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Englische Zusammenfassungen der im Berichtsjahr 1978 abgeschlossenen Dissertationen und Diplomarbeiten

Summaries of Ph D. and Diploma Thesis

Dissertationen (Ph D. thesis)

ROTH Christian. Soziologisch-ökologische Untersuchungen im Grenzbereich *Fagus silvatica* L./*Pinus silvestris* L. in der nördlichen Schweiz. Veröff. Geobot. Inst. ETH, Stiftung Rübel, *66*, 78 S.

Phytosociological and ecological investigagtions in the contact zone between *Fagus silvatica* L. and *Pinus silvestris* L. in northern Switzerland.

The study deals with phytosociological and pedological investigations in natural as well as anthropogenous forests of the *Molinio-Pinetum* from Swiss Midlands. The author's results having been compared with the previous data, the following classification of the *Molinio-Pinetum* is suggested:

a) subassociation with
   1) *Epipactis palustris*-variant
   2) *Listera ovata*-variant
   3) *Genista tinctoria*-variant
   4) *Sanguisorba minor*-variant

b) subassociation with *Laserpitium latifolium*
   5) typical variant
   6) *Geranium sanguineum*-variant
   7) *Parnassia palustris*-variant

The variants described under 1 - 3 represent open forests with well-developed herb layer containung numerous *Graminae* and *Cyperaceae*. The variant No. 4 cannot be fully compared to them, for a different method has been used for the resp. relevés. The variants No. 5 - 7 are natural forests occurring on steep slopes of northwestern Swiss Midlands; the variant No. 6 appears on drier soils than the typical variant, but its exposure is most frequently the same, i.e. southern or western. The variant No. 7 occurs on N-exposed steep slopes within the ridge of Albis, in sites that are permanently wet due to seeping soil water.

All the studied variants are characterized by the absence of *Fagus silvatica* in the tree layer, in spite of the fact that the beech represents the climax forest species of colline and submontane zone within the studied area. The present investivations show that the *Molinia-Pinus* forests inhabit the marly rendzina that is younger and shallower than soil of the neighbouring forests of *Fagus*. Marly rendzina developes very slowly; its uppermost layer may sometimes be removed by landslides which results in recurrent successions. *Fagus silvatica* is able to germinate in the *Molionio-Pinetum*, its life span being about 30 years; however, only exceptionally grow the individuals taller than 50 cm and so they nearly always remain within the herb layer. The abnormally reduced growth is apparently caused by properties of the marl soil that may remain quite wet for some time, but rapidly manifests a strong water deficiency in dry periods. The shallowness of marly rendzina as well as the above mentioned qualities of the marl may accordingly be considered as principal factors responsible for the absence of *Fagus silvatica* in the *Molinia-Pinus* forests occurring within the climax zone of this species.

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Diplomarbeiten (diploma thesis)

DICKENMANN Regula. Oekologische Grenzen zwischen zwei nahverwandten Arten. 105 S. + Tabellen. (Manuskript)

Ecological borders between two related taxa.

The study, carried out during the consecutive seasons 1977-1978, deals with distribution patterns and ecological requirements of *Ranunculus Grenierianus* (2n=16) and *R. montanus* (2n=32). Populations inhabiting acidic siliceous and dolomite soils within the alpine zone above Davos (Grisons) were studied as to their size, cytology, morphological variation and ecology; in addition, a small transplantation experiment was started.

Cytological investigations comprised chromosome counts and a comparative study of caryotypes, the second putative parent taxon of *R. montanus* viz. *R. carinthiacus* (2n=16) being included. *R. Grenierianus* and *R. carinthiacus* had very similar chromosome sets with the same caryotype formula 8SM 8A ($2A_{SAT}$). The caryotype of *R. montanus* consisted of sixteen submetacentric chromisomes and sixteen acrocentric ones; however, only two satellite chromosomes being invariably found, the caryotype structure of tetraploids does not support the hypothesis considering *R. Grenierianus* and *R. carinthiacus* as the parent taxa of the allopolyploid *R. montanus*.

Ecological requirements of *R. Grenierianus* and those of *R. montanus* are distinct. The transplantation experiment shows that *R. Grenierianus* is physiologically able to grow in dolomite soils, at least for some time; in wild, however, it does not occur in this substrate and seems to be sufficiently competitive only in some stations with a siliceous soil. Contrasting with the "specialized" *R. Grenierianus, R. montanus* occurs both in dolomite soils as well as in moister sites on siliceous substrate.

