černý & Zdenka Neuhäuslová, Department of Geobotany, Institute of Botany, Academy of Sciences of the Czech Republic, CZ-252 43 Průhonice, Czech Republic; e-mail: cerny@ibot.cas.cz; neuhauslova@ibot.cas.cz

Polish Botanical Studies 22: 149–154, 2006

THE TROGLOPHILE FUNGUS *PHYSISPORINUS VITREUS* ON A MINE WALL AT ZŁOTY STOK, POLAND

ANDRZEJ CHLEBICKI & MAREK W. LORENC

Abstract. The troglophile fungus *Physisporinus vitreus* (Pers.: Fr.) P. Karst. and coexisting microarthropods live in the medieval Prince's Adit of the gold and arsenic mine at Złoty Stok, Poland. The occurrence of a lignicolous fungus on a rock wall in a hypogean environment has been very rarely reported. The adaptation of the fungus sporophores to hypogean environmental conditions is discussed.

Key words: *Physisporinus vitreus,* polypore, morphological variation, adaptation, hypogean environment, arsenic mine, Sudetes

Andrzej Chlebicki, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland; e-mail: chlebick@ib-pan.krakow.pl
Marek W. Lorenc, Institute of Building and Landscape Architecture, Agricultural University of Wrocław, Plac Grunwaldzki 24, PL-50-363 Wrocław, Poland; e-mail: mwlorenc@ozi.ar.wroc.pl

Polish Botanical Studies 22: 155–164, 2006

THE STATUS OF INDIVIDUALS WITHIN A CHANGING PLANT POPULATION AND COMMUNITY: THE EXAMPLE OF *SENECIO RIVULARIS* (ASTERACEAE)

BOŻENNA CZARNECKA

Abstract. A population of *Senecio rivularis* (Waldst. & Kit.) DC. in the Roztocze National Park (SE Poland) was studied in 1987–2002 for the following purposes: (1) to estimate the absolute age of individuals in different parts of the population, their fecundity, and contribution to the reproduction of the whole population; (2) to assess the stability or variability of the size and stage structures over time; and (3) to find out whether simple measures such as means, variance, skewness and kurtosis can be used to characterize the dynamics of the plant size distribution. The absolute age and fecundity of individuals were higher at the population margins, suggesting that those plants make a greater contribution to the total reproduction of the population, and thus are responsible for genet abundance and population dynamics. Over the study period, a significant decrease of juvenile genets was observed in the whole population, accompanied by changes in the fraction of generative plants. Changes in the share of juvenile and flowering ramets varied between parts of the population area. This means that the studied population may be divided into small-scale patches with their own dynamics. Size structure, characterized by such parameters of flowering plants as stem height, leaf rosette dimensions and number of heads per umbel, was determined to be a very dynamic property. All the differences between years were statistically significant, but a temporal trend of changes was observed only for rosettes.

Key words: life cycle, individual fecundity, stage structure, size structure, long-term observation
Bożenna Czarnecka, Department of Ecology, Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland; e-mail: boczar@biotop.umcs.lublin.pl

Polish Botanical Studies 22: 165–172, 2006

LONG-TERM DYNAMICS IN THE HERB LAYER OF A CALCAREOUS BEECH FOREST: INVESTIGATIONS OF PERMANENT PLOTS, 1981–2001

HARTMUT DIERSCHKE

Abstract. In a calcareous beech forest near Göttingen (Germany), a transect consisting of 281 quadrats 10 × 10 m in size was laid out in a large fenced-in area in 1981. Detailed sampling of all quadrats, including percentage cover estimates of all species, was carried out in 1981, 1991 and 2001. The herb layer exhibits dominance structures of individual species, primarily *Allium ursinum*, *Mercurialis perennis* and *Anemone nemorosa*. The distribution of several dominance types was mapped in each of the three sampling years. A comparison of vegetation maps and the quantitative distribution patterns of selected species shows strong restructuring of the herb layer over time, in particular a massive increase of *Allium ursinum* and a strong decline of *Mercurialis perennis*. In recent years there has also been a strong increase of *Hedera helix*. The overall floristic balance shows a clear species turnover, with negative trends of biodiversity. Various causes for the vegetation dynamics of the 20-year period are discussed. As a whole, the causes appear to be rooted in a complex of internal and external factors that cannot easily be interpreted.

Key words: calcareous beech forest, plant diversity, vegetation dynamics, permanent plots, microsuccession, vegetation map, Göttingen Forest
Hartmut Dierschke, Albrecht-von-Haller-Institut für Pflanzenwissenschaften, Abteilung für Vegetationsanalyse und Phytodiversität, Georg-August-Universität Göttingen, Untere Karspüle 2, D–37073 Göttingen, Germany; e-mail: hdiersc@gwdg.de

Polish Botanical Studies 22: 173–183, 2006

PLANT COVER AND PROPERTIES OF UPPER SOIL HORIZONS IN ROAD/FOREST ECOTONES IN GÓRZNO-LIDZBARK LANDSCAPE PARK

HELENA DZIADOWIEC, IWONA PASZEK & RADOSŁAW CEREFICKI

Abstract. The influence of forest roads on plant cover and soil properties was studied in Górzno-Lidzbark Landscape Park in three road/forest ecotones incorporating three different forms of fertile oak-linden-hornbeam forest, *Tilio-Carpinetum*. The ecotones were divided into physiognomically uniform study plots. For each plot, inventories of vascular plants, bryophytes and lichen species were made and the cover of every species was estimated on a scale of 1 to 5. Vegetation maps were also made. Soil layers and horizons were studied along transects running perpendicular to the road. Moisture, bulk density, texture, pH, total content of carbon and nitrogen, $CaCO_3$ content, and the content of phosphorus soluble in citric acid were measured. At all study sites the highest number of species and the highest values of the floristic diversity index (Shannon diversity index) were noted on roadsides. The vegetation of the road/forest ecotones occurred mostly in a zonal distribution, but on roadsides the pattern of distribution was mosaic. The type of roadside flora and vegetation depended on the roadside's width and degree of insolation, and on soil properties, especially pH and nutrient content. Irrespective of the type of road surface, the forest roads strongly influenced soil properties within 6–7 m from the road. Organic, humic and often sideric horizons characteristic of forest cambic arenosols were destroyed. In their stead were layers consisting of material excavated from deeper down, and road construction material (gravel, stones, slag, asphalt fragments). They changed the texture (adding to the stone and gravel fraction) and the properties of the original soil. Phosphorus content and pH were distinctly higher as well. Such changes were significantly correlated with distance from the road.

Key words: ecotone, roadside, vegetation, floristic richness, Shannon diversity index, cambic arenosols, soil morphology, soil properties

Helena Dziadowiec & Radosław Cereficki, Soil Science Department, Faculty of Biology and Earth Sciences, Nicolaus Copernicus University, Sienkiewicza 30, PL-87-100 Toruń, Poland; e-mail: dziadow@biol.uni.torun.pl
Iwona Paszek, Department of Biology and Pharmaceutical Botany, Collegium Medicum, Nicolaus Copernicus University, Marii Skłodowskiej-Curie 9, PL-85-094 Bydgoszcz, Poland; e-mail: ipaszek@cm.umk.pl

Polish Botanical Studies 22: 185–194, 2006

LONG-TERM DYNAMICS OF HERB POPULATIONS IN SWEDISH DECIDUOUS FORESTS: SOME GENERALIZATIONS

OVE ERIKSSON* & JOHAN EHRLÉN

Abstract. We review results from studies carried out in deciduous forests near the Baltic coast in southeastern Sweden, in order to draw inferences about the factors that influence the local and regional dynamics of forest herbs, in particular *Actaea spicata* and *Lathyrus vernus*. Demographic studies suggest that many species have long life spans and stable population dynamics. Stable population dynamics are achieved through a capacity to buffer environmental variation by distributing the effects among growth seasons. Among large plants, the life cycle transitions contributing most to the population growth rate are the least affected

by environmental variation. Seed production contributes little to the growth rate of local populations but is still important as the basis for long distance dispersal and colonization of new sites. Seed sowing experiments followed for up to 17 years demonstrate that the distribution of many herbs is limited by the ability to reach suitable but unoccupied habitats. Seed production is affected by pollinators and pre-dispersal seed predators, and the effects vary considerably over time and space. Molluscan, vertebrate and insect herbivores have large effects on the growth and survival of plants, and may substantially decrease the population growth of some plant species. Seed size is important to both local and regional dynamics. Our overall conclusion is that many forest herbs exhibit slow population dynamics, with low extinction rates and little ability to colonize suitable but empty habitats. Fragmentation and habitat deterioration are therefore likely to pose serious threats to these species.

