3rd Nordic course on plant population and community ecology

DIVERSITY OF PLANT COMMUNITIES AND THE UNDERLYING PROCESSES

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STUDENT ABSTRACTS

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Transgenic poplars alters interactions with a non-target-pathogen

I present results from the first season of experiments within a project with the aim to identify and assess ecological risks of introducing genetically modified trees (GM trees) in forestry. In this study I focus on how genetically modified trees might affect non-target organisms and thereby ecosystem processes. In inoculation experiments we examine how seven populations of the pathogenic rust fungus *Melampsora pinitorqua* is affected by five transgenics of the hybrid poplar *Populus tremula* x *tremuloides*, aimed to improve growth and fibre characteristics. We found that all transgenics exhibited changes in susceptibility to *M. pinitorqua* and that the rust populations varied in their response to individual as well as different transgenics. We argue that commercial use of GM trees might affect biotic interactions which in turn could affect ecosystem functions and processes. The large variation in susceptibility to different rust populations stresses the importance of working with several pathotypes or populations in a risk assessment.

EDITA BAGDONAITE

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Evaluation of phenotypic diversity of *Hypericum* L. wild populations in Lithuania

Hypericum perforatum L. and *H. maculatum* Crantz are valuable medicinal plants and the demand for their raw material constantly increases. In Lithuania, the raw material of *Hypericum* is gathered in wild populations because there are no valuable local cultivars suitable for industrial cultivation. Research on wild populations of H. perforatum and *H. maculatum* are necessary for evaluation of their genetic resources. Recently the State Scientific Programme 'Investigation and conservation of Lithuanian plant and farm animal genetic resources (Genefund)' (1998-2002) was carried out. *Hypericum* was one of the objective genera in the theme 'Assessment of genetic stability, selection, and evaluation of genetic resources of medical and aromatic plants for essential oils and phenolic compounds'.

Purpose of the research - to evaluate variability of morphologic characteristics, productivity, and chemical composition of *H. perforatum* L. and *H. maculatum* Crantz in wild populations, and to choose populations characterized by breeding value.

The research shows that plants of wild *H. perforatum* and *H. maculatum* populations are characterized by high level of phenotypic heterogeneity. Statistically significant differences among morphologic characteristics, productivity, and amount of secondary metabolites in plants of the same species growing in different populations were determined. Within populations the length and width of inflorescence, number of lateral generative shoots, weight of flowers and raw material vary most significantly. In *H. perforatum* populations the largest variations are observed in plant height, length of internodes, number and width of leaves, number of black glandules, length of petals, and in *H. maculatum* populations - plant height, width and weight of leaves. Plant height and width of inflorescence are significant for the evaluation of *H. perforatum* productivity because according to its height it is possible to predict the weight of the whole plant, and according to the width of inflorescence - the weight of raw material.

Wild populations of *H. perforatum* and *H. maculatum* are characterized by high variability in the amount of secondary metabolites; therefore, in order to obtain homogenous and high-quality raw material of *Hypericum* it should be cultivated in plantations. Wild populations of these species can be the main source of genotypes for selection of new cultivars.

The genefund of *H. perforatum* and *H. maculatum* plants, characterized by high breeding value, is preserved in the collection of medicinal and aromatic plants at the Experimental Scientific Station of the Institute of Botany and seed gene bank of the Lithuanian Institute of Agriculture (Dotnuva).

DIRK-JAN TEN BRINK
Plant Ecology & Systematics, Lund University, Sweden

The importance of regeneration in plant habitat selection

Most plant species are restricted to a particular set of habitats. These habitats are characterized by certain environmental conditions which include the niche of the species. Studies of plant distribution and abundance often relate the presence of plant species to certain environmental variables. From such studies, conclusions are drawn about the niche requirements and habitat preferences of different species. But as Grime (2001) stated, it is evident that many plant species have germination regulating mechanisms facilitating seedling establishment under circumstances that are very different from the environmental conditions experienced later on during the life cycle.
In my PhD project I want to clarify the importance of regeneration in plant habitat selection.

A comparative study has been designed in which the germination requirements of closely related species from contrasting habitats (forest vs. open habitats) are experimentally determined. I will try to find out whether regeneration characteristics (germination requirements) for species inhabiting contrasting habitats are either general or specific, e.g. if habitat selection is in principle governed by the requirements of the germinating seed or by the resource demands of the adult plant. If the germination requirements of the closely related species from contrasting habitats appear to be very distinct, it can be concluded that the selection of the plant's habitat is governed by the germination requirements of the seed.

