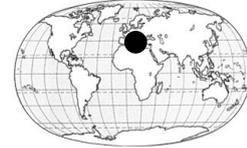


**ECOLOGICAL IMPACT AND
MANAGEMENT**

POSTERS
in alphabetical order

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ALIEN VERSUS NATIVE SPECIES ON COASTAL DUNES IN CENTRAL ITALY. PLANT DISTRIBUTION AND TRAITS

This study is part of a project searching for general mechanistic patterns of plant invasions in Mediterranean coastal sand dunes ecosystems. In this work we propose a vascular flora census and a comparative study of plant traits (for alien and native species) between the Italian Tyrrhenian and Adriatic coast. We test the hypothesis that alien invasive species from Mediterranean sand dunes share common biological traits across different environmental conditions. In each site the vascular flora sampling was carried out using the approach of European Cartographic Project. List of vascular plants, information about life forms, chorotypes, physical environment and disturbance were stored in a data-bank. Most common native and alien species (among them naturalized and actual and potential invaders) were selected. In order to perform a functional classification, we focused on the characterization of plant traits based both on measured and on published information. Morphological traits (plant height, plant growth form, leaf surface and leaf consistency) and regeneration traits (seed mass, dispersal mode, phenology (onset of flowering) and clonality or resprouting ability) were considered. Functional groups were determined using multivariate analyses. At present, more than 650 species of vascular plants were registered on sand dunes of Central Italy, with 86 taxonomic families. Among these species, 50 were considered aliens. The comparative analyses of plant traits showed different functional groups among aliens species and also different distribution patterns between the Tyrrhenian and the Adriatic coast.

keywords: coastal ecosystems, coastal aliens, functional classification, Mediterranean, plant functional types

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ANTHROPOPHYTES IN SECONDARY THICKETS AND WOODS ON SYNANTHROPIC HABITATS OF POZNAŃ AND ITS VICINITY

This paper is a part of a larger project concerning the phenomenon of encroachment of trees and shrubs on synanthropic habitats after the cessation of direct human impact. The city of Poznań and its surroundings give great opportunity to study this process. The aim of this study was to describe the participation of anthropophytes in secondary thickets and young woods. Particular attention was paid to the alien shrub and tree species. An attempt was made to determine exactly in which way the share of anthropophytes in phytocoenoses depends on:

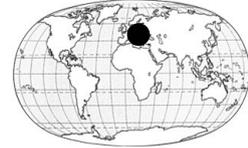
- 1) type of man-made habitat,
- 2) time since the abandonment of anthropopressure,
- 3) the density of trees and shrubs,
- 4) parameters describing indirectly age of thickets and woods (diameter and height of shrubs and trees).

Field investigations were carried out in the years 2002-2004. In the analysis 499 phytosociological relevés (made according to the Braun-Blanquet approach) were used. The studies were carried out in the potential habitats of oak-hornbeam and ash-elm forests. All the documented thickets and woods are spontaneously-developing communities. Such phytocoenoses are not a relict forest communities or forest degeneration and regeneration stages. The author noted 86 alien species. They constitute 37% of the spontaneous flora of vascular plants of studied thickets and woods. Metaphytes made up 30% of all species (archeophytes: 17%, kenophytes: 13%) and diaphytes - 7%. The greatest percentage of archeophytes was discovered in patches occurring around steel towers supporting electric lines on fields (23%), kenophytes and diaphytes – in thickets and woods in the area of abandoned gardens (19% and 13% respectively). Species of foreign origin made 46% (26 taxa) of tree and shrub species, among them only *Acer negundo* and *Robinia pseudacacia* were observed with a high constancy and cover.

keywords: anthropophytes, thickets, woods, synanthropic habitats

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THE APPLE TREE SAVANNAH – AN ALTERNATIVE PATHWAY OF SECONDARY SUCCESSION ON ABANDONED MEADOWS IN THE BIALOWIEZA FOREST

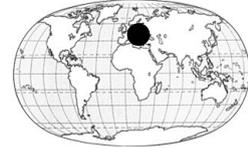
Malus domestica Borkh. (apple tree) is one of the most widespread representatives of alien tree species in the Białowieża Forest. It is most successful on unused meadows or abandoned fields temporarily used as pastures. In such conditions the tree often dominates reaching over 90% of all trees, and a density of more than 500 individuals per ha. In 10 to 15 years after abandonment, the trees grow in loose clusters (10-50% of cover) over significant areas of even a few hectares, in a way resembling the physiognomy of savannah vegetation. The apple trees are often accompanied by wild pear *Pyrus pyraster*, less frequently by myrobalan plum *Prunus cerasifera*, while the contribution of pioneer tree species (*Betula*, *Salix*, *Populus*) and permanent species of deciduous forests (*Quercus*, *Carpinus*, *Tilia*, *Acer*) is very low.

It seems that the appearance of the apple tree savannah is a consequence of a significant spreading of apple tree cultivation, the presence of mammals dispersing the seeds over large areas and a series of mild winters in the 1980s and 1990s, limiting the losses due to winter foraging of hares and the deer family.

keywords: *Malus domestica*, secondary succession

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BALSAMS IN ACTION

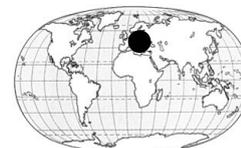
The genus *Impatiens* includes a number of species with very attractive flowers. Some of them were introduced in cultivation already in the 19th century. At least two taxa have become one of the most popular decorative plants in the world. The hitherto introductions of balsams have resulted in a few spectacular expansions e.g. of *Impatiens glandulifera*, *I. parviflora*, *I. capensis*, *I. balfouri*, *I. walleriana*, etc. Because of the recent interest in the genus as a source of potential decorative plants and cultivation of many new taxa, a study was undertaken to analyse the threat of appearance of other possibly invasive balsam species.

In the conditions of the temperate climatic zone, greater chances of wide spreading have the taxa originating from the mountainous areas in the Himalaya and in China (79 from the 220 balsam species known from China grow above 3000 m a.s.l.). The regions are characterised by well marked climatic seasons. Over 80% of the balsam species growing in these areas are annuals wintering in seeds. The balsams coming from tropical Africa are mostly perennials – in over 90% - adapted to more harmonious course of meteorological phenomena. They can expand in the intertropical zone characterised by abundant precipitations.

keywords: *Impatiens*, invasion, prediction

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ORNAMENTAL GROWING WILD IN THE BIALOWIEŻA FOREST REGION

Over the last 15 years numerous decorative plants have been introduced in cultivation. Some of them have spread over post-agricultural land and taken part in secondary succession. The study has been undertaken to document the present state of naturalisation of decorative herbal plants in the region of the Białowieża Forest and make predictions as to their further fate. Hitherto, at least 67 species from this group have been noted outside the places of cultivation and 50 species of this group occupied exclusively anthropogenically changed habitats (ruderal areas, road shoulders, fence adjoining grounds, etc., 10 appeared also in abandoned farmlands and only 9 revealed a tendency of spreading into natural vegetation communities.

The strongest spreading tendencies have been noted for *Lupinus polyphyllus*, *Solidago gigantea* and *Echinocystis lobata*. *Impatiens glandulifera*, known for its invasive character observed in many European countries, has not been much successful in the Białowieża Forest, although is noted at a few sites in the river rushes. A very interesting phenomenon is the escape from cultivation of *Matteucia struthiopteris*, the species under protection in Poland and whose presence in the Białowieża Forest is outside of its natural range.

keywords: ornamental plants, naturalisation, prediction

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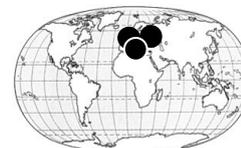


PATTERNS OF INVASION OF FOUR AMERICAN TREES IN THE KAMPINOSKI NATIONAL PARK, POLAND

We studied the distribution of four invasive American trees: *Acer negundo* L. (boxelder), *Quercus rubra* L. (red oak), *Robinia pseudoacacia* L. (black locust) and *Prunus serotina* Erh. (the black cherry) in the tree stands on the Eastern border of the Kampinoski National Park, in the vicinity of the Warsaw. We hypothesised that they colonise all forest stands at an equal rate, i.e. the abundance, the size structure and the spatial distribution of their populations would not differ in the tree stands of different properties. We counted individuals (or black locust ramets) belonging to the four height classes in a grid composed of 6370 37x 42m plot set up in the forest using the GPS. The properties of the tree stands (habitat type, potential vegetation, cover, mean height, DBH, volume and age of every tree canopy species) were taken from the databases of the Kampinoski National Park GIS. Our results indicate that all 4 species do not differ too much in their preference to the soil or potential vegetation properties. The red oak abundance was correlated with the greatest number of parameters of the canopy, while black cherry and the black locust were correlated with lower number of parameters. The greatest difference was found in the pattern of spatial distribution - the boxelder was mostly limited to the forest border and occurred only sporadically within forest, while the red oak and the black cherry were the most abundant species in the forest. Additionally, the red oak was most distantly spread in the forest from its initial stands. We concluded that dispersal capabilities together with competing canopy species composition may be more important determinants of the invasibility of the forest complexes by four studied species, than the abiotic conditions of the soil and habitat.

keywords: trees forest succession spread

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***PSYLLIODES* SP. NR. *CHALCOMERUS* AND *CERATAPION BASICORNE*:
SYNERGISM OF MORPHOLOGICAL OBSERVATIONS, LIFE HISTORY, HOST
RANGE AND GENETIC ANALYSES FOR THE SELECTION AS CANDIDATES FOR
THE BIOLOGICAL CONTROL OF *CENTAUREA SOLSTITIALIS* L.**

Centaurea solstitialis L. (Asteraceae) is an alien weed introduced at the end of 1800 in the Western United States. Today, with an infestation area of more than 9 million acres, is considered one of the most economically important weeds in California.

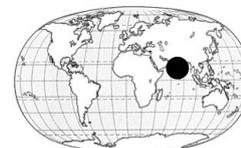
A biological control program was started in the middle of 1900, and 5 seed feeder insects of Eurasian origin have been released. Despite the annual biology of the plant and the high infestation rates recorded in the flower heads of the target weed for most of the species released, only recently occasional decline of the weed population density was observed. For this reason, starting from 2000 more effort has been put in the search, selection and evaluation of biocontrol candidates attacking *C. solstitialis* at the root and/or stem level at early phenological stages. Among them, high priority has been given to the crown boring weevil *Ceratapion basicorne* and the stem boring flea beetle *Psylliodes* sp. nr. *chalcomerus*. Both beetles have been found in Eastern Europe, are univoltine, attack the weed at the rosette or early bolting stage and showed relevant impact when several larvae are found in a single plant. The presence of sibling or closely related species was recorded in sympatric conditions for both insects.