Key words: elasticity, herbivory, plant demography, regional dynamics, seed limitation, seed predation

Ove Eriksson & Johan Ehrlén, Department of Botany, Stockholm University, SE-106 91 Stockholm, Sweden; e-mail: ove.eriksson@botan.su.se

Polish Botanical Studies 22: 195–206, 2006

ECOCOENOTIC DISTINCTIVENESS OF AN EXTRAZONAL ICE HOLE BIOTOPE IN THE VALLEY OF CEMBRA (SOUTHERN CENTRAL ALPS, TRENTINO)

DAN GAFTA

Abstract. Certain coarse screes lying on lower slopes cause strong air cooling through their cavities. These microthermal habitats, called ice holes, usually shelter extrazonal vegetation adapted to higher-elevation conditions. To estimate the ecocoenotic distinctiveness of the Lases ice holes (*ca* 760 m a.s.l., in the Cembra Valley), hygrothermal, soil and vegetation data were compared between these ice holes and plots from the neighboring zonal biotope (control) with identical topography and geomorphology. Mean temperatures were significantly lower over the ice holes than in the control during summer 1994. The largest thermal differences were observed when solar radiation was low or absent (e.g., cloudy days, night). In the same period, mean relative humidity did not differ significantly between the two contrasting habitats. Whereas orthidystric cambisols are the most common in control-like zonal biotopes, the entic podzol at the ice holes normally occurs in the upper montane belt. The sprucewood of ice holes (*Homogyno-Piceetum*) strongly contrasts with the mixed oak forests of the neighboring zonal biotopes (*Luzulo niveae-Quercetum petraeae*). Based on the mean minimum temperatures in July 1994, the elevation at which the spruce stands of ice holes would develop zonally was estimated at *ca* 1424 m. A better estimate probably could be obtained if winter temperatures were also used. The extrazonal sprucewood of ice holes might represent former potential vegetation (post-climax), as the loss of some microthermic species (*Cryptogramma crispa* and *Erigeron alpinus*) seems to indicate topoclimate warming.

Key words: air temperature, extrazonal vegetation, ice holes, microthermic species, relative humidity, protected biotope, soil unit, southern central Alps, topoclimate, spruce forest

Dan Gafta, Department of Taxonomy and Ecology, Babeş-Bolyai University, Republic Street 42, 400015 Cluj-Napoca, Romania; e-mail: dgafta@grbot.ubbcluj.ro

Polish Botanical Studies 22: 207–210, 2006

NORTH AMERICAN NATIVE TREE SPECIES DIVERSITY

MIROSLAV M. GRANDTNER

Abstract. The diversity of tree species native to North America has not yet been reported. Here we describe the diversity, distribution and threat status of living trees. The native tree flora comprises 6918 species, 324 subspecies and 488 varieties. They belong to 1048 genera and 151 families. Of the 7730 subgeneric taxa, 1412 are endemics and 152 are in danger of extinction. The highest species diversity (6915, or 80%) of all subgeneric taxa was found in the southeastern zone. More than 94% of endemics and 65% of the endangered taxa also occur in this zone. The data provided here describe an initial baseline for studying and monitoring the conservation and sustainable use of tree species diversity in a world affected by CO_2-induced warming.

Key words: biodiversity, species diversity, native trees, North America

Miroslav M. Grandtner, Wood and Forest Sciences Department, Faculty of Forestry and Geomatics, Laval University, Quebec, Canada G1K 7P4; e-mail: miroslav.grandtner@sbf.ulaval.ca

Polish Botanical Studies 22: 211–229, 2006

CHANGES IN THE VEGETATION OF DISUSED WET MEADOWS IN SUBGLACIAL CHANNELS OF THE KASHUBIAN LAKELAND (NORTHERN POLAND)

JACEK HERBICH & MARIA HERBICHOWA

Abstract. In a representative area of the Kashubian Lakeland (Northern Poland), changes in vegetation resulting from the cessation of use of wet meadows were determined. The study area, at the bottom of a subglacial channel, comprises a complex of terrestrialized, spring and percolating mires. The original material consisted of maps of actual vegetation prepared on the basis of aerial photographs from 1991 and 2004 and phytosociological and floristic studies in 1984, 1994 and 2004. The chronology of cessation of use of the wet meadows was determined from archival aerial photographs from 1964–1981 and the authors' mapping of

vegetation in 1991–2004. It was found that the vegetation underwent significant quantitative and qualitative changes: generally, the gradual disappearance of fen communities (mainly *Menyantho-Sphagnetum* and *Caricetum rostratae*) caused by invasion of *Phragmites australis, Carex acutiformis* and *Alnus glutinosa*. The expansion of *Phragmites australis* and *Phalaris arundinacea* also resulted in the disappearance of sedge communities, chiefly *Caricetum acutiformis, C. caespitosae* and *C. paniculatae*, which were formed shortly after mowing stopped.

Key words: Kashubian Lakeland, northern Poland, wet meadows, succession, cessation of mowing, mires

Jacek Herbich & Maria Herbichowa, Laboratory of Geobotany and Nature Conservation, Department of Plant Taxonomy and Nature Conservation, University of Gdańsk, Legionów 9, PL-80-441 Gdańsk, Poland; e-mail: biojh@univ.gda.pl

Polish Botanical Studies 22: 231–240, 2006

CHANGES IN COARSE WOODY DEBRIS OF A WEST CARPATHIAN SUBALPINE SPRUCE FOREST OVER TEN YEARS

JAN HOLEKSA, ALICJA BARĆ, ANNA HYLA & BARBARA KRAWCZYK

Abstract. Changes in the amount and structure of coarse woody debris (CWD) from 1993 to 2003 as well as the characteristics and spatial distribution of trees that died during two periods (1986–1993, 1996–2003) were studied in a large tract (14.4 ha) of West Carpathian subalpine spruce forest. All dead trees, both snags and logs, were measured and mapped in 1993 and 2003. The amount of CWD increased by 11% in respect of number of dead trees (from 201 to 224 trees ha^{-1}) and by 29% in respect of volume (from 133 to 172 $m^3 ha^{-1}$) during 10 years. Thus the input of snags and logs was not balanced by the recent disappearance of old ones. The rate of tree decay expressed as number of trees dropped in recent decades from 4.2 trees ha^{-1} $year^{-1}$ before 1993 to 3.1 trees ha^{-1} $year^{-1}$ after 1993. The size of dying trees increased considerably, however, and the rate of tree decay expressed as volume increased from 3.7 $m^3 ha^{-1}$ $year^{-1}$ before 1993 to 5.1 $m^3 ha^{-1}$ $year^{-1}$ after 1993. In both periods, most trees died standing and the fewest were uprooted. Before 1993, thinning intensity was highest among thin trees and lowest among trees of average dimensions. After 1993, thinning intensity was similar for all diameter classes. Spruces that died both before and after 1993 were distributed in clumps, but the spatial relations between trees that died standing and were broken or uprooted changed. Snags and logs of trees that died in 1986–1993 were randomly mixed, whereas those appearing after 1993 were strongly associated spatially. The shift in the mortality pattern reflects a shift in causal factors of tree death: from competition for light to wind and insect pests. These changes accompanied a gradual decrease in stand density.