ANU ESKELINEN
Department of Biology, University of Oulu, Finland

Seed and microsite limitation in relation to grazing in a low-productive mountain snowbed

An actual question in ecology is to determine to what extent plant communities in different environments are limited by seed availability and by microsite availability and how these variables depend on others such as site productivity and grazing. Even though mammalian herbivores strongly affect plant community composition, not much is known about the importance of seed and microsite limitation in low-productive environments with vegetation shaped by natural grazing. We conducted a three-year experiment to test whether low-productive mountain snowbeds are seed or microsite limited and how these depend on grazing and community biomass. In a factorial desing, half of the plots received a mixture of 14 species naturally occuring in the study site and from half of the plots, biomass was removed. In addition, half of these blocks had for long been protected from grazers, and at the beginning of the experiment the biomass of vegetation was significantly higher in fenced plots than in unfenced ones. Both sowing and biomass removal significantly increased the number of seedlings and species richness of seedlings, and this effect remained significant through the three years study period. The number of seedlings (in 2003) and the species richness of seedlings (in 2002 and 2003) were higher outside the grazer exclosures. Seedling establishment was significantly negatively dependent on the biomass of vegetation and positively dependent on the initial species richness in the plots. These results suggest that even fairly low-productive environments can be both seed and microsite limited, and that these depend on mammal grazing. Mammalian herbivores alleviate microsite limitation and hinder biomass accumulation and, thus, favour seedling establishment. The positive impact of initial species richness on seedling establishment suggests that even high species richness may not reduce species colonozation in a low-productive snowbed.

OSKAR FORSBERG
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Vegetation dynamics in natural vegetation preserved within urban areas

The research is aiming to answer the following questions: - How does the natural vegetation respond/change when new settlements are established nearby? - What causal relationships are valid for the vegetation changes? - What are the consequences of the vegetation changes? The objective is to study which species, groups of species and vegetation types are suitable for preserving as green areas within built-up areas. To servey these issues the Järva research project was started in 1972. Before the construction of a large new settlement in a future northern suburb of Stockholm 28 permanent investigation plots were laid out in different vegetation types at different distances from the planned settlements. Within the investigation plots, in permanent squares of 1 m, an inventory of the percentage of cover for all vegetation species present has been made every year since then. Changes in climate, soil, ground water and air and water pollution situation were also monitored in the first years of the

project. Up to now there has not been any thorough statistical evaluation of the data generated in this project. This is the task for my post graduate studies. The plan is to use multivariate methods, but the work is still in the bud.

KALLE HELLSTRÖM
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The role of grazing and mowing in maintaining species coexistence and diversity

The species rich semi-natural meadows in northern Europe are the result of centuries-old management by grazing and mowing. These management practices decrease interspecific competition and thus enable more species to coexist. Grassland management is topical as the area of these habitats is declining throughout Europe due to intensification of agriculture. We need more information how to maintain their diversity when the traditional ways are no more cost effective.

It has been proposed that moderate disturbance (e.g. by grazing or mowing) may increase plant diversity by preventing competitively superior species from getting dominance over the weaker species. Besides, grazing is selective, some species are preferred over others. Species may be grouped also according to how well they stand disturbance and stress (e.g. Grime's C-S-R-model of plant strategies). Plant functional groups may also be useful in studying plant responses to management. I have studied the effect of grazing and mowing on species richness and composition in two long-term experiments in northern Finland. In a sheep grazing experiment (1996-2000) I studied how an overgrown mesic meadow could be restored and in a mowing experiment (1998-2003) the effects of different mowing regimes were studied. Percentage cover of species was estimated every year in June in permanent plots (size 1 m^2 in grazing study and 0.25 m^2 in mowing exp.). Sheep grazing changed the community towards the traditional species-rich meadow. The species number per plot increased by 30%. Grazing suppressed late-flowering tall herbs and rich soil grasses. In contrast, some small growing herbs and poor soil grasses gained more space after grazing. In the mowing experiment the species richness did not change during five years. Early mowing was effective in creating a low-growing meadow. Late mowing favoured tall growing herbs, especially *Geranium sylvaticum*. Breaking the soil surface was combined to late mowing to study whether this induces germination from seed bank. This did not increase species number possibly indicating seed limitation. To study the seed limitation a new study was initiated in autumn 2003 in the same plots. Seeds of 8 species were sown there. These studies showed that the appearance of a traditional low-growing meadow can be restored in few years by grazing or early mowing but seed limitation may slow the increase in species richness.