This work describes the importance to combine the classical approach (biological observations and host range tests) with genetic analyses as an important tool for the successful discrimination of the target insect species.

keywords: biocontrol, yellow starthistle, *Ceratapion*, *Psylliodes*

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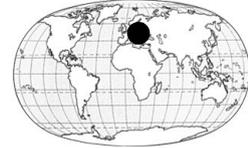
**CURRENT DISTRIBUTION, STATUS OF *LANTANA CAMARA* L. (VERBENACEAE)
AND BIOCONTROL POTENTIAL OF PHYTOPHAGOUS INSECTS RECORDED ON
IT IN JAMMU, (J&K), INDIA**

Lantana camara L. (Verbenaceae) is a pantropical weed affecting pastures and native forests in over 60 countries worldwide. It is considered a significant problem weed in many of the countries to which it has been introduced and has been focus of biological control attempts for long but yet still pose major problems in many regions of the world including India. *Lantana* pose serious problem in two districts of Jammu while low to medium infestations have been observed in other parts of the region. This weed has considerable impact on economic and environmental areas. Survey of phytophagous insects associated with *Lantana* in Jammu yielded nine species from four orders. Of these, *Telonema scrupulosa* (Hemiptera: Tingidae), *Hypena laceratalis* (Lepidoptera: Noctuidae) and *Ophiomyia lantanae* (Diptera: Agromyzidae) has shown potential in suppressing this weed. The present paper records current distribution and status of *Lantana camara* in Jammu and biocontrol potential of the insects recorded on it has been discussed.

keywords: *Lantana camara*, distribution, phytophagous insects, biocontrol potential

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UNSATURATED GUILDS, UNEXPLOITED RESOURCES AND PLANT INVASION

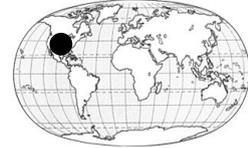
This study examines the role of unsaturated guilds and unexploited resources in the invasibility of plant communities. Due to the limited available species pool, there may be unsaturated guilds, which have not used up the all available resources. According to our hypothesis these unexploited resources facilitate the invasion of alien species belonging to these guilds. If this hypothesis is true, these invaders not only replace the native species, but can increase the abundance of their guilds by the utilisation of the unexploited resources.

We examined in the floodplains of the Carpathian Basin whether the cover of different guilds is higher in the case of presence of invasive species. According to our results the invasive species belonging to the tall forb and in a smaller extent to the annual dicots increase the abundance of their guilds. In our opinion, these guilds were unsaturated before invasion and this unsaturadness explain the success of invasive species belonging to them.

keywords: unexploited resources, species pool, floodplain

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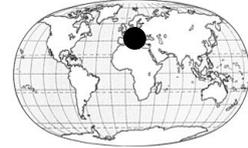
ECOLOGY AND MANAGEMENT OF *ALHAGI MAURORUM* MEDIK. (CAMELTHORN) IN ARIZONA, USA

Plant invasions are symptom of global environmental change. *Alhagi maurorum* Medik. is a native of the Middle East, southeastern Russia, and northern Africa. *A. maurorum* is a member of the Fabaceae family. *A. maurorum* is perennial, semi-woody, with highly branched glabrous stems, small entire leaves, and spines 2 cm in length. *A. maurorum* flowers in mid summer and produces 3 to 5 seeds per fruit, it can also vegetatively reproduce from deep rootstalks. *A. maurorum* was introduced to the United States in about 1900 as wrapping material of date palm *Phoenix dactylifera* L. offshoots and in alfalfa *Medicago sativa* L. seed. *A. maurorum* is locally abundant in the southwestern United States especially along the Little Colorado River in northeastern Arizona. It is competitive with native vegetation and is grazed lightly by domestic livestock. In 1999 stands of *A. maurorum* were found at an elevation of 2070 m in a forest of *Pinus ponderosa* Lawson and *Quercus gambelii* Nutt. in northcentral Arizona. The plants were along road right-of-ways and presumed to be introduced in the construction material for the roads approximately 15 years earlier. A total of 40 stands were found containing 4,468 plant crowns, ranging from 40 cm to 1 m height. *A. maurorum* is difficult to control. Pulling, fire and mechanical treatments result in numerous resprouts, and there are no known biological control agents. Selected herbicides can control *A. maurorum*. Selective, systemic herbicides were applied in mid summer, beginning in 2000 and have been applied to re-emerging crowns annually. Initial mortality from herbicide treatments averaged 84% and in 2004, crown mortality had increased to an average of 98.7%, with little damage to native species.

keywords: invasive, competitive, mortality, camelthorn, herbicides

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ECOLOGY AND DISTRIBUTION OF *OXALIS PES-CAPRAE* L. IN SARDINIA (ITALY)

Oxalis pes-caprae L. is a geophyte accidentally introduced from South Africa that has invaded many Mediterranean regions of the world, including Sardinia, since the beginning of the nineteenth century. In the Mediterranean Basin, it is mostly present in disturbed areas such as olive groves, orchards, vineyards, annual crops, home gardens and roadsides. It also may be present in pastures, especially on limestones and alluvial soils. This is one of the main potential impacts of this alien, because *O. pes-caprae* aboveground biomass contains oxalic acid, which is toxic to livestock when consumed in large quantities, i.e. when other forages are locally scarce. *O. pes-caprae* spreads vegetatively by means of underground bulbs and, so far, no sexual reproduction has been observed in the introduced range.

We have mapped *O. pes-caprae* distribution in Sardinia with GPS field survey recording ca. 1,800 presence sites (presence and local abundance) and ca. 2,100 absence sites. Environmental descriptors and anthropisation indices were both collected in the field and derived from GIS layers. Logistic and autologistic regression (SAS, R) were performed to assess relationships between distribution and predictors. General linear models (SAS) were applied to assess relationships between local abundance of the species and predictors. Raster modeling techniques were tested to predict potential range expansion on the island. Preliminary results of the analysis are presented.

keywords: *Oxalis pes-caprae*, GIS modeling, GLM, Mediterranean islands

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RAGWEED'S (*AMBROSIA*) POLLEN IN AEROPLANCTON OF UPPER SILESIA (SOUTH POLAND)

Ragweed's pollen is a strong allergen considered the most dangerous pollen allergens in the world. It is the most common cause of pollen allergy in North America where it is an economically burdensome pest in many regions.

Ragweed species have been introduced into Europe already in the 19th century with imported grain, soybean, clover and alfalfa as well as with ship ballast. They have spread in many regions after World War II, especially in the southern and south-western part of the continent. Three species have hitherto been recorded from Poland: *Ambrosia artemisiifolia* L., *Ambrosia psilostachya* DC. = *A. coronopifolia* Torr. et Grey and *Ambrosia trifida* L. The first two taxa have the status of naturalised species in our country, while *A. trifida* is regarded as a casual alien species. *A. artemisiifolia* occurs most frequently both in Europe and in Poland.

Aeroplancton investigations have been conducted in 1998-2004 in cities in the Upper Silesia urban area using the volumetric method (Burkard's apparatus) and the gravimetric method. Presence of ragweed's pollen has been confirmed every year in all assay points from August until mid-October. The beginning and length of pollen seasons were different in particular research years and measuring points. The periods of maximum pollen concentrations in the atmosphere happened at different times. The annual sums of pollen grains and maximum values of the twenty-four hour concentration were significantly different in the research years. Observations performed during many years show fluctuations in ragweed's pollen concentration and do not allow implicating any increasing tendency. This fact may be linked to the small number of localities of these species in the study region. However, one should not disregard the possibility of long-distance pollen transfer by wind from the Czech Republic, Slovakia, Ukraine and Hungary. Earlier forecasts of ragweed invasion in Poland where it was predicted to encroach with time on grassy hillsides, dry pastures and arable fields on sand have hitherto not come true. Although ragweed is included in the quarantine weed list in Poland, it does not yet constitute a major threat. Still, it requires alert attention in Poland due to the spreading tendencies in shows currently in neighbouring countries.

keywords: Ragweed, *Ambrosia*, pollen concentration, allergen, Upper Silesia, Poland

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INVASION OF WOODLAND COMMUNITIES IN THE LIGHT OF PHYTOSOCIOLOGICAL STUDIES

In the Silesian-Krakow Upland, region situated in southern Poland geobotanical studies in forests were conducted during the years 1997-2004. Total 416 phytosociological records with a presence of alien plant species (neophytes) were taken into analyses, including data completed from the literature. Relationships between abundance of aliens and chosen characteristics of forest communities, e.g. their structure and species composition manifested by participation of plant functional groups, were examined. In woodland communities there were 20 neophytes to be found. Amongst forbs the most frequent and abundant is *Impatiens parviflora* which, as the only one, is a true woodland species with a wide synecological amplitude. Of woody aliens, escaping from cultivation sites, *Quercus rubra* and *Padus serotina* predominate. Analysis of contribution of particular syntaxonomical groups, i.e. species from various phytosociological classes to forest vegetation, revealed different relationships. Species from *Quercus-Fagetum* are positively correlated with a frequency and cover of *Impatiens parviflora* and negatively correlated with alien trees, but there are positive correlations between them and species from *Vaccinio-Picetea* class. Detrended Correspondence Analysis (DCA) show that phytocoenoses with the presence of aliens differentiate along almost all environmental gradients expressed by mean values of Ellenberg indicators but there are no any statistical correlations between them and the frequency and abundance of alien species. Spearman rank correlation tests indicate that there is a weak negative correlation between number, cover-abundance of aliens and both diversity and abundance of native species. Thus, the results of the phytosociological study indirectly confirm negative impact of invasive alien species on biodiversity and support diversity-invasibility hypothesis.

The study was partially funded by KBN, no. project 3 PO4 G 093 25.