Key words: coarse woody debris, spatial pattern, subalpine spruce forest, West Carpathians

Jan Holeksa & Barbara Krawczyk, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland; e-mail: holeksa@ib-pan.krakow.pl
Alicja Barć & Anna Hyla, Department of Geobotany and Nature Conservation, Silesian University, Jagiellońska 28, PL-40-032 Katowice, Poland.

Polish Botanical Studies 22: 241–249, 2006

SCIRPUS OLNEYI (CYPERACEAE) SHOWS PHENOTYPICAL DIFFERENTIATION IN A SALT MARSH ON THE EAST COAST OF THE U.S.A.

MAKIHIKO IKEGAMI, DENNIS F. WHIGHAM & MARINUS J. A. WERGER

Abstract. The clonal plant *Scirpus olneyi* A. Gray, which grows in salt marshes, shows different growth forms. This species has two types of ramets: a ramet with a long rhizome and a ramet without or with a very short rhizome. In different communities this species shows different ramet architectures in combinations of the two types of ramets. To describe ramet architecture, growth forms, life history strategies and the features of different environmental communities, we conducted a field survey in a salt marsh at the Smithsonian Environmental Research Center (SERC) on the western shore of the Chesapeake Bay in the United States. We recognized six different types of communities present in different environments and found that *S. olneyi* showed various growth forms and propagation patterns among these communities. Plants produced short spacer ramets in patches where plants achieved high biomass and seed production, and long spacer ramets in patches where plants achieved low biomass and seed production. This result suggests that this plant can retain favorable patches with shorter spacer ramets, and can escape from unfavorable patches with longer spacer ramets.

Key words: clonal plant, ramet architecture, *Scirpus olneyi,* morphological variability

Makihiko Ikegami, Department of Plant Ecology, Utrecht University, P.O. Box 80084 3508 TB Utrecht, The Netherlands, and SERC P.O. Box 28 647 Contees Wharf Road, Edgewater, Maryland, U.S.A. 21037*
Dennis F. Whigham, SERC P.O. Box 28 647 Contees Wharf Road, Edgewater, Maryland, USA 21037 and Department of Landscape Ecology, Utrecht University, P.O. Box 80084 3508 TB Utrecht, Netherlands
Marinus J. A. Werger, Department of Plant Ecology, Utrecht University, P.O. Box 80084 3508 TB Utrecht, Netherlands

Polish Botanical Studies 22: 251–260, 2006

METHODOLOGICAL PROPOSALS FOR STUDIES ON THE STRUCTURE AND DYNAMICS OF URBAN FLORA

BOGDAN JACKOWIAK

Abstract. The paper presents suggestions for a comprehensive methodological procedure for geobotanical/ecological studies on the structure and dynamics of modern flora, based on the author's experience during long-term studies carried out in a large Central European city. A nonstandard methodological perspective on the concept of local flora is put forward, and terms such as 'elementary structure of flora,' 'dynamics of flora' and 'spatial structure of flora' are defined. The work concentrates on three methods of classifying species that are the basis for estimating the influence of culture on the local variation and dynamics of flora.

Key words: biogeography, urban ecology, methodology, anthropopression, synanthropization, hemeroby, vascular flora

Bogdan Jackowiak, Department of Plant Taxonomy, Adam Mickiewicz University, Umultowska 89, PL-61-614 Poznań, Poland; e-mail: bogjack@amu.edu.pl

Polish Botanical Studies 22: 261–271, 2006

SEASONAL DIVERSITY, LIGHT REQUIREMENTS AND SEED MASS OF SPECIES IN THE PERSISTENT SOIL SEED BANK OF A SHADED DECIDUOUS FOREST

MAŁGORZATA JANKOWSKA-BŁASZCZUK

Abstract. The persistent soil seed bank was studied in a shaded natural deciduous forest in patches with a sparse herb layer, in two periods: after closure of the tree canopy in a fully shaded patch of forest but before the arrival of a new portion of seeds from seed rain; and in early spring before development of leaves. The aim of the work was to reveal seasonal changes of the seed bank in terms of its density, similarity to the herb layer, and the shares of species with different light requirements and seed mass. In both periods, the seed bank did not reflect the species composition of the herb layer, although the coefficient of similarity taken before development of leaves was much higher. In both periods the seed bank was relatively small (density: 888.2/m^2 and 1394.1/m^2) and was dominated by perennials. The main difference in species structure was the high participation of shrubs and trees in early spring. In terms of number of species and seedlings with different light requirements, the seed bank can be represented by a bimodal curve, with a similar share of species with moderate (light index 4) and high light requirements (light index 7). The share of light-demanding species was much higher in the seed bank than in the herb layer. The seed banks in both periods consisted mainly of small seeds weighing 0.1–1 mg. In early spring the seed bank had a distinctly higher percentage of species with larger seeds (seed mass 1–3 and > 3 mg).

Key words: soil seed bank, deciduous forest, herb layer, seed mass, light requirement

Małgorzata Jankowska-Błaszczuk, Department of Botany, Świętokrzyska Academy, Świętokrzyska 14, PL-25-406 Kielce, Poland; e-mail: mjanko@pu.kielce.pl

Polish Botanical Studies 22: 273–282, 2006

TEN YEARS OF REGENERATION DYNAMICS IN AN UNEXPLOITED LIME-HORNBEAM FOREST IN THE BIAŁOWIEŻA NATIONAL PARK (POLAND): AN ASSESSMENT OF THE VARIABILITY OF THE FOREST MOSAIC

HENK G. J. M. KOOP & RIENK-JAN BIJLSMA

Abstract. Changes in tree species composition and the forest mosaic over the 1982–1992 period are described for a one-hectare plot in an unexploited lime-hornbeam forest in the Białowieża National Park (Poland). For trees > 10 m the total numbers declined slightly, basal and crown projection area remained stable, and crown volume increased, resulting in a denser canopy. *Picea abies* had the highest annual mortality rate (3%), *Carpinus betulus* the lowest (0.2%). For trees with height ≤ 10 m, *Carpinus* had the lowest mortality rate and showed the highest increase in both crown projection area (133%) and crown volume (215%). Regeneration occurred irrespective of crown cover. The percentage of the area occupied by tree phases, based on the height of the upper canopy layer (1: ≤ 10 m; 2: 10–20 m; 3: 20–30 m; 4: > 30 m) remained rather stable. The gap phase slightly increased. Phase 4 expanded most, at the cost of intermediate height phases 2 and 3, and had the highest probability (0.75) of remaining stable. The highest probability of a transition was for phase 3 to become phase 4 (0.34), reflecting the growth of the highest canopy layer. Developmental phases overlapped considerably. Pair-wise overlap (1 + 2, 1 + 3, etc.) amounted to 15–20% for all pairs of phases. Double (1 + 2 + 3, etc.) and triple overlaps added *ca* 15% for phase 1 with the other phases. Phase 1 was not confined to former gaps but showed a net pattern (regeneration network) earlier recognized by Koop (1989). Between 1982 and 1992 this pattern became more pronounced. It was concluded that tree regeneration outside gaps is an important and probably general phenomenon in old-growth forests, and that differential regeneration beneath declining or otherwise heterogeneous canopies may produce spatial patterns and vertical structures not easily explained by gap dynamics. An important consequence is that studies on the dynamics of forest mosaics must deal explicitly with overlapping developmental phases.