ŠTEPÁN JANECEK
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Effect of litter, leaf cover and cover of basal internodes of dominant species *M. caerulea* on seedling recruitment

The effect of litter, leaf cover of established plants and cover of basal internodes of a dominant species *Molinia caerulea* on seedling germination and the dynamics of established plants was studied in a field experiment in an oligotrophic wet meadow. Whereas the negative influence of litter on seedling number and seedling species was non-significant, litter significantly affected the dynamics of the established vegetation and caused inhibition of total leaf cover development. The effects of total leaf cover of established plants on seedling establishment changed during the vegetation season. Whereas the effect of total leaf cover was positive at the start and in the middle of the vegetation season, at the end of the vegetation season the total leaf cover negatively affected seedling establishment. Both total leaf cover and cover of basal internodes affected seedling composition. Effects of these two variables were statistically separable and suggesting that they are based on different mechanisms. The response of seedling establishment to these factors was species specific and, consequently, our data support the hypothesis that biotically generated spatial heterogeneity can promote species co-existence through the differentiation of species regeneration niches.

INGA JÜRIADO, AVE SUIJA & JAAN LIIRA
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The environmental factors determing the lichen species richness on islets in West-Estonian Arcipelago

Estonia is a country rich in islands, over 1500 islands and islets are situated on its western and northern coasts. The islets are higher parts of earlier sea ground risen above sea level as a result of the constant and rather fast neotectonic uplift. The investigated islets are relatively young, the rise of them started about 2000 years ago. The islets formation and disappearance, joining together or with mainland continues also nowadays. The lichen flora of the Estonian islands and islets has been investigated quite intensively, but the environmental factors, which could affect the lichen species richness, are statistically evaluated for the first time.

This study deals with the lichens of the Hiiumaa Islets Landscape Reserve which is part of the West-Estonian Archipelago. We investigated 25 islets during the summer period in 2001 (Suija & Jüriado 2002). The islets vary by size (0.1 to 140 ha), age, distance from mainland (the farthermost islet is ca 18 km from mainland) and vegetation. We studied all biotopes with different kind of substrate types, suitable for growth of lichens, thoroughly and compiled the species lists for every islets. The total number of species registered on the islets is 297 (lichenicolous and allied fungi are included as well). A general linear model (GLM) analysis (Statistica 6.0) was applied to study the dependence of the species richness on heterogenity of biotopes on islets, distance of the islets from mainland, area of the islets and human influence. In accordance with previous biogeographical studies on other organism groups, the number of lichen species on islets decreases with increasing distance from mainland.

Furthermore, this study shows that the area per se effect or habitat diversity effect on species richness depends on the specific species group: for lichens both on deciduous and coniferous trees, lichens on granite and on limestone (with admission) the presence of different biotopes is more important than the size of islet; for lichens on soil, mosses, dead wood and for lichenicolous fungi the size of the islet per se is the most relevant.

KAUPO KOHV
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Changes in structure and composition of forest communities under different management regimes

The aims of the study were to describe and analyse the variance of structural characteristics of *Vaccinium vitis-idaea* forest community on objectively determined management intensity gradient; to describe the variance pattern of different community characteristics. Forest management appeared to affect most strongly the physical characteristics of community structure. Most pronounced changes caused by management were as follows: 1) simplification of age and diameter structure, especially the decrease of number of very big (d>80 cm) trees; 3) decrease in relative proportion of spruce and birch in the forest composition; 5) decrease in number of big deciduous trees (d>40 cm) and in presence of deciduous dead wood; 6) decrease in total amount of dead wood and lack of representative range of decay stages and diameter classes. Management intensity also cause changes in species composition of understory vegetation.

MARI LEPIK
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High shoot plasticity favours ramet coexistence in herbaceous vegetation

Several theoretical considerations imply that high shoot morphological plasticity could increase competition symmetry and favour plant coexistence. We tested whether mean plasticity across co-occurring species is a key trait for explaining ramet density and species richness in herbaceous vegetation. We used three data sets to test the hypotheses: a) experimentally achieved estimates of plasticity to light availability for 35 herbaceous species; b) richness, ramet density and canopy architecture data from 17 herbaceous communities; c) species richness data from a five-year permanent-plot study in a calcareous grassland.