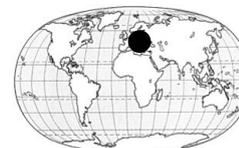
keywords: forest communities, phytosociology, neophytes, Poland

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HABITAT REQUIREMENTS OF *IMPATIENS PARVIFLORA* DC IN THREE ADJACENT REGIONS OF SOUTHERN POLAND

In three neighboring regions situated in southern Poland, namely the Krakow-Czestochowa Upland, the Glubczyce Plateau and the Silesian Upland, differing in land use, soils and a type of forest vegetation, the autecological studies on one of the most invasive alien species of the country - small balsam *Impatiens parviflora* - were conducted. Habitat requirements of *I. parviflora* were estimated in 97 permanent plots, randomly distributed in various forest communities, differing in the percentage cover of *I. parviflora*. Physical and chemical properties of soils, canopy cover, slope and aspect were analysed in relation to the abundance of *I. parviflora* and a type of forest community. There were distinctive differences between the regions studied in granulometric composition of the soils, their pH level, the content of organic matter, P, K, Mg, and Ca in substratum. In contrast, no significant differences in N and Na content were detected. There were no significant relationships between the percentage cover of the species studied and a slope and the cover of a tree canopy. On the other hand, the results indicate that *I. parviflora* predominantly occurs in colder, northern slopes rather than in warmer slopes of southern and south-western aspect. The study shows that small balsam is a species with a wide ecological amplitude, which enhances its success in colonizing and persisting in different forest communities, regardless of the physical and chemical properties of the soils.

The study was partially funded by KBN, no. project 3 PO4 G 093 25.

keywords: *Impatiens parviflora*, Poland, autecology, habitats

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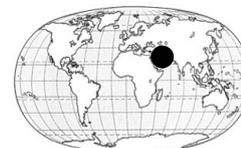
RESEARCH OF THE ARTHROPOD FAUNA OF THE SMALL BALSAM (*IMPATIENS PARVIFLORA* DC.) AND THE FIREWEED (*ERECHTITES HIERACIFOLIA* RAF. EX DC.)

According to the actual Hungarian list of neophytes the small balsam and the fireweed are both qualified as invasive neophytes. By the research of interactions between plants and animals were got information not only about effect of the adventives plant on the fauna, but also about the actual parasites that can cause serious damages and may be applicable for biological controll. 100-100 individuals of both plant species were examined to count the insects existing on them. This research revealed through direct or indirect feed connections 212 individuals of 45 arthropod species in case of the fireweeds and 1528 individuals of 17 species on the small balsam. On the fireweeds leaf miners were the most important phytophages, their tunnels occurred in 29 percentages of the plants. Phloem-suckers occurred in 28 percentages of plants: 17% chinchies, 5% cicadas, 6% aphides and wax insects. Aphidophages were presented by 4 species and appeared on 17 plants. Fireweed can be characterized by a very rich flower visitor fauna, altogether 42 specimens of 16 insects family visited the plant species. Also 16 specimens of 6 predator species were presented on fireweeds. Phytophages of the small balsam were leaf miners in the largest number; their tunnels have been found on 34 leaves of 20 plants. Phloem-suckers were the most remarkable group of the small balsam's insect fauna with 1442 aphides and 74% presence on plants. Afidophages occurred in 22% of the plants. Aphidophages were prey of spiders mainly, spider species involved four families. During the research quite poor fauna of flower-visitors including cockroaches (*Ectobiidae*), blossom beetles and tumbling flower beetles (*Mordellidae*) were found. Also several consumer organizations were observed, but no serious damage nor death of plant individuals of any species were recorded.

keywords: *Impatiens parviflora* DC., *Erechtites hieracifolia* RAF. ex DC., arthropod fauna, interactions between plants and animals

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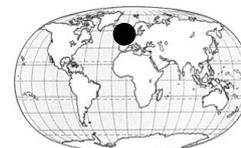
ASSESSMENT OF THE EFFECTIVENESS OF NUTRIENTS RECYCLING BY FERN (*AZOLLA*) IN THE CONTAMINATED AQUATIC SYSTEMS

Azolla filiculoides Lam. (Water fern) has been assessed for growth and nitrogen and phosphorus removal in laboratory scale experiments comparing river water (A), river-to-wastewater in the ratios of 3:1 (B), 1:1 (C), and 1:3 (D) respectively; and primary treated domestic wastewater (E). Experiments were performed in batch mode with 10L of five water systems exposed to constant temperature and light intensity. *A. filiculoides* grown on mixtures of river-to-wastewater ratio of 1:1 (C) and 1:3 (D) exhibited maximum gain in fresh and dry weights. *A. filiculoides* was capable of efficient quantitative and qualitative algal reduction. Maximum efficiency in algal removal was achieved in mixture „C” (94.5%). The concentrations of Nitrate, Ammonia and Phosphorus in the five water systems decreased significantly ($p < 0.05$). The Ammonia rate of reduction was markedly high in mixtures enriched with wastewater with a complete depletion of any detectable nitrogen. The Nitrate removal efficiency was 100% after 8 days in all of five water systems. The Phosphorus rate of reduction was increased with increasing wastewater ratio. The Phosphorus removal efficiency after 16 days were: 60% in mixture “A”, 83% in mixture “B”, 94% in mixture “C”, 96% in mixture “D” and 86% in mixture “E”. The results obtained confirm using the *A. filiculoides* for tertiary treatment of municipal wastewater.

keywords: *Azolla*, aquatic treatment, nitrate, phosphorus, ammonia

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BIOHERBICIDES – A POTENTIAL TOOL IN THE FIGHT AGAINST WEEDS IN THE UK?

Increased environmental concerns and pressures to reduce our reliance on chemical herbicides for pest control encourages biological control to play a significant role in the sustainable management of alien invasive plants.

When problem weeds are indigenous plants, plants which are a naturalised and established part of the flora, or indeed hold some horticultural significance, the conflicts of interests which would exist under classical control, necessitate the use of an alternative biological strategy. The exploitation of indigenous fungal plant pathogens as bioherbicides/mycoherbicides, is a relatively new weed control approach and involves the mass production, formulation and application of fungi in a manner analogous to chemical herbicide applications or as site-selective stump treatments.

The potential use of this environmentally beneficial method of control is reviewed for UK targets including *Rhododendron ponticum*, *Buddleja davidii* and *Senecio jacobaea* alongside examples of safely and successfully implemented commercial products.

keywords: bioherbicides, indigenous fungi, weed biocontrol

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INVASION AND MANAGEMENT OF THE WATER PRIMROSE (*LUDWIGIA SP.*) IN FRANCE

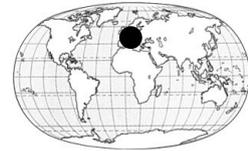
Water primrose (*Ludwigia sp.*) was accidentally introduced in France, from South America, at the beginning of the 19th century. Two species of this taxon are present: they are considered in France as the most harmful exotic aquatic plants. Their large ecological amplitude allowed them to colonize all kinds of aquatic ecosystems. Their easy vegetative reproduction and their strong capacity to create propagules (fragments of stems) permit them to colonize interconnected sites very quickly. The total colonization of aquatic biotopes by Water primrose creates very unfavorable conditions to the indigenous macrophyte populations and many others aquatic organisms. It also produces important nuisances opposite the human water body uses. Consequently, since about ten years, many managers had to do regulation interventions of these plant populations consisted in applications of herbicides, mechanical and manual extractions. Coordination within institutional managers is under creation to facilitate the information exchanges between different sites and several meetings took already place to confront data on these plants and their management. In order to increase, in the French context, the knowledge on the biology and the ecology of these plants, and facilitate their management, new researches have been recently undertaken in a specific research project in a national program started in 2003 on the biologic invasions (INVABIO). This project includes research on the biology and the ecology of these plants, their ethno botanical representation and the economic conditions of their management in different parts of France. The balance of this situation, that can be drawn up currently from different examples, shows a great diversity of the situations, the necessity of setting up a global analysis of the particular management of these plants, as well as the needs that remain to satisfy for this management.

keywords: water primrose, France, invasion, research, management

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DOES LOCAL ADAPTATION CONTRIBUTE TO THE SUCCESS OF INVASIVE *BUDDLEJA DAVIDII*?

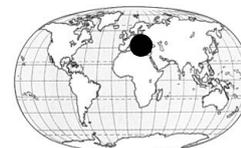
There is increasing evidence that the ability for microevolutionary adjustments to novel environmental conditions may be a key feature of successful invaders. For instance, local genetic adaptation can facilitate colonization of new habitats and lead to a further spread in the new area. We will investigate the importance of local adaptation during plant invasions using the Butterfly bush (*Buddleja davidii*, Buddlejaceae) as a model system. *B. davidii* is native to China and was introduced to Europe around 1890. It became naturalized in western and central Europe and is still spreading. In England and Switzerland, it is invading natural habitats, but in other countries it is common only on wasteland and along railways. In continental climates, the species is not invasive and in sub-continental climates, it does only occur in the centres of cities. However, frost resistance of *B. davidii* is very differently assessed in the literature. We hypothesize that frost damage is limiting the distributional range of invasive *B. davidii*, and that populations from different origins in Europe are locally adapted to climatic factors. We will test these two hypotheses using 20 invasive populations sampled across western and central Europe. Two progeny of 5 individuals from each of these populations will be planted in a common garden experiment replicated in three central European regions ranging from an oceanic to a sub-continental climate. A second experimental approach will be carried out in a sub-continental region in central Germany. We will plant different *B. davidii* genotypes at six sites along a temperature gradient in an urban area. The temperature gradient will be based on previous measurements and the degree of sealing. In both experiments, we will measure survival, growth, frost damage, and seed production. In this poster, we will present our experimental design and preliminary results of the ongoing project.

keywords: climate, evolution, common garden, differentiation

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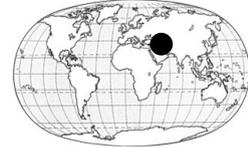
CONTRIBUTION TO THE MECHANICAL REGULATION OF INVASIVE *HELIANTHUS TUBEROSUS* POPULATIONS

Helianthus tuberosus (Jerusalem Artichoke) is a perennial reproduced from seeds and spread primarily by tuberbearing rhizomes. It is one of the most dangerous invasive plant species in Central Europe, including Slovakia. Its population and growth dynamics have not been studied yet in details and no effective control method is known to regulate its spreading. The impact (effect) of mechanical regulation of *H. tuberosus* stands has been studied by comparison of both mown and not mown populations (cuttings were done two or four times per year). Until June, the old tubers produced in the previous year had been exhausted by fast spring growth of shoots. After that, the above-ground biomass was removed as a part of the control method, so no energy and organic nutrients were accessible for new tubers production. In September, after a regeneration of above-ground shoots, the cutting was repeated. As a result of this, there was not enough time for the regeneration of shoots and forming new tubers before winter. The number of shoots and the underground biomass weight were reduced on every mown research plot, therefore mechanical regulation may be proposed as a possible control method.

keywords: control, *Helianthus tuberosus*, invasive plant, Jerusalem Artichoke, mechanical regulation