Keywords: forest structure, permanent plot, phase transitions, tree decline, species shifts

Henk G. J. M. Koop, Dwerggras 12, 3902 AX Veenendaal, Netherlands; e-mail: koop-ecobus@wanadoo.nl
Rienk-Jan Bijlsma, Alterra, Centre for Ecosystem Studies, P.O. Box 47, 6700 AA Wageningen, Netherlands; e-mail: rienkjan.bijlsma@wur.nl

Polish Botanical Studies 22: 283–309, 2006

SNOWBED COMMUNITIES AND THEIR RELATIVES IN THE HIGH MOUNTAINS OF THE GREATER CAUCASUS

KONSTANTIN KOROTKOV

Abstract. The paper presents the syntaxonomy of alpine carpet-like meadows or mats – communities with the prevalence of perennial low herbs – along the Greater Caucasus. The syntaxonomic diversity of Caucasian alpine meadows is comprised of five associations and at least five variants. Two associations (*Carici pyrenaicae-Colpodietum pontici*, *Taraxaco confusi-Geranietum gymnocauli*) are confined to the Western Caucasus, one (*Carici atratae-Anthoxanthetum odorati*) to the Central Caucasus, and two (*Taraxaco crepidiformis-Colpodietum variegati*, with three variants; *Minuartio imbricatae-Agrostietum lazicae)* are met in the Eastern Caucasus. The creation of a novel Caucasian alliance, *Colpodion variegati*, uniting all these associations, is proposed. The affiliation of the new alliance to the European class *Salicetea herbaceae* and the order *Salicetalia herbaceae* is postulated.

Key words: syntaxonomy, alpine belt, the Caucasus, regional variation

Konstantin Korotkov, Institute of Ecology and Evolution, Russian Academy of Sciences, Lenin Avenue 33, 119071 Moscow, Russia; e-mail: korotkov@polisma.ru

Polish Botanical Studies 22: 311–316, 2006

SEASONAL RHYTHMICITY OF *IRIS SIBIRICA* (IRIDACEAE) POPULATION IN THE KOSTRZE DISTRICT OF KRAKÓW (S POLAND)

KINGA KOSTRAKIEWICZ

Abstract. The phenology of a Siberian iris population growing in a *Molinietum caeruleae* meadow in the Kostrze district of Kraków (Bielańsko-Tyniecki Landscape Park) was investigated in 2000–2002. Climatic conditions varied between years in this period. Temperatures were high and precipitation was reduced in 2000. Temperatures were lower in 2001, especially in the first part of the year, and precipitation was high. Temperatures were very high in 2002, particularly in the first part of the year, and precipitation was lowest. To describe phenology, the Growing Degree Days (GDD) method was used to model the population in different climatic conditions. These studies showed that heat accumulation in 2000 began in February and ended in December when GDD measured 3080, and all phases started at the earliest point. Heat accumulation in 2001 started in March, GDD in December reached 2791, and all events were delayed, most of them prolonged. Heat accumulation in 2002 began in January, GDD reached 3197 in December, and all phases started early and were shortened. It was found that high temperature accelerated and low temperature delayed the phenophases; low temperature accompanied by heavy rainfall prolonged them. A model of the seasonal rhythmicity of *Iris sibirica* was created on the basis of the observations.

Key words: *Iris sibirica, Molinietum caeruleae,* Kraków, Bielańsko-Tyniecki Landscape Park, clone, ramet, phenology, Growing Degree Days (GDD), precipitation, temperature

Kinga Kostrakiewicz, Department of Plant Ecology, Institute of Botany, Jagiellonian University, Kopernika 27, PL-31-512 Kraków, Poland; e-mail: kostrakiewicz@ib.uj.edu.pl

Polish Botanical Studies 22: 317–331, 2006

TULIPA SYLVESTRIS (LILIACEAE) IN NORTHWESTERN GERMANY: A NON-INDIGENOUS SPECIES AS AN INDICATOR OF PREVIOUS HORTICULTURE

INGO KOWARIK & JOHN OLIVER WOHLGEMUTH

Abstract. Invasions by non-native plants are generally perceived as harmful, having negative ecological or economic impacts. Such impacts usually are caused by only a minority of introduced species which have begun to spread. The majority of both introduced and spreading species do not cause detrimental effects. Using the wild tulip (*Tulipa sylvestris*) as an example, this paper illustrates a positive side of biological invasions: the significance of some spreading species for cultural history. In Central Europe, *T. sylvestris* has been used as an ornamental since the end of the 16th century. The current distribution of wild living populations was analyzed for Lower Saxony, Germany. It still matches the underlying cultural pattern of previous plantations. About 50% of the total 184 populations and 72% of the populations with more than 10,000 individuals are confined to former sites of cultivation (e.g., historic parks from the Baroque and the later period of landscape garden design, churchyards). Here, *T. sylvestris* functions as an indicator of previous horticulture. Some populations have survived as a cultural relic for at least 250 years. A considerable number of populations (20%) are found in grassland and near-natural vegetation. Some could be identified as vestiges of old gardens. Others result from long-distance dispersal by water. Historic gardens located in the floodplain of the Aller River act as major dispersal foci. A floating trial revealed that bulbs can survive at least 11 days in water.

Key words: *Tulipa sylvestris,* alien species, dispersal, plant invasion, horticulture, hydrochory, ornamental, nature conservation, Germany, Central Europe

Ingo Kowarik & John Oliver Wohlgemuth, Institute of Ecology, Technische Universität Berlin, Rothenburgstr. 12, D-12165 Berlin, Germany; e-mail: kowarik@tu-berlin.de

Polish Botanical Studies 22: 333–341, 2006

DETAILED MAPPING OF HIGH-MOUNTAIN VEGETATION IN THE TATRA MTS

ANNA KOZŁOWSKA

Abstract. The paper deals with methods of mapping the structure of high-mountain vegetation and the informational value of mountain vegetation maps, using the example of a selected fragment of the Tatra Mts above the upper timberline (1500 m a.s.l.). A mapping method developed in field work is presented. Natural and anthropogenic factors that cause differentiation of the high-mountain vegetation are considered, and the structure and content of vegetation patches on the map are discussed. Patch structure can be homogeneous or complex; the complexes can be characterized by domination, zonation or mosaicism. Patch content can be homogeneous or complex. Complexity can be considered in terms of typology, dynamics, ecology or topography. The legend units are defined in terms of the analyzed properties of vegetation patches. The informational value of the map is explained.

Key words: vegetation patches, vegetation structure, legend units

Anna Kozłowska, Institute of Geography and Spatial Organization, Polish Academy of Sciences, Twarda 51/55, PL-00-818 Warszawa, Poland; e-mail: a.kozl@twarda.pan.pl

Polish Botanical Studies 22: 343–346, 2006

PRODUCTION AND STRUCTURE OF UNISEXUAL AND BISEXUAL INFLORESCENCES IN POPULATIONS OF *CAREX SECALINA* (CYPERACEAE)

MARLENA LEMBICZ*, AGNIESZKA BOGDANOWICZ & WALDEMAR ŻUKOWSKI

Abstract. In the sedge *Carex secalina* Willd. *ex* Wahlenb. we found that the sex of spikes ranges from monozonal unisexual through bizonal bisexual (androgynous and gynaecandrous) to trizonal bisexual. Bisexual spikes have not been reported for *Carex* sect. *Secalinae* previously. In three populations the studied individuals had generative shoots with bisexual spikes, but most of the shoots with trizonal bisexual spikes were recorded in a population originated from a man-made habitat. We suggest that multizonal spikes, not bizonal ones, are the starting point for all spike forms observed today; evolution to other forms would proceed through simple reduction of particular zones of a complex inflorescence.