In herbaceous communities containing species with relatively higher shoot plasticity, ramet density was significantly higher. Consequently, relatively more species were growing per unit area - a greater proportion of the community species pool was represented on one sq. m. In the permanent plot study species-richness was higher in those 40 x 40 cm quadrats where species with high shoot plasticity prevailed - there was a positive regression of richness on the mean plasticity of species. This relationship was highly significant in five consecutive years. Our results suggest that shoot plasticity to light availability is evidently one of the key traits in processes that

alter the density of co-existing plants and, therefore, species diversity in herbaceous communities.

ANNE PIETIKÄINEN
Department of Biology, University of Oulu, Finland

Arbuscular mycorrhizal symbiosis and seedling establishment in subarctic meadow

Arbuscular mycorrhizal (AM) associations are widely found in low arctic areas. However there is very little information about the functioning of AM symbiosis in arctic environments. We conducted a field experiment in a subarctic meadow at Kilpisjärvi area, in Northern Finland. We studied how changing resource availability by fertilising and clipping affects seedling establishment and mycorrhizal symbiosis. Our results suggest that reduction of plant biomass by herbivores may have different effects on seedling establishment in areas of high and low nutrient availability. The response of AM colonisation to clipping and fertilisation was weak suggesting that AM symbiosis is not affected by altering plant resource availability under the conditions employed in this study.

TRIIN REITALU
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Species diversity in changing landscape

There are many theories and models that attempt to explain the maintenance of diversity in plant communities. In recent years, the role of history as a potential determinant of species diversity has been emphasised. Attempts to understand the mechanisms that control levels of local species diversity require a historical perspective. For example, the local or regional occurrence of a particular species may be related to past landscape structure of the historical, rather than present, availability of habitat.

In my project, I will look at the present-day species diversity in dry semi-natural grasslands and how species diversity is influenced by landscape structure today, historical continuity of habitat patches and historical landscape structure. My study area is on Öland in an area where the land-use is well documented from the beginning of 18th century until today. A lot of grasslands in the area have been open pastures for at least 300 years. I have collected species diversity data from 150 grasslands patches with different size, shape, isolation and land-use history from different parts of the the study area. The samples were collected from similar community in all grasslands. I will present the background and methodology of my project because there are no presentable results yet.

TERHI RIUTTA
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Water level as a determining factor for the photosynthetic capacity and structure of a fen plant community

Competition for space and resources is one of the key processes structuring plant communities. Any individual that grows more slowly than the others will be taken over in competition for any type of resource. Therefore, photosynthetic capacity, i.e. the ability to assimilate CO_2 under full daylight conditions, can be used as a measure to evaluate the competitive ability of a species in a given environment.

In some environments the ability to tolerate extreme conditions becomes the determining factor for competition and plant community structure. In mires, high water level results in anoxic conditions, which limit the number of species and regulate the plant community composition. Mire species must have an adaptation strategy to tolerate such conditions. One such mechanism is aerenchymatous tissue found in mire plants, for example in sedges, which enables the plant to transport oxygen to the roots. Nevertheless, the range of water levels where a species is present or abundant does not directly correspond with the photosynthetically optimal water level for the species but reflects the competitive ability of that species in different environments.

This study aimed at determining how water level gradient influences the photosynthetic capacity of different plant groups, sedges and shrubs, and how these differences in capacity in turn are reflected in the mire plant community structure.
The study was carried out in an oligotrophic fen in Central Finland between the growing seasons 2001 and 2003. In the study site, 18 sample plots were established and CO_2 exchange between plant communities and atmosphere was measured weekly using closed-top chambers. The development of the vegetation was monitored monthly. After a one-year control period water level gradient was broadened by surrounding half of the study site with a shallow ditch that lowered the water level approximately 15 cm. The average water level of each plot ranged from 7 to 42 cm below the mire surface during the studied growing seasons. There was no correlation between the water level and the total area of vascular plants. However, the community structure differed along the water level gradient. The relative abundance of sedges was highest in the plots where the water level was close to the mire surface. Conversely, the relative abundance of shrubs was highest when the water level was deep. Photosynthetic capacity of the plant community increased with increasing water level and with the total area of vascular plants. These preliminary results indicate that changes in hydrology bring about changes in photosynthesis and plant community structure.