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EVALUATION OF *AZOLLA* INVASION TO THE IRANIAN FRESHWATER SYSTEM

Azolla filiculoides Lam. is an exotic species, which has occupied a vast surface of freshwater in the north of Iran. Excessive growth of *Azolla*, has not only interfered with the use of water resource, but has also created ecological and water quality problems. *Azolla* has generally invaded freshwaters with hard water, abundant nutrients with heavy use of human. To determine the reasons for *Azolla* excessive growth, three experiments were undertaken under laboratory and field conditions during 2000-2004. Results showed that rapid growth rate, high reproductive capacity and rapid dispersal of *Azolla* allow it to exploit environments with frequent disturbances. The results revealed that maximum relative growth rate (0.11 gg-1day-1) and minimum doubling time (6.27 days) were observed during May to August. The growth rate and doubling time record for *Azolla* in this investigation illustrates its rapid colonizing ability. Results showed that rapid grow of *Azolla* to the water surface had allowed the plants capture the maximum of sunlight, which cause degraded water quality and habitat conditions.

keywords: *Azolla filiculoides*, invasion, growth rate, Iran

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THE SPREAD OF ALIEN PLANTS AS A SIDE EFFECT OF THE ACTIVITY OF BOTANICAL GARDENS - DISPERSAL MODELS

Botanical gardens (in short: BGs) have a distinctive character due to the fact that these institutions contain a wide variety of plants, as well to the regular international exchange of plant material between the gardens. Therefore a specific group of weeds strongly associated with BGs can be recognized, consisting of invasive garden escapes and unintentionally introduced weeds, which have persisted in BGs for a long time. Their dispersal history in Central Europe was analyzed with respect to historical data (herbarium and literature data from the 19th and 20th centuries) and the authors' findings (in Polish BGs, 1992-1999). Early stages of the species dispersal were presented as 5 theoretical models:

- *Impatiens parviflora*: intentional introduction into one BG intentional introductions from one BG to many BGs spontaneous spread from many BGs;
- *Galinsoga parviflora* and *G. ciliata*: intentional introduction into several BGs intentional introductions into many BGs spontaneous spread from many BGs;
- *Elodea canadensis*: unintentional introduction to Europe (not into BG) intentional introduction into BGs (as well as the spread of the plant from other sources) spontaneous spread from one (or many?) BG (as well as the spread of the plant from other sources);
- *Euphorbia humifusa* and *E. maculata*: intentional introduction into BG unintentional introduction into other BGs (due to the exchange of plant material) long-term persistence in BGs (with weak tendency to spread outside);
- *Cuscuta gronovii*, *Veronica peregrina*, *Oxalis stricta* and *O. corniculata*: unintentional introduction into BG unintentional (rarely intentional) introductions into other BG.

keywords: botanical gardens, plant introduction, plant migration, models of migration

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ECOLOGICAL ASPECTS OF INVASIVENESS OF THE GOLDENROD GENUS *SOLIDAGO* L. IN CASE OF EASTERN SECTION OF THE BESKID ZYWIECKI, SOUTH POLAND

The alien perennial forbs *Solidago canadensis* and *S. gigantea* became aggressive invaders appearing vigorously across its non-indigenous range in Europe.

A survey concerning spatial patterns of distribution was carried out in eastern section of the Beskid Zywiecki, South Poland. Fieldwork data gathered between 2000 – 2004 were mapped and analyzed within the frame of altitudinal and ecological gradient. Habitat occupancy tendencies and type of plant community especially in relation to site elevation and land use were also examined.

The study enlists all documented types of habitats in which both species occur. The results suggest that patterns of species distribution in part stays determined by proper habitat availability, with *Solidago canadensis* being observed on wider array of habitats, ranging from open field meadows to forest clearings and from intact areas to sites marked with apparent anthropogenic disturbances, easily reaching higher elevated exposures and much outnumbering second species. In reverse, *Solidago gigantea* populations were found to be much constrained in habitat type, mostly reaching lower locations, however covering the area more densely when present.

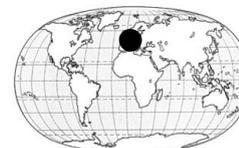
keywords: invasive plant species, phytogeography, *Solidago*, land use

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MORPHOLOGICAL RESPONSE OF TWO INVASIVE SPECIES, *ELODEA NUTTALLII* AND *ELODEA CANADENSIS*, TO THE TROPHIC LEVEL AND THE MINERALISATION OF WATER. AN EXPERIMENTAL STUDY IN CONTROLLED CONDITIONS OF LABORATORY

Elodea canadensis Michx., *E. nuttallii* (Planch.) St. John were introduced in Europe in the 19th and 20th centuries, respectively. Several authors reported that the most recent invader, *E. nuttallii*, often replaces the ancient, *E. canadensis*, especially in nutrient-rich sites. The aim was to test the hypothesis that invasive populations have evolved traits likely to increase their success or alternatively that ecological determinant factors of communities may control invasiveness. The specific aims of this study were to determine, in controlled conditions of laboratory, i) the effect of trophic level (we test 2 concentrations of phosphates 20 and 100 µg/l P-PO₄) on the growth of the two *Elodea* species, growing together or apart, and ii) the influence of the hardness of water, a factor we know to control the bioavailability of phosphorus. *Elodea* species were harvested in calcareous hard water, in a watercourse in the upper Rhine plain, (France), and, then cultivated in soft (acidic) water or in hard water.

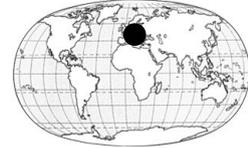
The growth rate of plants was evaluated by measurements of fresh and dry weight, length of shoots, number and length of buds and lateral shoots, number and length of roots, and number and length of internodes. Measurements were compared by using a complete three way analysis of variance (ANOVA), on ranks, with factorial design.

Our first results showed that the growth of *E. nuttallii* was higher than that of *E. canadensis*, the dry weight, the length of shoots, of roots, of lateral shoots and of internodes are significantly greater. Surprisingly, we also noted that the culture conditions have an influence, as when the two species were cultivated together, *E. nuttallii* grew significantly more and had longer lateral shoots whereas the behavior of *E. canadensis* was not modified. The trophic level did not significantly influence the growth of the two *Elodea* directly, but the statistical analysis showed an interaction species-phosphate. Finally *E. nuttallii* has a greater capacity of growth in hard water than *E. canadensis* whatever the trophic level. From these results, the invasiveness seems to be due to the biological traits rather than the environmental factors.

keywords: *Elodea*, invasion, trophic level, soft water, experimental study

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ECOLOGICAL FOREIGNNESS: THE DIFFERENCE BETWEEN ALIEN AND NATIVE

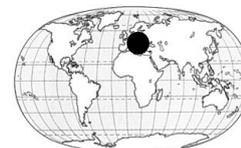
Many invasive species perform and behave differently in the new area compared to the home range, and the impact they exert on the communities in the new area does in many cases differ from the impact they have on coevolved communities. Invasion literature discusses mainly two reasons for these differences: a lack of specialist predators, or the ability to use *new weapons* the resident species are not adapted to. The contribution will show that the concept of *ecological foreignness* is suitable to synthesise these and other aspects and to give an integrative explanation for the differences in behaviour of species in their adventive versus their new range. Initial event for a biological invasion is the passing of a barrier to dispersal. As a consequence of this event, the invading species is present in an area where it did not evolve. This, in turn, leads to an *ecological foreignness* of the species: the communities as well as the abiotic conditions it is confronted with will only by chance be similar to the ones it is adapted to. At the one hand, this is the reason why so many introductions fail to become invasions, but on the other hand this foreignness in some cases can be advantageous for the aliens, as the examples of *new weapons* or the lack of predators show. There are different ways of being *foreign* to a new area: a species can be foreign in an ecological sense, if it e.g. belongs to a life form which was not present in the area before, or it could be foreign in a taxonomical sense (i.e. no congeners in the new area). The contribution will show, that a differentiation of these types of foreignness may help us to explain differences in impact of an invader in its adventive versus its home range. Finally, we will discuss the hypothesis that the impact of an invasive species on a community is stronger the *more foreign* the species is to this community.

keywords: impact, coevolution, adaptation, new weapons, predators

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IMPACT OF INVASIVE SPECIES ON THE SPECIES RICHNESS OF RESIDENT COMMUNITIES AND THE ROLE OF HABITAT IN PLANT INVASIONS

A field study was carried out to answer the following questions: (i) How do invasive species influence plant communities? In addition, to obtain a general overview of the role of habitat in plant invasions, literature data on neophytes naturalized in Czech Republic were reviewed, with an aim to explore (ii) whether there is a correspondence between habitats occupied by neophytes in their native and introduced ranges, and (iii) whether neophytes from different primary habitats differ in their invasiveness. *Heracleum mantegazzianum* (monocarpic perennial), *Impatiens glandulifera* (annual), *Lupinus polyphyllus* (polycarpic perennial) and *Reynoutria* taxa (clonal perennials) were studied in the field. For each, vegetation records of heavily invaded vegetation (60–100% cover) were compared with records of nearby not yet invaded plant communities. Taxa of genus *Reynoutria* and *H. mantegazzianum* reduced the species richness most severely, by 76.3% and 49.2%, respectively. Only a few ruderal species are able to grow under the cover of these invaders. The invasion by *L. polyphyllus* does not reduce the species richness substantially (17.4%), but results in changes in species composition, with increased representation of nitrogen-demanding ruderal species. This is likely to be caused by nitrogen fixing ability of the invading dominant. The effect of *I. glandulifera* on species richness of invaded sites was minor. On average 10-1.8 species of riparian communities occurred in stands dominated by this species. The reduction of species number (9.9%) was not statistically significant ($p = 0.096$) and neither was the change in community composition ($p = 0.268$). This makes *Impatiens* an exceptional example of a fast spreading invader, impact of which is restricted to suppressing dominant species but allowing them to re-colonize, as proven experimentally.

keywords: dominance, impact, species diversity, Czech Republic

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DISTRIBUTION AND ESTABLISHMENT OF *ROSA RUGOSA* IN DUNE VEGETATION

Species-rich dune grasslands and heaths of the Wadden Sea Islands are threatened by the encroachment of shrubs such as *Hippophae rhamnoides* or *Rosa rugosa*. The dune vegetation of the islands presents a typical landward zonation from the beach across the yellow dunes to the more stabilized grey dunes and, in the oldest parts, brown dunes characterized by dwarf-shrub heath.

Vegetation analyses considered the whole dune series and compared plots with and without *Rosa rugosa*. The total cover of the different vegetation layers, the percent cover of *R. rugosa*, and all other species were recorded. In addition, soil parameters (pH, organic matter, C, N, C/N, water content) were determined. Furthermore, the relative irradiance was investigated by comparing the light intensity beneath and outside the *Rosa*-scrub.