Key words: *Carex secalina*, Cyperaceae, sex of spikes, fertility, life history, evolution of spikes

Marlena Lembicz, Agnieszka Bogdanowicz & Waldemar Żukowski, Department of Plant Taxonomy, A. Mickiewicz University, Umultowska 89, PL-61-614 Poznań, Poland; e-mail: lembicz@amu.edu.pl

Polish Botanical Studies 22: 347–354, 2006

USING A SEED MIX TO ESTABLISH NATIVE HAY MEADOW SPECIES IN ORNAMENTAL MEADOWS

ŁUKASZ ŁUCZAJ

Abstract. Species-rich meadows, although still common, are declining in Poland. For aesthetic and practical reasons it is becoming popular to plant similar 'wildflower meadows' in gardens. The performance of a seed mixture containing 18 flower species in the creation of new meadows was studied. Twenty-four newly created meadows were surveyed from 5 months to 2 years after sowing. *Leucanthemum vulgare* usually became dominant. Other successful species were *Achillea millefolium, Trifolium repens, T. pratense, Daucus carota, Lychnis flos-cuculi, Knautia arvensis, Lotus corniculatus, Centaurea phrygia, C. jacea, Tragopogon pratensis* and *Rumex acetosa*. The species that usually failed to establish were *Ranunculus acris, R. repens, Sanguisorba officinalis, Leontodon hispidus* and *Luzula campestris*. One of the meadows was divided into a grid of 2 × 2.5 m subplots and studied. Two site preparation methods were used: (1) November sowing on land cleared of weeds, with the application of glyphosphate (without ploughing), and (2) May sowing on land cleared with glyphosphate and ploughed in autumn, and then sprayed with glyphosphate in spring. Seeds were sown at varying densities (0, 1, 3, 9, 27 g/m^2). Sowing rates and land preparation methods had little effect on the number of established species, although sowing density of 3–9 g/m^2 and autumn sowing without ploughing produced the highest species richness. These are preliminary results which do not follow the fate of established species later in meadow succession, but they shed light on the potential for creating meadows from seed mixes.

Key words: grassland, *Arrhenatheretum*, species richness, restoration, sowing rate, competition

Łukasz Łuczaj, Rzepnik 20A, PL-38-473 Łęki Strzyżowskie, Poland; e-mail: lukasz.luczaj@interia.pl

Polish Botanical Studies 22: 355–363, 2006

SUBDIOECY IN INVASIVE POPULATIONS OF *ACER NEGUNDO* (ACERACEAE) IN EASTERN POLAND

PIOTR MĘDRZYCKI, BEATA KOŁASZEWSKA & PIOTR BROWIŃSKI

Abstract. Subdioecy provides an excellent opportunity for the study of the ecology and evolution of dioecy and related sexual systems. A new case of at least morphological subdioecy was found in box elder (*Acer negundo* L.) in the Białowieża Forest (NE Poland). Previously it had been reported only twice from single individuals in its native range in the U.S.A. The aim of this study was to determine (a) the variability of the frequency of hermaphrodites, (b) the spatial distribution of subdioecy in *A. negundo* populations in central and eastern Poland at different distances from the Białowieża Forest, and (c) the frequencies of hermaphrodites in different habitats and in the sets of damaged and undamaged individuals. Research in the Białowieża Forest and along a 250 km gradient westward revealed that hermaphrodites occurred in two-thirds of 36 studied populations. Their average frequency ranged from 5% to 15% of all fruiting individuals. Frequencies above 25% were probably an artefact of small sample size. There was no correlation between the frequency of hermaphrodites and the distance to Białowieża. This may indicate that hermaphroditism is more widespread in other populations, at least in Central Europe. The phenomenon seems not to have been induced by damage to branches, but is more frequent in forest habitats. The relevance of the reproductive assurance hypothesis and targeted pollen transport by insects in the forest is discussed.

Key words: *Acer negundo*, trioecy, dioecy, colonizing species, reproductive assurance, facultative insect pollination, forest habitats

Piotr Mędrzycki[*]*, Białowieża Geobotanical Station, Warsaw University, Sportowa 19, PL-17-230 Białowieża, Poland*
Beata Kołaszewska & Piotr Browiński, University of Ecology and Management in Warsaw, Faculty of Ecology, Wawelska 14, PL-02-061 Warsaw, Poland

Polish Botanical Studies 22: 365–385, 2006

PRESENT STATE OF MIXED FOREST (*PINO-QUERCETUM*) IN OJCÓW NATIONAL PARK (SOUTHERN POLAND)

ANNA MEDWECKA-KORNAŚ

Abstract. Plant associations and their distribution in Ojców National Park (ONP) were investigated nearly 50 years ago. Thereafter the area was impacted by air pollution from industry located mainly in Silesia. Massive dieback of coniferous trees followed. The most apparent changes were in acidophilous mixed forests growing on higher sites and not exploited in the traditional ways. The present paper compares old and new phytosociological records from the ONP. It reveals further disintegration of *Pino-Quercetum* in the main forest area of the Park, including reduction of the role of *Vaccinium myrtillus* and the disappearance of other acidophilous plants. Some forest stands, located mostly on the periphery of the Park still represent the association studied. The occurrence or time of disappearance of several groups of plant species were determined. The reasons for the present state and syntaxonomic position of *Pino-Quercetum* are discussed with reference to other publications and problems of nature conservation.

Key words: acidophilous forests, *Pino-Quercetum*, phytosociological changes, Ojców National Park

Anna Medwecka-Kornaś, Institute of Botany, Jagiellonian University, Lubicz 46, PL-31-512 Kraków, Poland; e-mail: - ubmedwec@cyf-kr.edu.pl

Polish Botanical Studies 22: 387–398, 2006

THE FLORA OF KURGANS IN THE STEPPE ZONE OF SOUTHERN UKRAINE – PHYTOGEOGRAPHICAL AND ECOLOGICAL ASPECTS

IVAN MOYSIYENKO & BARBARA SUDNIK-WÓJCIKOWSKA

Abstract. The paper presents the results of preliminary studies on the flora of kurgans (barrows) in two steppe subzones (*Festuca–Stipa* and *Artemisia* steppe) of the Kherson region in southern Ukraine. There are about 50,000 kurgans in Ukraine, forming a characteristic element of the landscape, with estimated ages ranging from 700 to 5000 years. The kurgans are distinguished from their surroundings by a considerable number of steppe species. They can therefore be regarded as enclaves of steppe flora in the anthropogenic landscape. The barrows of the two steppe subzones differ in size, and their upper parts represent different degrees of disturbance. In fescue/feather-grass steppe the kurgans are surrounded by cultivated fields, and more rarely by abandoned agricultural fields, whereas those located in the wormwood/sod-grass steppe subzone are surrounded by extensive pasture. This study covered 44 kurgans at least 4 m high and 50 m in diameter, subject to weak anthropogenic influences, with well-preserved steppe flora. It was found that the flora of the barrows differed from that of the surrounding area and between the different microhabitats (fringe, foot, slope and top of mound) and subzones (different proportions of weeds, halophytes, halo-mesophytes, shrubs). The floristic richness of the kurgans was estimated; 401 species were noted, including 209 steppe species. Barrows can play an important role in local restoration of steppe vegetation on abandoned agricultural fields.

Key words: climatic-vegetation zones, *Festuca-Stipa* steppe, *Artemisia* steppe, kurgan microhabitats, refugia, steppe flora, Ukraine

Ivan Moysiyenko, Department of Botany, Kherson State University, Str. 40 let Oktriabrya 27, 73000 Kherson, Ukraine; e-mail: Vanvan@ksu.ks.ua
Barbara Sudnik-Wójcikowska, Department of Environmental Botany, Warsaw University, Al. Ujazdowskie 4, PL-00-478 Warsaw, Poland; e-mail: barbara.sudnik@uw.edu.pl

Polish Botanical Studies 22: 399–405, 2006

PARASITIC MICROFUNGI OF THE TATRA MOUNTAINS. 4. *MELAMPSORIDIUM HIRATSUKANUM* (UREDINIOMYCETES)

WIESŁAW MUŁENKO, KAMILA BACIGÁLOVÁ & MONIKA KOZŁOWSKA

Abstract. *Melampsoridium hiratsukanum* S. Ito *ex* Hirats. (Urediniomycetes) on *Alnus incana* (L.) Moench (Betulaceae) is an invasive species that is spreading rapidly in Europe. It has been recorded particularly frequently in the Tatra Mts on both the Polish and Slovakian sides. It is also a species new for the Tatra Mts and Slovakia. The general distribution of the fungus worldwide and in the Tatra National Park is given, and its ecology is briefly described.