Some tetraploid plants found in small populations inhabiting the contact zone between silicate and dolomite as well as those observed in some stations with siliceous soils corresponded morphologically to *R. Grenierianus*. No triploid hybrids between *R. Grenierianus* and *R. montanus* having ever been found, it seems that the 32chromosomic but *R. Grenierianus*-like variants are not products of an introgression; it is conceivable that they represent segregates of *R. montanus* stabilized by a disruptive selection and/or a genetic drift.

An extremely interesting microdifferentiation was found within the silicate area at Jakobshorn, *R. montanus* and *R. Grenierianus* following the microrelief of the E slope: moister depressions and open talus slopes inhabited by tetraploids alternated with narrow stripes of grassy mounds occupied by diploids. The finally balanced pattern of distribution suggests an influence of the soil water supply.

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Lüönd Annamaria. Unterschiedliche Nährstoffansprüche nahverwandter Arten und ihre ökologische Bedeutung. 84 S. (Manuskript).

Differentiated nutrient requirements in closely related taxa and their ecological significance.

The study, dealing with nutrient requirements in some *Lemnaceae*, comprises both field investigations as well as laboratory experiments.

I. Field investigations. Water samples taken from natural stations were studied as to their pH, conductivity, temperature, NO_3-N, NH_4-N, o-P, Na, Ca and Mg content. Comparisons between samples from seven sites inhabited by the *Lemnaceae* and those from five duckweed-free stations showed that the *Lemnaceae* occur in water characterized by a low conductivity resulting from a low salt concentration, the tendency being particularly pronounced in *Lemna trisulca*. The occurrence of *L. gibba* and *L. minuscula* in surroundings of Koblenz is probably due to a recent introduction.

II. Laboratory experiments. Influence of various nitrogen levels in the culture medium was studied in four taxa of the *Lemnaceae*. The following aspects were investigated: growth rate, dry weight, length of roots, length and breadth of the fronds, in *Lemna gibba* also thickness of the fronds. As far as growth rate and dry weight are concerned, the studied taxa fall into groups viz. "large" (*Lemna gibba* and *Spirodela polyrrhiza*) and "small" (*Lemna minor* and *L. minuscula*). The growth rate as well as a general appearance of fronds varied with given concentrations of nitrogen. All clones kept on low NH_4NO_3 levels (0,064 mg/l, 0,16 mg/l) showed an apparent nitrogen deficiency, whereas higher concentrations (1,6 mg/l, 8,0 mg/l and 40,0 mg/l) proved to be sufficient for the studied taxa throughout the experiment.

An attempt was undertaken to compare the field observations with the results of experiments. It seems that a nitrogen deficiency resulting in a checked growth of the *Lemnaceae* was not encountered in the wild.

JENKA Boris. Zum Wasserhaushalt von Trockenwiesen (*Mesobrometum*) bei Merishausen (Kt. Schaffhausen). 69 S. (Manuskript).

Water-relations of dry grasslands (*Mesobrometum*) near Merishausen (Ct. Schaffhausen, Switzerland).

Dry *Bromus*-grasslands were investigated in respect to soil physics (pore size distribution, plant available water, matrix potentials, desorption curves) and ecophysiology (transpiration, diffusion resistance of leaves, water turnover, xylem water potentials).

The plant available soil water was 38 mm. Community transpiration extrapolated from transpiration values of individual species was 5,4 mm/day (sunny summer day, good water availability) and corresponded well to the values calculated from soil water potentials (5,2 mm/day). If the transpiration rate is not reduced, the plant available water thus lasts for about 8 days.

Eight plant species were investigated more in detail under natural water regime and artificial drought (by covering with a transparent plastic roof). Five types of daily transpiration curves could be distinguished. The maximum rates were between 23, 2 mg/dm^2 min and 57,4 mg/dm^2 min. Water turnover time varied between 40 and 60(-150) minutes.

According to the seasonal course of xylem water potential the species could be grouped into four types: the "conformers" (*Bromus erectus, Thymus pulegioides, Hippocrepis comosa*) and three types of "regulators" *(Carex flacca, Anthericum racemosum, Scabiosa columbaria,*Buphthalmum *salicifolium, Viola hirta*).

There was no clear correlation between the life form of the plants, the shapes of their transpiration curves and the four water balance types. This pronounced diversity could be one of the bases for the coexistence of different species.

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WIDLER Beat. Vergleichende pflanzengeographische und phytotaxonomische Untersuchungen in Korsika. 114 S. (Manuskript).

Comparative phytogeographical and taxonomical investigations in Corsica.