The vegetation types (*Ammophila*-vegetation, *Corynephorus*-sward, *Empetrum*-heath and *Rosa*-scrub) were characterized by different values of the soil parameters. The soil variables of the scrub were more or less similar across all dune types, indicating that *R. rugosa* creates its own uniform habitat. In general, the relative irradiance decreased very strongly with increasing cover of *R. rugosa*.

Vegetation parameters of *R. rugosa* shrubland was very similar in the different dune types. Distinct differences were found between the four vegetation types. Vegetation parameters were more similar between the *Ammophila*-vegetation and the *Corynephorus*-swards and between the *Empetrum*-heath and the *Rosa*-scrub. Scrub of *R. rugosa*, which is established in all of the three dry dune types, is often accompanied by the moss *Brachythecium rutabulum* and, is moreover characterized by the absence of other accompanying species. The majority of species showed a decrease in cover with increasing dominance of *R. rugosa*. Only few herbaceous species, which are in general typical shrubland-species, increased with increasing shrub cover.

In general, the total number of species decreased with increasing cover of *R. rugosa*.

Specifically, the number of typical shrubland-species slightly increased and the number of typical grassland-species decreased more strongly with increasing cover of *R. rugosa*. The number of threatened species declined in the species-rich *Corynephorus*-sward.

The encroachment of species-poor scrub types, e.g. with *R. rugosa*, which are characterized by the dominance of one or two shrub species and a simple vegetation structure reduces the species diversity. Especially species-rich dune vegetation could be threatened by the expansion of *Rosa rugosa*-scrub. These scrub types have a low conservation value and could present a serious conservation problem in dune habitats of our region.

keywords: coastal dunes, shrub encroachment, species richness, Wadden Sea

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BIOLOGICAL CONTROL POTENTIAL OF *ARUNDO DONAX* (POACEAE) IN THE U.S.

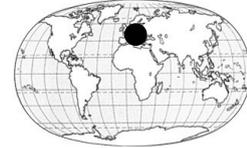
Arundo donax is a widespread invasive grassy weed in California and the southwestern U.S. It is thought to originate in the Mediterranean area of Europe and to have been brought to North America by the early Spanish invaders. Collections of plant material for phylogenetic studies have been made from Nepal to the Canary Islands. It is a biocontrol target because of its intransigence to cultural and chemical control and its disastrous impact on the local ecology. *Arundo donax* in the Mediterranean region does not appear to be so invasive. On the average, 55% of an *A. donax* stand was dead in France and Spain compared to 22% in California. In France and Spain, 90% and 80%, respectively, of the canes in the 1-100cm length class were attacked by a Chloropid fly species; other important arthropod natural enemies are a Eurytomid wasp *Tetramesa* sp. and a Diaspid scale insect. No Chloropids were found in *Arundo* stands observed in California and Texas in 2003. Cane density per square meter was lower in France than in California and New Mexico where canes were significantly taller and thicker. In addition to the arthropods, several pathogens including bacteria, *Fusarium* spp., and *Nigrospora* sp. have been associated with cane death in Europe. The Chloropid species that attack *A. donax* in Europe are associated with a fungus and/or bacterium. From these preliminary results in Europe, it is clear that biological control has the potential to limit invasiveness of *A. donax*. Initially a search for natural enemies in areas of the weeds native range climatically similar to the regions infested in the U.S. would be needed. Evaluation of natural enemy host specificity and their impact on the weed would lead to selection of the most efficacious agents for release in the U.S.

keywords: *Arundo donax*, biological control, invasive weeds

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A NATIONAL SURVEY AS “BUTTON UP APPROACH” TO DETECT INVASIVE PLANT SPECIES IN GERMANY

Results of a national survey on alien plant species addressing 360 regional and local conservation authorities in Germany are demonstrated.

The amount of problems reported (96%) indicate that invasive alien plants are a important issue for conservationists in Germany. Even though 57 species have been mentioned all together, only four species/groups present over 50% of all records (*Heracleum mategazzianum*, *Impatiens glandulifera*, *Fallopia spec.*, *Solidago gigantea* and *S. canadensis*). Six other species/groups (*Robinia pseudoacacia*, *Prunus serotina*, *Elodea canadensis* and *E. nuttallii*, *Impatiens parviflora*, *Helianthus tuberosus*, *Lupinus polyphyllus*) cover 80% of the records and an other 11 species have been mentioned more than ten times. There is only a few variation, but *Prunus serotina* and *Rosa rugosa* are more often mentioned in northern countries, *Robinia pseudoacacia* and *Acer negando* in the eastern. On the basis of this data, 25 plant species can be regarded as invasive (in the meaning of threatening biodiversity) in Germany.

The data also reveals that this “button up” approach to detect alien species is not satisfactory. Participants are in most cases not able to describe problems in detail and they are often transcribed not on the impact but on the observation level. Although the named alien species are often considered problematic, only in 39% of all cases control measures are taken whereof only 23% are regarded as „successful“. Moreover, some problematic species are very rare but not less problematic (*Lysichiton americanus*, *Vaccinium angustifolium x corymbosum*). Therefore, a “top down” approach is needed, defining criteria for invasiveness for conservational purposes.

keywords: invasive alien plants, national survey, Germany

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HELIANTHUS TUBEROSUS L. PHYTOCOENOSES IN THE TOWNS OF UPPER SILESIAN INDUSTRIAL DISTRICT (SILESIAN UPLAND)

Helianthus tuberosus L. is considered as an alien species of North-American origin in Polish flora (agriophyte). It was introduced into Europe in XVII century.

There were carried out phytosociological research in *H. tuberosus* L. aggregations during 1999-2004 years in towns of the Upper Silesian Industrial Region. *H. tuberosus* phytocoenoses occupy refuse dumps, edges of allotments and roadsides, urban wastelands or sites where the fresh soil layer was deposited. They do not cover large areas and can be found in the mosaics with ruderal or nitrophilous plant communities.

The collected material was ordinated with the use of PCA method. The relevés were also classified with the use of Cluster Analysis and the results of classification were imposed upon the ordination diagram. In order to show the floristic differentiation of *H. tuberosus* phytocoenoses the phytosociological table was made taking into account the above-mentioned classification.

In phytocoenoses of the investigated area apart from nitrophilous species from the *Convolvuletalia sepium* order a significant share have species from the *Arction* and *Convolvulo-Agropyron* alliances owing to they approximates some phytocoenoses which were described by many authors.

It is a difficult community to place within phytosociological scheme. The phytocoenoses where kenophytes predominate, growing near willow thickets or carrs from the *Salicion albae* alliance, were included into the *Convolvulion sepium* alliance.

Kopecký (1985), Hejný et al. (1979), Oberdorfer (1983) placed *H. tuberosus* stands from the ruderal sites into the *Eu-Arction*, the *Dauco-Melilotion* or the *Aegopodion podagrariae* alliances. The phytocoenoses of the study area were classified in a community rank and grouped into the *Arction lappae* alliance and the *Onopordetalia acanthii* order.

keywords: agriophyte, invasive plant, Upper Silesian Industrial District, ruderal phytocoenoses

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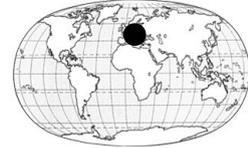
PHYTOCOENOSES WITH *BUNIAS ORIENTALIS* L. ON THE ANTHROPOGENIC HABITATS OF THE CRACOW-SILESIAN UPLAND (POLAND)

Bunias orientalis L. is considered as an epiphyte (Zajac et al. 1998) in Poland. The aims of research which were conducted during 1995-2004 years in chosen towns of the Cracow-Silesian Upland was to show the floristic differentiation of *B. orientalis* stands, their habitat preferences, to compare these phytocoenoses with others which can be found in some European countries and to determine if they should be considered as a separate association. There were made phytosociological research in ruderal habitats. On the basis of numerical analysis there were arranged phytosociological tables. The phytocoenoses apart from a dominant are made of ruderal species from the *Onopordetalia acanthi* order and the *Artemisietea* class and meadow species from the *Molinio-Arrhenatheretea* class. They occur among various ruderal and nitrophilous communities from the *Artemisietea* class, meadow associations from the *Molinio-Arrhenatheretea* class and some thermophilous thickets. At the first the phytocoenoses with *Bunias orientalis* were included into *Sisymbrietum sophiae* association (Fijałkowski 1966, 1968). Fijałkowski 1978; Święs, Kucharczyk 1982, Święs 1986 grouped them into a separate association *Bunidetum orientalis*. Mirek, Piękoś-Mirkowa (1992), who examined *Bunias orientalis* phytocoenoses in the northern sub-Tatra region pointed out their affinity with meadow communities from the *Polygono-Trisetion* alliance. Phytocoenoses from the study area show intermediate position between ruderal phytocoenoses from the *Onopordetalia acanthii* order and meadow communities from the *Molinio-Arrhenatheretea* class. Species from the *Stellarietea mediae* class do not play significant role in their floristic composition. According to our research they should be considered only as *Bunias orientalis* aggregations.

keywords: invasive plant, Cracow-Silesian Upland, *Bunias orientalis*, anthropogenic habitats, ruderal communities

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DISTRIBUTION OF INVASIVE PLANT SPECIES' TRAITS IN GERMANY

Biological invasions are among the most important threats to biodiversity. Thus it is crucial to predict biological invasions. Usually species are in the focus of such analyses. Typical questions are e.g. which species may become invasive or what are the characteristic traits of species being invasive? Another important issue is the spatial prediction: where will invaders be found geographically? While much information exists on the distribution of invasive plant species the distribution of 'invasive traits' was never studied before. A comparison of traits of invasive vs. non-invasive species in Germany is conducted using the database BIOLFLOR. We will provide the current distribution of particular traits and their relative abundance in Germany. This is a prerequisite to understand the relationship between traits of invasive species and the environment in a spatial context and to provide a complementary way for predicting biological invasions.

keywords: plant traits, Germany, successful invaders, risk analysis

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IMPORTANCE OF WATER PRIMROSE (*LUDWIGIA SPP*) MONITORING IN THE RIVER LOIRE VALLEY (WORLD HERITAGE AND EUROPEAN SITE) IN ORDER TO ORGANISE THE ECOLOGICAL MANAGEMENT AND THE BIODIVERSITY CONSERVATION

A French national program INVABIO: Biological Invasions started in 2003 linking researches about Water Primrose biology, ecology, ethnobotanical representation, propositions and economic conditions of management. The objective of this study concerns extension of Water Primroses, evaluation of their competition with native plants and European habitats, proposition of management procedures, development of a global conservation program to survey natural habitats which are highly influenced by extension of invasive species. The impact of Water Primroses is studied on the river Loire valley where *Ludwigia spp* are in great competition with European habitats (*Isoeto-Nanojuncetea*, *Chenopodion rubri p.p.*, *Bidention p.p.*) in the river bed. The first surveys revealed the presence of *Ludwigia peploides* and *L. hexapetala* in homogeneous or heterogeneous vegetation where *L. hexapetala* appears to be dominant. The biotopes typology (river banks, emerging sand banks, ...) submitted to different ecological conditions emphasizes the large ecological amplitude of Water Primroses in the river Loire valley. It also shows their variability in the competition strategy within native plants or other invasive species as *Paspalum paspalodes*. The results of this competition will be presented in term of abundance and dominance of the species and with the description of the structures of the studied vegetations. The Park started to developed his own GIS to endow information and exchange with all partners. Synthetic maps over the different years, maps of extension of Water Primroses compared to the location of European habitats will be presented in order to propose management targets of this European site (choice of technologies to be used for limiting Water Primroses extension, amount of biomass to be considered, ...)