MINDAUGAS RYLA
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The impact of vegetation layers coverage upon demographic structure and density of *Dactylorhiza fuchsii* populations

It is generally accepted that *Dactylorhiza fuchsii* is a shade-liking species, but it occurs in various wet habitats with different vegetation types, such as grass dominated

open meadows and transitional mires, light-shaded forest edges and glades, as well as tree dominated forests with deep shade. Demographic structure of a population, density and coverage of tree, shrub, herb, and bryophyte layers were analysed in 11 populations of *D. fuchsii*.

It is presupposed that in all studied populations humidity level is sufficient and mycorhizal fungus is present. It is also assumed that the coverage of herbs indicates approximate level of competition, and the coverage of ligneous plants (the sum of coverage of tree and shrub layers) approximately indicates the level of insolation. The medium negative, significant (at $p < 0,05$), correlation among these values was found ($r = -0,63$). It indicates that a dense coverage of ligneous plants not only limits the light for *D. fuchsii*, but also lowers the intensity of the competition among herbs. The density of the bryophyte layer has no impact for the demographic structure and density of *D. fuchsii* population.

The results show that the coverage of ligneous plants strongly correlates with a percentile part of young (the sum of juvenile and immature) and adult (the sum of virginal, generative, and senile) plants in a population ($r = 0,72$ positive and negative, respectively). It has been also found that the coverage of ligneous plants positively correlates with the density of young plants ($r = 0,67$), but not with adult ones. Analysis of the correlation matrice of coverage of herb layer shows opposite results: medium negative correlation with young, and positive correlation with adult ($r = 0,69$ negative and positive, respectively) plants, and medium negative correlation with the density of young plants ($r = -0,59$). No significant correlation with the density of adult plants was found.

In case of a dense coverage of the herb layer, several processes could take place: faster elimination of young *D. fuchsii* plants (especially in protocorm and juvenile stages) because of strong competition for free space (negative impact) and acceleration of the development of immature and virginal plants into the generative stage because of more intense light (positive impact). The medium positive ($r = 0,55$), but not significant, correlation is found between the density of generative plants and density of the herb layer. Therefore, more shaded (wooded) sites are preferred because of less competition, and *D. fuchsii* could be characterized as a shade tolerant species.

JURATE SENDŽIKAITE
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Naturalisation of sown meadow communities on hilly landscape of Eastern Lithuania

The aim of the research - to investigate the development of sown and natural meadow communities, changes in structure and aboveground phytomass in the process of naturalisation on the East Lithuanian hilly agricultural landscape and create hypothetical models for sown meadow communities naturalisation.

Long-term naturalization process influences the structure of sown meadow communities: floristic composition of vascular plants varies, their diversity increases, phytocenotic role changes, phytocenotic diversity manifests itself in mosaics.

Impact of meadow communities age upon their transformation was ascertained: positive correlation between the number of vascular plant species and the age of sown meadow communities ($r=0,84$) indicates, that diversity of species in

communities increases with the age of grassland. The number of vascular plant species in sown meadow communities approximates to that of natural meadow communities during 30-35 years of running.

Competitive species *Festuca pratensis, Festuca rubra, Phleum pratense, Poa pratensis* and *Trifolium repens,* included in most sown meadow seed mixtures, consolidate easily in the grassland and during many years (30) remain stable and often dominate in mesophillous communities. Unadaptable to ecological conditions species *Glyceria fluitans, Poa palustris* are usualy eliminated from the grassland and more adaptable ones occupy their place. Basing on the analysis of stability and productivity of plant species in sown meadow communities we recommend appropriate plant species for stable grassland formation on hilly lands. On upper parts of slopes, it is recommended to use *Festuca pratensis, Festuca rubra, Poa pratensis, Medicago falcata, Onobrychis viciifolia, Trifolium hybridum* species suitable for mesoxerophillous seed mixtures. On the middle part of slopes, it is suggested to use *Festuca pratensis, Festuca rubra, Poa pratensis, Phleum pratense, Lathyrus pratensis, Trifolium pratense, Trifolium repens* for mesophillous seed mixtures. On the lower part of slopes the *Alopecurus pratensis, Beckmannia eruciformis, Festuca pratensis, Festuca rubra, Phalaroides arundinacea, Phleum pratense, Poa palustris, Lathyrus pratensis, Trifolium pratense* species relevant to mesohygrophillous seed mixtures should be used.