Key words: *Melampsoridium hiratsukanum,* rust fungus, invasive species, ecology, distribution, Tatra National Park, Poland, Slovakia

Wiesław Mułenko & Monika Kozłowska, Department of General Botany, Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland; e-mail: botog@biotop.umcs.lublin.pl
Kamila Bacigálová, Institute of Botany, Slovak Academy of Science, Dúbravská cesta 14, SK-845-23 Bratislava, Slovakia; e-mail: kamila.bacigalova@savba.sk

Polish Botanical Studies 22: 407–416, 2006

CHANGES IN GROUND VEGETATION AROUND BADGER SETTS AND FOX DENS IN THE BIAŁOWIEŻA FOREST, POLAND

ARTUR OBIDZIŃSKI* & PIOTR KIEŁTYK

Abstract: The aim of the work was to establish whether foxes and badgers may, through their utilization of dens and setts respectively, bring about changes in natural forest phytocoenoses, and to determine the nature of any such changes and the degree to which they depend on the mammal species involved and the forest community in which it is found. Nineteen badger setts and 16 fox dens were studied in the Białowieża Forest. Floristic data were collected using the Braun-Blanquet method. The sett/den areas were characterized by the presence of more plant species, albeit with less cover. Ordination of the floristic composition using the DCA method indicated a shift in the vegetation of sett/den areas versus the surrounding areas, in the direction of increased similarity to that of oak-lime-hornbeam forest. Indices of soil trophic status and pH, determined using ecological indicator values for vascular plants, gave higher values for den/sett areas than for control areas. Dens/sett are sites of higher occurrence of species typical of meadows, and also of coniferous forest communities in the case of foxes. At badger setts also more ruderal species occur. At dens/setts there are greater shares of therophytes and bryophytes, as well as herbal chamaephytes in the case of badger setts in deciduous forest. The changes were more distinct where badgers had been at work.

Key words: *Meles meles, Vulpes vulpes*, zoopression, vegetation dynamics, natural forests

Artur Obidziński, Department of Forest Botany, Warsaw Agricultural University, Nowoursynowska 159, PL-02-776 Warsaw, Poland; e-mail: artur.obidzinski@wl.sggw.pl
Piotr Kiełtyk, Department of Forest Botany, Warsaw Agricultural University, ul. Nowoursynowska 159, PL-02-776 Warsaw, Poland. Present address: Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland; e-mail: kieltyk@ib-pan.krakow.pl

Polish Botanical Studies 22: 417–425, 2006

DISTRIBUTION AND STRUCTURE OF *MELITTIS MELISSOPHYLLUM* (LAMIACEAE) POPULATIONS, AND ITS PRESERVATION IN BELARUS

VICTOR PARFENOV, RAISA BLAZHEVICH, LARISA SEMERENKO & IRINA SHVETS

Abstract. *Melittis melissophyllum* L. (Lamiaceae) occurs primarily in southwest Belarus. Over the past 20–30 years the viability of its regional Belarusan population has diminished. Coenopopulations more often have low and medium levels of viability in local populations: they occupy small areas, occur at low density, have low seed yield, and their age structure is incomplete.

Key words: *Melittis melissophyllum*, ecology, phytocoenology, vitality, population, coenopopulation, age structure, distribution, Belarus

Victor Parfenov, Raisa Blazhevich, Larisa Semerenko & Irina Shvets, Laboratory of Plant Flora and Taxonomy, Institute of Experimental Botany, National Academy of Sciences of Belarus (NASB), Academicheskaya 27, 220733, Minsk, Belarus; e-mail: flora@biobel.bas-net.by

Polish Botanical Studies 22: 427–435, 2006

VEGETATION SERIES OF THE TRENTINO-ALTO ADIGE REGION (ITALY)

FRANCO PEDROTTI

Abstract. This contribution presents a list of the vegetation series of the Trentino-Alto Adige region (Central Alps, northern Italy). The series are grouped according to altitudinal belt (glacial, alpine, subalpine, montane and colline) and phytogeographic criteria of zonality (zonal, intrazonal, extrazonal and azonal vegetation). Each vegetation series is defined with a diagnosis that includes the following information: bioclimatic belt, thermotype, chorology, ombrotype, hygric-pluvial continentality, edaphic requirements, dominant species, and most mature community of the series. The vegetational landscape of the Trentino-Alto Adige region is characterized by 77 series of vegetation. This high number is the consequence of multiple causes, such as latitudinal extension, lithological substrate, geomorphological conditions and phytoclimate. It demonstrates the complexity and the great phytogeographic diversity of the territory under study, with a very marked gradient, passing from the prealpic to the endoalpic sector, which can be highlighted by referring to both flora (including endemism) and vegetation series.

Key words: vegetation series, Trentino-Alto Adige region, Central Alps, zonal vegetation, intrazonal vegetation, extrazonal vegetation, azonal vegetation

Franco Pedrotti, Dipartimento di Botanica ed Ecologia, Università di Camerino, Via Pontoni 5, 62032 Camerino, Italy; e-mail: franco.pedrotti@unicam.it

Polish Botanical Studies 22: 437–448, 2006

BIODIVERSITY AND PLANT PRODUCTIVITY IN A GRASSLAND SUCCESSION: EFFECTS OF NUTRIENT LEVELS AND DISTURBANCE REGIMES

WOLFGANG SCHMIDT

Abstract. Since 1969, succession has been studied on a formerly cultivated field under the influence of various mowing regimes (one to eight times per vegetative period) and fertilization. Thirty years of permanent plot experiments demonstrated a relationship between diversity parameters (species richness, evenness) and biomass production. Species richness and aboveground biomass generally increased in the course of succession. Evenness, by contrast, declined: the significance of the dominant species increased during grassland succession. The highest productivity was observed when plots were mowed twice annually, while the species-richest stands developed under a single-mowing regime. Lack of fertilization led to species-richer stands with less pronounced dominance structures (higher evenness) and lower biomass production. Based on these different relationships, no general positive correlation could be detected between diversity and biomass production as an important ecosystem function. Likewise, the suspected resilience to disturbance through higher plant diversity could not be demonstrated. Although the succession experiment could not separate the effects of sampling and niche complementarity, the functional characteristics of the dominant plant species were found to greatly determine the height, constancy and stability of a given ecosystem function within the grassland communities.

Key words: species richness, evenness, plant functional types, ecosystem functioning, permanent plot, old-field succession, mowing, fertilization

Wolfgang Schmidt, Institute of Silviculture I: Silviculture of the Temperate Zones and Forest Ecology, Georg August University of Göttingen, Büsgenweg 1, 37077 Göttingen, Germany; e-mail: wschmid1@gwdg.de

Polish Botanical Studies 22: 449–458, 2006

VEGETATION PATTERNS AROUND PENGUIN ROOKERIES AT ADMIRALITY BAY, KING GEORGE ISLAND, MARITIME ANTARCTIC: PRELIMINARY RESULTS

JERZY SMYKLA, JERZY WOŁEK, ADAM BARCIKOWSKI & PAWEŁ LORO

Abstract. Vegetation patterns were studied in ice-free areas of Admiralty Bay on King George Island in the Maritime Antarctic. This paper investigates and discusses the role of penguin rookeries in determining patterns of Antarctic vegetation, and provides a preliminary describtion of the series of vegetation zones found around penguin rookeries. Areas of active penguin rookeries support little or no vegetation. The adjacent zone is covered with nitrophilous green algae, and locally also cyanobacteria. The next zone is dominated by the Antarctic hair-grass *Deschampsia antarctica*. Further on, a zone dominated by mosses is formed. Finally, the zone least impacted by penguins is dominated by lichens. It is suggested that this vegetation gradient, comprising a few species and being relatively simple, offers unique opportunities to study relationships between ecological processes and structural patterns of Antarctic vegetation.