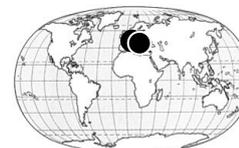
keywords: *Ludwigia*, invasion, river Loire, typology, European habitats

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PATTERNS OF PLANT TRAITS IN ANNUAL SYNANTHROPIC VEGETATION ALONG THE URBANITY GRADIENT IN THE CZECH REPUBLIC

Variation in species composition and proportion of different plant traits was studied for annual weed and ruderal vegetation in the Czech Republic, with a focus on differences between agricultural and urban environments. A data set of 2715 plot records of species composition, which contained 1009 plots from cereal fields, 889 from root-crop fields, 401 from villages, and 416 from towns was used for the analysis. Detrended correspondence analysis revealed that major changes in species composition were associated with macroclimate variation (annual rainfall, mean annual temperature and elevation), seasonal changes and the year of record. Habitat type (arable field vs. settlement) had also significant effect on the species composition. To investigate structural changes in vegetation between arable fields and settlements, we subtracted the variation in species composition attributable to the other factors, using partial canonical correspondence analysis, and established a single constrained axis related to the urbanity gradient. Then we related this gradient to species traits, using logistic regression of traits on the constrained axis. The majority of traits considered showed a clear habitat dependence if the analysis was done with individual species, but some of these trends became weaker when the analysis was corrected for phylogenetic relationships among species. Moving from arable fields to settlements, archaeophytes decreased and neophytes increased, species reproduced only or mostly by seeds decreased and species reproduced by both seeds and vegetatively increased, annual species decreased and biennial and perennial-pollakanthic species increased. Therophytes decreased and phanerophytes increased, R-strategists decreased and C-strategists increased, species with persistent seed bank and species with overwintering green leaves decreased. Pollination mode shifts from insect, selfing a pseudocleistogamy on arable fields to wind in settlements.

keywords: CCA, Central Europe, logistic regression, weed and ruderal vegetation

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THE IMPACT OF *REYNOUTRIA SACHALINENSIS* ON VEGETATION - EXCLUSION OF TALL FORBS AND FACILITATION OF THE DEVELOPMENT OF ANCIENT WOODLAND FLORA

Reynoutria sachalinensis is a very tall Asian perennial, which has been spreading in Europe recently. *Reynoutria* spp. spread by producing numerous suckers, and exclude other vegetation from the site. However most reports come from ruderal sites and less is known about its interactions with natural and semi-natural vegetation.

In order to estimate the impact of *R. sachalinensis* on species-rich semi-natural vegetation, the vegetation inside and outside three large clumps of *R. sachalinensis* (each 200-300 m²), growing along a stream in Sokołowsko (the Sudety Mts, SW Poland), was studied.

The studied area is a narrow strip of flood-plain located between a stream and a steep slope overgrown by spruce plantation. The area is an abandoned hay meadow with remnants of ancient forest vegetation, which now constitutes a successional mosaic of meadow and woodland species dominated by large forbs (*Petasites* sp. div., *Urtica dioica*, *Chaerophyllum aromaticum* etc. In this place three clumps of *Reynoutria* were found, each ca. 400 m apart.

In each *Reynoutria* clump the vegetation was sampled using four 2 x 2 m squares, i.e. two squares were set up 3 m outside the clump, up and downstream, and two squares were set up 3m into the centre of the *Reynoutria* clump.

The vegetation outside the clumps was much richer in species and none of the forbs clearly dominated. The vegetation under the *Reynoutria* canopy is sparse and is mainly constituted by spring-flowering typical ancient woodland indicators such as *Anemone nemorosa*, *A. ranunculoides*, *Ficaria verna* and *Leucojum vernum*. These species also occur in the surrounding meadows but they flower more abundantly in *Reynoutria* clumps.. Their good health and abundance can be attributed to the fact that a dense *Reynoutria* canopy appears in mid-May allowing the spring flora to develop, simultaneously excluding the competition from other tall forbs whose shoots develop earlier than those of *Reynoutria*.

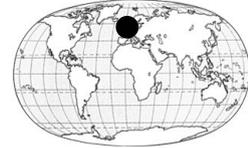
In conclusion, *R. sachalinensis* is a serious danger for Sudety Mts streamside forb communities. On the other hand it creates good conditions of growth for some valuable woodland plants. *R. sachalinensis* can be viewed both as an inhibitor of succession as far as the development of tree canopy is concerned and as its facilitator where the herbaceous woodland flora is concerned.

keywords: exotic species, succession, *Anemone*, Sudety Mts, ancient woodland indicators

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ASSESSMENT OF VIABILITY OF *FALLOPIA* SPP. (JAPANESE KNOTWEED)

RHIZOME

Observations at a variety of sites under a number of different treatment regimes over a period of several years have indicated the capacity of several large *Fallopia* species to remain in a semi dormant condition for periods which may extend into several years. Typically, no aerial shoots are evident, but the rhizome remains viable and capable of regenerating growth above ground when suitably stimulated. This growth pattern reflects the ability of the plant as a primary coloniser in volcanic areas.

Assessment of success of control treatments is frequently dependent on observation of presence or absence of aerial shoots. In view of the foregoing, this is not considered to be a reliable methodology as it not possible to tell, by this method, if the rhizomes are dormant or dead. The only currently available test for rhizome viability requires assessment of growth after incubation for 30 days.

In order to develop a more rapid methodology which can demonstrate definitively whether rhizome is capable of regeneration, a range of viability assessment techniques have been investigated. Initial results indicate that it is difficult to quantify tissue responses, but it is hoped that the work may lead to the development of an efficient, rapid test.

keywords: Japanese knotweed, rhizome, viability

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LAND USE DETERMINES GROWTH AND REPRODUCTION OF INVASIVE BOX-ELDER (*ACER NEGUNDO* L.) IN BIAŁOWIEŻA FOREST (NE POLAND)

Beside the impact of the global and local transport on the spatial spread of species, our understanding of the mechanisms of direct and indirect interactions of humans and invasive species is far from being exhaustive. The aim of this paper is to examine to what extent the life history traits of individuals of *Acer negundo* (box-elder) are modified in habitats differing in the light availability and the probability of damages due to land use. The study was carried out in a 25 km² large research plot located in the centre of the Białowieża Forest. The dbh of all stems and the height of all individuals were measured; the sex and the number of samara clusters was assessed and number of damages to the stems were noted. The age of individuals from various light environments was assessed using increment cores.

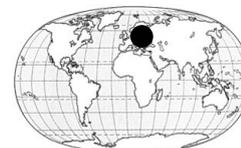
The individuals in the forest were higher, had lower dbh, stem number and the number of samara clusters, than outside the forest. In the forest, the minimum reproduction age was three times longer, the height of reproducing individuals - greater and the number of samara clusters produced by individuals in every age class smaller, than outside the forest. The impact of the land use intensity was different in forest and non-forest habitats. In the forest box-elder individuals occurred only in intensively managed pine plantations. The frequency of cut stems increased with the intensity of land use, but the regrowth of individuals was faster and more frequent in non-forest habitats. The time to the first reproduction after cutting of all stems of an individual was 50% shorter, than the time to the first reproduction after seed germination.

I conclude that the light availability and the probability of damages resulting from the human land-use both determine the invasibility of different habitats by the box-elder. At the landscape level, suitable and unsuitable habitat patches may function as a source-sink metapopulation, due to the unequal reproduction rate.

keywords: woody alien species, life history traits, light availability, disturbances, body damages

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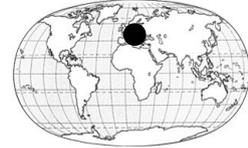
ECOLOGICAL CONDITIONS, RESOURCES, AND IMPACTS OF INVASIVE PLANTS IN AREA OF CLOSED LANDFILLS

Investigations on neophytocoenoses and species diversity in wood communities of neophytes were accomplished in 4 closed landfills in Vilnius. Besides the Braun-Blanquet approach, the method of Kopecky and Hejny complementary vegetation classification was also employed. Special indices of species diversity were used. Leachate is the main factor of pollution in landfills. Before a few decades the closed landfills reached the methane stage. There were four large vegetation complexes distinguished. Phytocoenon *Sambuco racemosae-Aceretum negundi* (with three maturity stages) is one of most characteristic vegetation unit of complex of wood, shrub and ruderal herbs. It is spread in the areas with dangerous degree of contamination. Phytocoenon *Lamio albi-Prunetum cerasiferae* occupies the areas with very dangerous degree of contamination in the zone of pollutants infiltration. It is distinguished by the complexes of synanthropic ($N_{sa}=55.8\%$) and pliurizonic ($N=58.4\%$) species. In landfills the preoptimal (youthful) stage of phytocoenon *Sambuco racemosae-Aceretum negundi* has very low value of species uniformity, but its communities have already attained more than half of the maximum possible value of species diversity. Preoptimal stage (II maturity group) and optimal stage (III maturity group) of the phytocoenon together with phytocoenon *Lamio-Prunetum* (II maturity group) were distinguished by high condensation degree, showing the completeness of their formation. Irregularity of species abundance, rapid changes of structure, the maximum entropy not exceeding 0.7 are typical for neophyte woods. Neophyt herb species are notable for tendency to form monodominant layer of wood communities and for their high productivity, and on this basis, specific balance of matter and energy of ecosystems, maintaining their not typical structure, form. Biotic factors initiate the ruderalisation.