On the grounds of our research data and literature references, the developed hypothetical models for species stability in communities and changes in productivity enable to prognosticate grassland alteration, management period as well as yield capacity and assist in defining other aspects of optimal changes in communities. Basing on the developed sown meadow naturalisation scheme under natural conditions of Eastern Lithuania, subject to irregular management and maintenance of meadows, communities succession towards mixed forest formation is probable: under surplus humidity and poor aeration conditions – to Vaccinio-Piceetea Br.-Bl. 1939, while under humidity deficiency conditions – to Querco-Fagetea Br.-Bl. et Vlieger 1937 em. Klika 1939.

KATA-RIINA VALOSAARI
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Invasion under a trade-off between density dependence and maximum growth rate

The risk of invasion and competition by genetically modified organisms (GMO's) has recently become an important question in ecology. Invasion analysis provides a tool for studying the performance of combinations of life-history traits against the resident type in the population. The traits that increase competitive ability are often different in competition-free and densely inhabited environments, but both may affect the equilibrium population density. For a given carrying capacity, the maximum growth rate and the type of density dependence have to be traded-off to each other. Constant carrying capacity allows the detection of the impacts of different traits on population dynamics, competitive ability and the ability to invade or resist invasion by other trait combinations.

In the model by Maynard-Smith and Slatkin, one parameter defines the maximum population growth rate and another the type of competition in the continuum from contest to scramble. A third parameter scales population density without qualitative effect on dynamics. We let the populations differ in maximum growth rate and the type of competition, then simulated invasion with different initial intruder densities and recorded the lowest initial density that led to a successful invasion. We also used the Lyapunov invasion exponent and analytic stability condition of the intruder to predict invasion and coexistence of the resident and the intruder.

When the dynamics of the resident population are stable, an intruder can invade even with a low initial density, but will remain rare. An intruder that has a more contest-type competition than the resident can invade an unstable resident population. The invasion exponent accurately predicts invasion, which reveals that the success of invasion depends more on the dynamics of the resident than the dynamics of the intruder. Unstable dynamics of the intruder usually allows invasion with a low initial density and leads to the extinction of the resident population.

The results suggest that stable resident populations may harbor low densities of invaders without the risk of being outcompeted. Plant populations are usually intrinsically stable and thus in low risk of outcompetition, but may receive unwanted gene flow from a persisting GMO population. Unstable populations are susceptible to higher densities of invaders and becoming outcompeted. Populations with intrinsically unstable or stochastic dynamics, such as many insect and fish species, are therefore in risk of outcompetition. Knowledge of the resident populations time series and the density dependence of the intruder population is sufficient for accurate prediction of the probability of invasion.

SANDRA VARGA ESTANY
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Differences in response to simulated herbivory between females and hermaphrodites of *Geranium sylvaticum*

Arbuscular mycorrhizas are the most common form of underground symbiosis. They are formed in the roots of an enormously wide variety of host plants by obligated symbiotic fungi of the phylum Glomeromycota. The fungus obtains carbon from the plant, which in return receives nutrients. Under natural conditions, many factors affect the outcome of this symbiosis, such as light, herbivory, nutrient levels, etc. It is plausible that male and female plants do not have identic interactions with their symbionts because female plants spend proportionally more of their resources on reproduction than males (it is more costly in terms of resources to be a female and the symbiosi is costly for the plant in terms of carbon). In mycorrhizal plants resources must be shared between different plant functions: growth, reproduction and the symbiont. Herbivory is thought to influence mycorrhizal symbiosis by limiting the amount of photosynthate available to the fungus. At present this hypothesis has not been corroborated by consistent results and the differences in response to defoliation between males and females is not clear. In the field, we performed an experiment using *Geranium sylvaticum* L. (a gynodioecious species). We defoliated some plants (in order to simulate natural levels of herbivory) and investigated the consequences on resource allocation to the symbiont and to reproductive function in both female and

hermaphrodite individuals. We also checked the effects on arbuscular mycorrhizal colonization level. We expected to find a decrease in the colonization level and in the reproductive success (number of fruits) both in female and hermaphrodite individuals. The experimental design and some preliminary results are presented.