Key words: vegetation patterns, zonation, vegetation-animal relationship, terrestrial ecosystem, King George Island, Maritime Antarctic

Jerzy Smykla, Department of Biodiversity, Institute of Nature Conservation, Polish Academy of Sciences, Al. Mickiewicza 33, PL-31-120 Kraków, Poland; e-mail: smykla@iop.krakow.pl

Jerzy Wołek, Institute of Biology, Pedagogical University of Cracow, Podbrzezie 3, PL-31-054 Kraków, Poland; e-mail: jwolek@ap.krakow.pl

Adam Barcikowski, Institute of Ecology and Environmental Protection, Nicolaus Copernicus University, Gagarina 9, PL-87-100 Toruń, Poland; e-mail: barcik@biol.uni.torun.pl

Paweł Loro, University of Warmia and Mazury, Department of Botany and Nature Conservation, Plac Łódzki, PL-10-727 Olsztyn, Poland, and Department of Antarctic Biology, Polish Academy of Sciences, Ustrzycka 10/12, 02-141 Warszawa, Poland; e-mail: loro@uwm.edu.pl

Polish Botanical Studies 22: 459–472, 2006

VEGETATION DYNAMICS IN AN EXTREME DESERT WADI UNDER THE INFLUENCE OF EPISODIC RAINFALL

IRINA SPRINGUEL, MOHAMED SHEDED, FRANK DARIUS & REINHARD BORNKAMM

Abstract. In an extreme desert stream channel (Wadi Aggag near Aswan, Egypt, precipitation 1 mm per year), vegetation structure and soil water content were investigated over a period of 13 years (one downstream site) or parts of this period (two upstream sites). Three large precipitation events were observed in that time (1987, 1990, 1996). After each storm, densities of 10–15 individual plants per m^2 were produced within a few weeks. This number decreased to almost zero during the following years before the next rain destroyed the surviving individuals. The stands of vegetation that developed subsequently after the floods contained mostly *Zilla spinosa, Morettia philaeana, Fagonia indica* or *Salsola imbricata* as frequent species. All stands showed a similar shift from short-lived to longer-lived species. Spatial differences were found between the wadi beds, terraces and slopes. Very rarely, single specimens of perennial woody species (*Acacia ehrenbergiana*, *Tamarix nilotica*) were found in only some parts of the wadi beds. The remaining parts of the wadi beds, terraces and adjacent lower slopes developed only accidental vegetation; the upper slopes remained barren.

Key words: *Zilla spinosa, Salsola imbricata, Acacia ehrenbergiana,* Aswan region (Egypt), desert floods, soil water content, vegetation periods

Irina Springuel & Mohamed Sheded, Unit of Environmental Studies and Development, University of the South Valley, 81528 Aswan, Egypt; e-mail: irina44@yahoo.com
Frank Darius & Reinhard Bornkamm, Institute of Ecology and Biology, Technical University Berlin, Rothenburgstr. 12, D-12165 Berlin, Germany; e-mail: frank.darius@tu-berlin.de, r.bornkamm@tu-berlin.de

Polish Botanical Studies 22: 473–485, 2006

APOPHYTES IN THE FLORA OF CENTRAL EUROPE

HERBERT SUKOPP

Abstract. Apophytes are native plants that have left their natural habitats and passed spontaneously to artificial sites. This phenomenon is widespread, known for a century but little studied. Thus the role of apophytes in studies of synanthropic flora has often been unappreciated. The paper discusses nativeness (*Indigenat*), habitat change from natural to human-made vegetation, apophytes' association with natural communities and historically with human-made habitats, and their evolution, spatial and temporal dynamics. Since the 1950s, apophytic occurrences have been increasing in number and distribution. Half to two-thirds of the native plants of Central Europe have apophytic occurrences. Apophytes contribute to the biological diversity of cultural landscapes. The more that species are associated with humans in their native range, the more successful they are as invasive species after being introduced to new areas. Therefore, knowledge of the degree of apophytism in the home range is a good criterion for predicting the degree of expansiveness of the species in new areas.

Key words: apophyte, evolution, biological diversity, Central Europe

Herbert Sukopp, Institut für Ökologie, Technische Universität Berlin, Schmidt-Ott-Str. 1, D-12165 Berlin, Germany; e-mail: herbert.sukopp@tu-berlin.de

Polish Botanical Studies 22: 487–501, 2006

COMPARISON OF *QUERCUS* FORESTS IN WESTERN JAPAN AND EASTERN CHINA

SHIN-ICHI SUZUKI & AKIRA MIYAWAKI

Abstract. Summer-green oak communities in eastern China and western Japan have been studied comparatively since 1996, using phytosociological methods. Most summer-green oak forests of the lower Yangtze River region in China and the *Camellietea japonicae* region in Japan exist as substitute vegetation for potential evergreen broadleaved forests. These forests have been used for a long time as coppices to provide firewood, charcoal and compost, and have been maintained by such management practices as periodic felling, undergrowth weeding and forest floor sweeping. These coppices have no phytosociological vegetation units common to both regions, but common genuses such as *Quercus*, *Castanea*, *Celtis*, *Carpinus* and *Pinus* are found in the tree layer, and there are many common or closely related species: 29% of Chinese oak forest *Quercion brevipetiolati-acuteserratae* species are in common with Japanese oak forest *Carpino-Quercion serratae*. In this study the phytosociological features of these summer-green broadleaved forests are discussed, based on comparison of the vegetation units in the two regions.

Key words: *Quercus* forest, phytosociology, eastern China, western Japan, summer-green broadleaved forest

Shin-ichi Suzuki & Akira Miyawaki, Japanese Center for International Studies in Ecology (JISE), Okano, 2-12-20, Nishi, Yokohama 220-0073, Japan; e-mail: suzus@jise.or.jp & miyawaki@jise.or.jp

Polish Botanical Studies 22: 503–518, 2006

MORPHOLOGICAL REACTIONS OF *LURONIUM NATANS* (ALISMATACEAE) TO WATER AND SEDIMENT PROPERTIES IN LAKES

JÓZEF SZMEJA & EWA BAZYDŁO

Abstract. The effect of water and sediment properties on size, fecundity and biomass allocation to shoots was determined in *Luronium natans* (L.) Raf. (Alismataceae) in 21 lakes in NW Poland. The most favorable conditions for growth and development were found to be poor (0.8–1.2 mg TN dm^{-3}, 10–30 µg TP dm^{-3}), slightly acidic (pH 6.0–7.0) and fairly well lit (> 20% PAR) waters with low DOC concentrations (< 6 mg dm^{-3}), on mineral and organic substrate. *Luronium natans* is a species of great morphological plasticity easily influenced by water and sediment acidification in lakes. The relative robustness of shoots of the same age depends on the concentration of nitrate ions, light intensity (PAR) and access to free space in the littoral. The fecundity of the plant is a function of its robustness. Limited light and excessive acidification of lakes are the main causes of the decline in the *L. natans* populations under study.