keywords: neophytocoenoses, neophyte woods, species diversity

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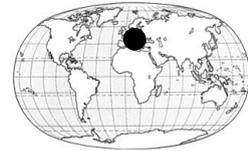
AERIAL PHOTOGRAPHS AS A TOOL TO SURVEY AND INVASIVE HERBACEOUS PLANT: PROMISES AND PITFALLS

The Giant Hogweed (*Heracleum mantegazzianum* Somm. et Lev.) is known to be invasive since the 1950ies. The aim of the presented study was to create an individual-based model (IBM) to assist management decisions. Within a project to describe and prevent invasion of Giant Hogweed in Europe, we were concerned with local spread of the plant. Thus, it was essential for us, not only to reproduce demographic dynamics, but also spatial behaviour of a population (namely, spread rates). Today, the plant has formed extensive stands around its nascent focus in the Czech Republic. We had the opportunity to use a time series of aerial photographs to follow the different stages of local invasion, from the first plants till today stage. We used empirical data collected from those populations at their present state and parameterize a model of local spread. The model results then were compared with the dynamics visible on the aerial photographs, covering a time span of approximately 50 years. On the aerial photographs flowering plant could be identified and the area occupied by them calculated. We used a Virtual Ecologist approach to illustrate potential biases arising from this method. Discrepancies between IBM results and the insights gained from the time series are discussed for further adjustment of the IBM model. We also consider how the procedure could assist to predict potential spread of today small populations. An estimation of their future expansion would be helpful for management advice.

keywords: aerial photographs, *Heracleum mantegazzianum*, virtual ecologist, modelling

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THE NEOPHYTE-FLORA OF AN INNER ALPINE REGION (NORTHERN TYROL, AUSTRIA)

The inner alpine region of Northern Tyrol is located in the Eastern Alps and encompasses an area of 10.600 km² kilometres, whereby less than 10% are beneath 1000 m a.s.l. The central part is enclosed by rather high mountain ranges and there is only one corridor in the northeast, which is open to the alpine foreland (Germany). Therefore, the possibility for alien plants to invade the area is restricted. The only migration path is the Inn-valley, which extends in an east-west direction and shows a gradient of increasing continentality and elevation.

Nevertheless about 550 neophyte taxa of higher plants (*Pteridophytes*, *Gymnosperms* and *Angiosperms*) are recognised in the flora of Northern Tyrol. The total flora consists of about 2350 taxa (including microspecies of *Hieracium*, *Rubus*, *Alchemilla* etc.), i.e., more than 20% of the flora are neophytes. About 100 taxa are considered as established, whereby c. 50% are invasive and 25% are problem plants. Sites of >100 species are currently unknown.

Analysis of the immigration modes show that with the exception of few examples like *Senecio inaequidens*, human intervention is nearly alone responsible for the high number of alien plants. Nearly one third of all species arrived with intentional intervention of humans and includes almost all neophytes that may cause environmental problems. In contrast to this, further distribution in the inner alpine region of Northern Tyrol takes place without (e.g., along streets or railway tracks) or with unintentional intervention of humans (e.g., soil transport), but intentional dissemination by man (e.g., apiculture) is still an important factor for some weeds or transformers.

keywords: neophytes, Austria, alpine region

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THE CHEMICAL COMPOSITION OF PLANT LITTER OF *ROBINIA PSEUDOACACIA* L. AND ITS ECOLOGICAL ROLE IN SANDY ECOSYSTEMS

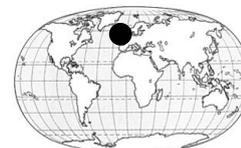
Robinia pseudoacacia is a species of North American origin considered in Poland as an invasive plant. It is used for reclamation of sand excavations and other post-industrial sites, most often to advance the process of soil and plant succession. The positive effect of *R. pseudoacacia* on a habitat is primarily connected with the chemical composition of plant litter as well as with the biology of the species.

Samples for investigation were taken from reclaimed areas of Bukowno sand excavation (Southern Poland). Chemical composition of *R. pseudoacacia* litter (green leaves, leaf litter, bark, fine twigs, root) have been researched. By means of AAS after wet mineralization of samples the composition of macroelements (C, N, P, Mg, K, Ca, Na) microelements (Mn, Mo, Co, Fe, Al, Zn, Si, Cd, Sr) and plant litter reaction have been determined. The greatest accumulation of elements has been observed in the following parts: green leaves (Ca >K >Mg >P >S >Na >Fe >Zn >Al >Mn), leaf litter (Ca >K >Mg >Si >Fe >P >Na >Al >Zn >Mn). Similar regularities are observed in the remaining litter of *R. pseudoacacia*. It must be emphasized that nitrogen occurs in similar quantities in particular samples and it varies from 1,01 to 2,65%. The plant litter reaction (pH) vary from acid (bark and fine twigs – 3,6) to weak acid (green leaves and litter – 5,3). After withering the leaf litter becomes the source of nutrient compounds which may be assimilated by plants and to a large extend it modifies the habitat conditions, in particular, it has an influence of the rate of soil forming processes. In a short period of time under the canopy of *R. pseudoacacia* a 10 cm organic and humus horizon (O/A) has developed.

keywords: *Robinia pseudoacacia*, invasive tree species, plant litter, nutrient elements, soil formation, sandy soil

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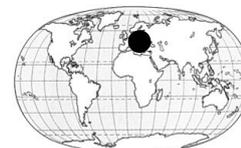
INUNDATIVE BIOCONTROL OF *AZOLLA FILICULOIDES* USING A SPECIALIST WEEVIL

The floating fairy fern, *Azolla filiculoides* is a largely unwelcome invader in the UK and Europe, capable of rapidly smothering still or slow-moving freshwater habitats with a thick vegetative mat which excludes light and oxygen. Small fragments of plant material can establish a new infestation and are often found as contaminants of aquatic plants for sale but can arrive on visiting birds. The same weed became invasive in South Africa where it was soon the subject of a classical biological control programme. As a result of this research the highly-specific American weevil, *Stenopelmus rufinasus*, was released after safety testing, with great success. Remarkably, the same weevil arrived accidentally in the UK as early as 1921 and most probably many times since, but was faced with less favourable climate. This may be the reason it has failed to provide continual sustainable control countrywide. Nonetheless, this naturalised agent has been proven to control and even eradicate relatively large *Azolla* infestations, mirroring performance in our lab studies. Demand for inundative releases is increasing but the challenge remains to convince the user that an early season application at the first sign of the weed is the best way to use this highly effective insect.

keywords: Biological Control, *Azolla*, *Stenopelmus rufinasus*

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**HEMLOCK *CONIUM MACULATUM* L. – AN INTERNATIONALLY INVASIVE
POISONOUS PLANT OF EURASIAN ORIGIN: ITS REGIONAL STATUS,
PHYTOCOENOLOGICAL SCALE AND SELF-BUILT COMMUNITY IN
WIELKOPOLSKA (MIDDLE WEST OF POLAND)**

Conium maculatum is today almost a cosmopolitan plant species showing its high invasiveness in many remote parts of the world (in America, Africa, western Europe and even Australia with New Zealand). Its natural distribution remains still uncertain although the plant is regarded to be of Mediterranean-all-Irano-Turanian origin (Zajac 1987) and in Poland it is considered to be an ancient alien species – the so-called archaeophyte (Mirek et al. 2001). In the large provinces of Wielkopolska and the Western Pomerania the species has been so far regarded as rare (Żukowski, Jackowiak, ed. 1995). In 1999 large phytocoenoses dominated by hemlock were found in two sites near the Poznań agglomeration. The largest and most luxuriant phytocoenoses were found on an industrial waste dump near a potato processing factory, although some well-developed communities were also observed in a typically agricultural landscape. The mentioned communities were subject of observations and phytosociological documentation, supplemented by some data from the Gnieźnieńskie Lakeland. Furthermore, *C. maculatum* has also been repeatedly recorded from various natural plant communities developing in the neighbourhood of the investigated localities.

The author would like to present chosen data and to propose discussion focused on:

- (1) the floristical structure and
- (2) syntaxonomical status of the investigated hemlock community, as well as
- (3) the occurrence and present status of *C. maculatum* in other vegetation types, particularly of natural origin.

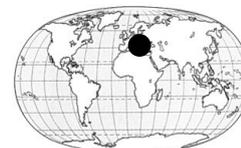
The results may contribute to general information about contemporary phytocoenological scale and potential invasiveness in Poland of this highly poisonous plant.

keywords: alien plants, status, *Conium*, plant communities

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COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) INVASION IN HUNGARY

Ambrosia artemisiifolia L. (common ragweed) first appeared in the 1920's in South-West Hungary. The plant started to spread rapidly, and has invaded almost the entire territory of the country becoming the most harmful agricultural weed.

In addition to the detriment of the agricultural income, it also causes serious health problems. Some 20% of the population suffers from the symptoms of allergy, while 80% of them are allergic already to ragweed.

An unprecedented social and political cooperation started when the roots of the problem became widely-known. Politicians, the government, a great number of NGO-s, scientists and people started to organise their own campaigns and actions, including amendments to render even more stringent regulations. However, without harmonisation and cooperation, these were not efficient enough.

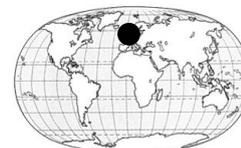
In order to increase the efficiency of the actions, Municipality of Budapest and Pest County Council worked out the basis of a wide cooperation, and launched their first joint campaign in 2004. The key objective was to raise the awareness throughout the whole society. Via the media, by organising drawing and ragweed collection competitions both for children and adults (communities), more and more people joined the campaign and started to act. To ease bureaucracy, the two municipalities started to operate a public ragweed hotline for people to report about infected areas, and then to forward the data to the competent authorities.