Key words: *Luronium natans,* aquatic plant, plasticity, biomass allocation, fecundity, anthropopression

Józef Szmeja & Ewa Bazydło, University of Gdańsk, Department of Plant Ecology, Al. Legionów 9, PL-80–441 Gdańsk, Poland; e-mail: biojs@univ.gda.pl

Polish Botanical Studies 22: 519–523, 2006

A STOCHASTIC-DETERMINISTIC MODEL OF THE GROWTH OF THE RHIZOMATOUS SEDGE *CAREX BRIZOIDES* (CYPERACEAE)

DANUTA TUMIDAJOWICZ

Abstract. A stochastic-deterministic model of the growth of the rhizomatous sedge *Carex brizoides* L. was developed in order to determine (1) the rate of growth of the sedge expressed in terms of rhizome length and (2) the length of time it takes for the sedge to recover in a disturbed area, considering the density of tillers and the length of rhizomes. Real data from a four-year experiment were incorporated into a stochastic-deterministic model written in SIMULA 67. The data encompass the following morphological parameters: number and length of annual rhizome increments, probability of rhizome branching, branching angle, and number of tillers. The first peak of tiller density was attained after 12–14 years in the simulation. The relationship between tussock density and total rhizome length was logarithmic, and between the number and length of rhizomes was linear.

Key words: *Carex brizoides*, ecological modeling, disturbed forest, population growth rate, vegetation removal

Danuta Tumidajowicz, Department of Botany, Agricultural University, Al. 29 Listopada 54, PL-31-425 Kraków, Poland

Polish Botanical Studies 22: 525–533, 2006

SOME REMARKS ON THE MEASUREMENT AND INTERPRETATION OF SPECIES MOBILITY IN PLANT COMMUNITIES

EDDY VAN DER MAAREL

Abstract. Species mobility indices are reviewed and compared. Mobility analysis should proceed through year-to-year analysis of the presence and absence of species in series of nested quadrats that are small relative to the size of the plant community stand. The carousel model is considered as a phenological model for characterizing the often rapid changes in the occurrence of plant species in species-rich grassland, which seem to turn around across the subplots, but the idea of a carousel turnaround time can be abandoned. Immigration rate and extinction rate are welcomed as useful direct measures and as basic elements of some species mobility indices. In addition, a separate index of species mobility based on cumulative frequency is needed. Immigration can be restricted to quadrats where the species already occurred, and the essence of species mobility in the carousel is occupation of new quadrats. Some data and ideas on the number and size of the small quadrats are presented. It is recommended to achieve more uniformity in the establishment of these small quadrats and then to obtain data on species mobility, which can be compared over a wider range of steady-state communities, from open grasslands to forest floor communities.

Key words: carousel, cumulative frequency, extinction, forest floor, grassland, immigration, mobility rate, residence time, turnaround time

Eddy van der Maarel, Community and Conservation Ecology Group, University of Groningen, P.O. Box 14, 9750 AA Haren, Netherlands; e-mail: eddy.arteco@planet.nl

Polish Botanical Studies 22: 535–549, 2006

BIOMASS AND PRODUCTION OF *HYPOGYMNIA PHYSODES* IN A SCOTS PINE PLANTATION CHRONOSEQUENCE

JADWIGA WILKOŃ-MICHALSKA, ANDRZEJ NIENARTOWICZ, DOMINIK J. DOMIN & MIECZYSŁAW KUNZ

Abstract. The cover, biomass and production of the most frequent foliose epiphytic lichen in the Bory Tucholskie forest, *Hypogymnia physodes* (L.) Nyl., were analyzed. Measurements were taken in the Zaborski Landscape Park in 1982–1986 in dry pine forest habitats, in *Pinus sylvestris* L. plantations 3, 10, 30, 45, 65 and 90 years old. A graphic method based on rosette contour drawing was used to measure thallus growth. The growth of rosettes of different size classes (<5.1, 5.1–10.0 and >10.0 cm^2) was presented as the ratio of their actual surface area to initial area, that is, relative growth, and as the growth rate (cm^2 cm^{-2} $year^{-1}$). Small rosettes had a significantly higher growth rate than medium and large ones. No influence of tree stand age on the growth rates of rosettes of various sizes was confirmed. In further calculations, the biomass of *Hypogymnia physodes* as well as its chlorophyll (*a* + *b*) content (kg per ha of forest community) were expressed as percentages of the total green biomass of the whole plant community. In the analysis of forest development stages in the dry *Cladonio-Pinetum* forest habitat, the maximum biomass of *Hypogymnia physodes* (69.5 kg ha^{-1}) was noted in a tree stand 30 years old. It was only 1.5% of the green biomass of the whole forest phytocoenosis. The production of epiphytic lichen biomass in this succession series did not exceed 9 kg ha^{-1} $year^{-1}$. The results of our study were compared with measurements of arboreal lichen biomass and production in temperate and circumboreal zones from recent lichenological literature.

Key words: epiphytic lichens, biomass, production, chlorophyll content, managed forests, secondary succession, Bory Tucholskie forest, Poland

Jadwiga Wilkoń-Michalska, Andrzej Nienartowicz & Dominik J. Domin, Nicolaus Copernicus University, Institute of Ecology and Environmental Protection, Gagarina 9, 87-100 Toruń, Poland
Mieczysław Kunz, Nicolaus Copernicus University, Institute of Geography, Gagarina 5, 87-100 Toruń, Poland

Polish Botanical Studies 22: 551–560, 2006

INFLUENCE OF THE ISOLATION AND SIZE OF MINERAL-HABITAT ISLANDS ON THE SPECIES RICHNESS OF VASCULAR PLANTS IN THE UPPER NAREW VALLEY (NE POLAND)

DAN WOŁKOWYCKI

Abstract. The paper reports on the species richness of the vascular plants on small hills in the Upper Narew Valley (NE Poland). These mineral hills are habitat islands – isolated patches surrounded by highly contrasting mire habitats. Among the total observed flora are 132 species spreading from the matrix of the islands, 163 from the slopes of the river valley, and 11 occurring only on the mineral-habitat islands. Only the number of species from the river valley edges was related to the area and perimeter of the islands. The distance between the islands or between them and the valley edge significantly affected the increased differentiation of the floras of species from long-distance spread. Isolation makes colonization of the islands especially difficult for species from forest habitats of valley edges, particularly for herbaceous ones. Most species exclusive to the islands were endangered elements of the flora of the Nizina Północnopodlaska lowland or even the whole country. The mineral islands in the Upper Narew Valley have become refuges enabling populations of species of this group to persist in NE Poland.

Key words: flora, habitat islands, isolation, Narew, NE Poland, species richness, vascular plants

Dan Wołkowycki, Department of Landscape Ecology, Technical University of Białystok, Wiejska 45A, PL-15-345 Białystok, Poland; e-mail: danwolko@pb.edu.pl

Polish Botanical Studies 22: 561–568, 2006

COLONIZATION PROCESS ON COAL MINE SEDIMENTATION POOLS (UPPER SILESIA, POLAND)

GABRIELA WOŹNIAK

Abstract. The article considers the early stages of vascular plant colonization of coal mine sedimentation pools, studied in Upper Silesia (S Poland). From 9 to 11 species were recorded in the three analyzed transects (50 × 1 m) after four years of colonization. In each pool the development of vegetation started at its edge and continued towards the center. Most species occurred in only one of the three transects. Most of the colonizing species were hemicryptophytes; very few therophytes were recorded. The sedimentation pool richest in species at the beginning of colonization was invaded by numerous groups of halophilous plants. After four years of development the spread of plant cover was most extensive at this site. At the other sites the development of vegetation was nearly three times slower in respect of cover. The rate of spread of vegetation was between 4 and 10 m per year. The relationship between cover and the number of species was linear at two sites; for the third one the linear equation does not express the relationship well. The presence of leading/dominant species was determined. There were one or two leading species at each site. Such leading plants were present in more than half of the investigated plots, and were the first colonizers of bare coal dust. These species represent vegetation of a narrow ecological amplitude. New species appeared on plots regardless of whether or not the plot had been covered by plants in the previous year.

Key words: colonization, vegetation, pioneer species, dominant species, post-industrial sites

Gabriela Woźniak, Department of Geobotany and Nature Protection, Faculty of Biology and Environmental Protection, University of Silesia, Jagiellońska 28, 40-032 Katowice, Poland; e-mail: wozniak@us.edu.pl