In spite of all the efforts we still have not found a satisfactory solution to stop the invasion of common ragweed.

keywords: common ragweed (*Ambrosia artemisiifolia*), pollen allergy, invasion, cooperation, raising awareness

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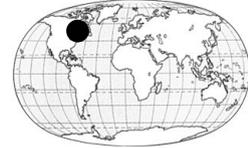
THE POTENTIAL FOR THE BIOLOGICAL CONTROL OF *IMPATIENS* *GLANDULIFERA* ROYLE IN THE UK AND EUROPE

Impatiens glandulifera Royle (Himalayan balsam) is invasive in thirteen EU countries and introduced to more than twenty. The weed has successfully invaded almost every riparian system in the UK at a remarkable rate since its introduction as a garden ornamental in 1839. Currently *I. glandulifera* is naturalised in over 50% of the 10 km recording squares of the UK and this, the tallest annual in the country, is able to out-compete the most resilient species due to its vigorous growth rates, large seed banks and prolific, widespread seed dispersal. Where *I. glandulifera* forms monocultures in riparian habitats the effects on the local ecosystem can be severe, including bank erosion, biodiversity loss and increased flooding risk. The environment agency have placed a figure of between £150- £300 million for its eradication in the UK. Current control methods are usually difficult and costly and often not attempted due to the location and sensitivity of the habitat invaded, or the sheer scale of the problem. *I. glandulifera* is native to the Himalayas, from where it arrived without its suite of natural enemies, so it should be amenable to classical biological control. The case is strengthened by the discovery of *Puccinia komarovii*, a natural enemy of *I. parviflora* catching up with its host in Central Europe as reported by EMAPI 6. Herbarium studies indicate similar co-evolved pathogens exist on *I. glandulifera*. Any biological control agent would, as always, need to be highly specific especially due to the presence of the native and scarce *I. noli-tangere* in the UK. This paper examines the distribution and spread of the weed in the UK and Europe, the scale of the problem, control methods, and the potential for its biological control. The likely constraints are also discussed.

keywords: *Impatiens glandulifera*, Himalayan balsam, biocontrol, natural enemy, invasive weeds

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A CANADIAN STRATEGY TO ADDRESS THE THREAT OF INVASIVE ALIEN PLANTS AND PLANT PESTS

In Canada, as in other countries, invasive alien species have severe and often irreversible impacts on native ecosystems, and cost the forestry and agriculture industries billions of dollars annually. Increases in international trade, travel and other factors have increased the frequency of new species introductions to Canada. This trend is expected to continue in the future.

To protect Canada's plant resources, related industries and natural environments, government and non-government groups from all jurisdictions in Canada have undertaken the development of a national strategy to address invasive alien species. The strategy integrates environmental, economic and sociological considerations into decisions regarding invasive species. It enhances co-ordination and co-operation among partner agencies, strengthens programs to protect natural resources, and maximizes collaboration to ensure that limited resources target highest priority issues.

One of these agencies, the Canadian Food Inspection Agency (CFIA), plays a leading role in protecting Canada's plant resource base. It guards against the entry and spread of plant pests and diseases from foreign countries and works to control or eradicate introduced pests and diseases. These include plants, viruses, fungi, bacteria, mycoplasmas, nematodes, insects, and mites.

keywords: Canada, plant pests

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CHANGES IN PLANT SPECIES RICHNESS IN SOME RIPARIAN PLANT COMMUNITIES AS A RESULT OF THEIR COLONISATION BY TAXA OF *REYNOUTRIA (FALLOPIA)*

The aim of the study presented was to estimate the type and scale of threat posed by alien plant species with regard to native biological diversity, especially in view of the fact that these problems have hitherto rarely been addressed in Poland.

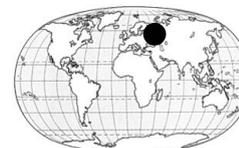
The studies were carried out using the example of *Reynoutria (Fallopia)* species which are considered to be invasive in our country as well as in other regions of Europe and of the world. This is an attempt to determine the impact of these plants on the composition and diversity of natural components of the herb layer in floodplain forests in the example of fragments of valleys of the Soła, Biała and Jasienica rivers in the southern part of Poland. Investigations were performed on permanent study plots (20m x 20m) localised in patches of floodplain forest.

The composition and diversity of species in the floodplain forest herb layer was found to be dependent on the extent to which the investigated plot was covered by knotweed shoots. The results of these field studies have confirmed the hypothesis that *Reynoutria* species exert a negative influence on the native components of floodplain forest herb layers. This impact is, however, different for various life forms and ecological habitat groups of plants. Increases in the proportion of the surface covered by knotweeds does not significantly influence the development of early spring geophytes which are able to go through their full life cycle. In the case of this ecological group, a decrease in coverage coefficient can only be seen in plots with a massive occurrence of knotweeds. The following species are able to compete successfully with knotweeds even if these plants are present at a high coverage coefficient: *Aegopodium podagraria*, *Urtica dioica* (rhizomatous perennials with similar modes of growth), balsams: *Impatiens parviflora* and *I. glandulifera* (alien annuals with an R-type life strategy) and *Calystegia sepium* (a creeper).

keywords: alien species, *Reynoutria*, floodplain forest, ecological impact

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MICROEVOLUTION PATTERNS IN INVASIVE SPECIES

Microevolution of the most widespread European invasive species was studied - *Acorus calamus*, *Amaranthus albus*, *Ribes aureum*, *Aronia melanocarpa*, *Acer negundo*, *Impatiens glandulifera*, *I. parviflora*, *Epilobium adenocaulon*, *E. rubescens*, *Echinocystis lobata*, *Bidens frondosa*, *Conyza canadensis*, *Chamomilla suaveolens*, *Galinsoga parviflora* and *G. quadriradiata*.

An important common pattern for all those species was established: a broad genotype reaction's norm, caused by their native distribution range out of the ecological optimum zone.

A type of propagation does not influence a naturalization potential, e.g. successful invaders are *Acorus* (vegetative propagation), as well as the cross-pollinators *A. negundo*, *C. canadensis* and the self-pollinator *Galinsoga*. In contrary, a type of propagation determines an adaptation mechanism: in cross-pollinators the adaptation pattern is represented by genes recombination and following natural selection; in self-pollinators and apomicts micromutation of physiological characters (those further stay intact in pure lines) starts already at initial population stage and results in broadening of the reaction's norm. Thus, two types of natural selection are demonstrated – moving selection in the first case and stabilizing selection in the second.

Cross-pollinators during naturalization invent and then genetically fix the most important adaptive characters, like shorter growth period and faster complete development cycle in gradient from South to North. According to the same gradient *C. canadensis* records a reasonable growth of winter forms percentage in populations and *A. negundo* demonstrates increasing of seeds' hardiness and resting period. Long-day plants are influenced mainly by temperature and precipitation, short-day ones – by a day length.

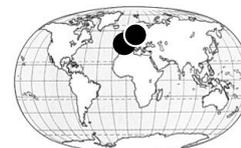
In contrary, self-pollinators, apomicts and vegetatively propagated species demonstrate a relative stability of bio-morphological characters within the secondary distribution ranges. Variability of growth and developments cycles is either not present or has a chaotic, inter-populations character with no clines. This phenomenon could be explained in the following way: a selection of eurytolerant lines and clones is taking place at the earliest naturalization stages and those lines remain genetically stable (almost unchanged) ever since.

keywords: microevolution, *Conyza*, *Galinsoga*, *Impatiens*, *Echinocystis*, *Bidens*

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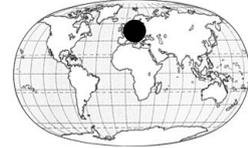
COMPETITIVE BALANCE BETWEEN THE ALIEN INVASIVE *ACACIA* *LONGIFOLIA* AND NATIVE MEDITERRANEAN SPECIES

Non-native species like *Acacia* spp. have been introduced in Portugal at the beginning of the last century with the aim to stabilize sand dunes. However, these species became invasive in some areas, reducing native species density and biodiversity and causing serious ecological problems. In spite of the high seed rain and germination rate, seedling survival of the invasive species is low, especially in the arid south coast, where successful establishment is restricted to nursery plants. We explored the hypothesis of a shift in competitive balances among the invasive and native species at different developmental stages. This hypothesis was explored in a competition experiment of seedling of the invasive *Acacia longifolia* versus the indigenous Mediterranean dune species *Halimium halimifolium* and *Pinus pinea* during early seedling stage and among established plants. Competitiveness was tested using an additive experimental design in combination with ¹⁵N labelling experiment. The major competitive advantage of *A. longifolia* was its constitutive high shoot elongation rate and its effective nutrient acquisition. Established *A. longifolia* plants were highly competitive and tolerant against competition from native species. However, during early seedling stage, *A. longifolia* was less competitive and sensitive towards competitions of the native *H. halimifolium*. We argue that this susceptibility together with drought sensitivity may restrict the spread of the invasive *A. longifolia* under less favourable environmental conditions (e.g. in the South).

keywords: alien invasive *Acacia*, competition experiment, coastal dunes, seedlings

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HOMOGENIZATION EFFECTS ON A PLANT-FUNCTIONAL SCALE

As one of the most important results of plant invasions, biotic homogenization, the replacement of local biotas by nonindigenous and locally expanding species, will increase in the next years. Almost all of the conducted studies related to this issue, focused on species. Due to this fact our approach was to focus on plant traits to determine functional traits, which are influenced by biotic homogenization. With the help of different data-bases we analysed changes in functional diversity of continental and regional floras. The poster represents first results of these statistical analyses.

keywords: biotic homogenization, functional traits, invasions

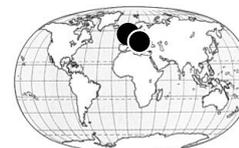
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THE ESTABLISHMENT OF NEOPHYTES IN FORESTS ON NATURAL (NON-ANTHROPOGENIC) AND ANTHROPOGENIC HABITATS (UPPER SILESIA POLAND)

The neophyte establishment phase is crucial in the process of the invasion into forest communities. It might be expected that there will be a difference between neophyte establishment in managed forests on natural (non-anthropogenic) and anthropogenic habitats.

This study examines mixed forest vegetation from natural habitats and from an anthropogenic habitat type, coal mine spoil heaps. The vegetation samples have been collected using the Braun-Blanquet method. From coal mine spoil heaps, 98 relevés were collected from tree stands which have been classified as being strongly transformed mixed forests. The relevés (106) from managed forests on natural, non-anthropogenic, habitats were obtained from the literature.

The study addresses the following questions: do the same species invade the two groups of forests; which of the neophyte species are the most frequent; do they occur with the same abundance in all forest layers and does the tree cover influence neophyte number and abundance in the bush and herb layer?

Preliminary results show that there were 16 neophyte species present in the vegetation on the coal mine spoil heaps. The most frequent, abundant and present in the tree, shrub and herb layers were: *Quercus rubra*, *Robinia pseudoacacia* and *Padus serotina*. In the forests of non-anthropogenic natural habitats only 7 of the 16 neophyte species recorded from the coal mine spoil heaps were recorded. None of them was frequent, however three neophytes were recorded both in the shrub and herb layers: *Quercus rubra*, *Robinia pseudoacacia* and *Padus serotina*.

keywords: woodlands, forest, *Quercus rubra*, *Padus serotina*, *Robinia pseudoacacia*