The study of the floristic composition of the different patterns of distribution and of the different floristic relations, together with a bibliographical research about the tertiary paleogeography in the mediterranean area, has given three results:

1. The messinian events, which caused the mediterranean basins to dry up, had a great influence in the mediterranean flora and fauna. The acceptance of the deep-basin model makes the formulation of a new hypothesis for the immigration of alpine species in the Corsian mountains possible: the messinian model.
2. The re-establishment of land connections during the Messinian allowed great exchanges of floristic elements among the different mediterranean areas.

3. The basic assumption of a tertiary flora grown up "in situ" is confirmed, but every floristic model which has been presented up to now to explain the immigration of alpine species in Corsica is rejected because of geological and geographic aspects.
4. The floristic model is subjected to a first test, by means of the study of seven species: *Gentiana lutea* L.; *Brassica insularis* Moris; *Aconitum napellus* ssp. *corsicum* (Gayer) Seitz; *Digitalis gyspergerae* Rouy; *Digitalis lutea* L.; *Helichrysum frigidum* Willd.; *Morisia monanthos* (Viv.) Ascherson.
5. Two new sections are distinguished:
   - in the genus *Brassica* L. the section *lignosae* Widler (sect.nov.) which includes paleoendemics with a ligneous caudex.
   - in the genus *Helichrysum* Miller the section *frigidae* Widler (sect.nov.) which includes taxas from Sardinia and Corsica.
6. The *Gentiana montserratii* Vivant is considered to be *Gentiana lutea* L. ssp. *montserratii* (Vivant) Widler (comb.nov.).

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KUHN Urs, LEUPI Erwin, OBERHOLZER Hansruedi, TSCHUETSCHER Barbara.

Naturwissenschaftliche und gesellschaftliche Bedeutung der Naturschutz- und Erholungsgebiete im Reusstal. 236 S. + 2 Tabellen (Manuskript).

Scientific and social importance of the nature conservation and recreation areas in the Reuss Valley.

The paper deals with 1) general problems of nature conservation and 2) a comparative ecological description of a straw and a fertilised meadow.

The investigations were carried out in the Argovian Reuss Valley (Schneckenmatten near Unterlunkhofen) in 1977/1978. Three ecological topics were investigated:

I. How can nutrient regime of straw meadow be characterised? How can a meadow ecosystem be stable, if each year phytomass and therefore nutrients are removed and exported with the autumn harvest?

II. How are the respective compartments (producer, consumer, destruents) composed on the three different sites? What are their relationships?

III. How do plants react, morphologically and physiologically, to low nutrient concentrations?

Results

I. All soils on the investigated plots were alluvial and partly modified by management. Apart of management they were mainly influenced in the relation to the water table and its fluctuations. The following types of management were observed.

- straw meadow : slightly peaty gley on limestone and Fe(II)-mixed parent rock

- field : id., with terrestrial null horizon
- fertilised meadow : id. drained to a depth of 60 cm by lowering the level of ground water table.

The soils were silty, containing only little clay and sand. The straw meadow top soil was rich in humus whereas top soils of the fertilised meadow and those of the field were very humic. Total nitrogen fluctuated in relation to humus content. The C/N ratio comported about 10, i.e. approached the lower limit of suitable conditions for microbial decay. According to the P- and K-test values presented by the Swiss Federal Institute for Agricultural Research (FAP), all investigated soils were poor in P and K. pH-values were about 8, and soils were generally rich in carbonate.

In all plots only nitrate was accumulated. In the straw meadow the accumulation rate reached 18 kg/ha.year at the maximum, in the fertilised meadow 190 kg/ha.year.

N-fixation was assessed by the method of Ballandreau and Dommergues. After two hours of incubation the samples from fertilised meadow showed a significantly higher rate of N-fixation than the material of the straw meadow· however, the values obtained after four hours did not show pronounced differences. Straw meadows are able to fix 1-2 kg N_2/ha.year, fertilised meadows 2-4 kg N_2/ha.year. Between August 22, and October 28, 1977, *Molinia coerulea* transferred especially N and P from above-ground to below-ground parts. A transfer of parts of the cellular walls could not be detected.

II. The following vegetation units were found in the studied area: *Caricetum gracilis, Ranunculo-Caricetum hostianea* (surfaces investigated in detail), *Stachyo-Molinietum caricetosum tomentosae, Saturejo-Molinietum serratuletum* and *Valeriano-Filipenduletum*. Net primary production in the fertilised meadow was about four times higher than that of the straw meadow.

In accordance with TIETZE (1973), typical association between the carabids for all the habitats were found. The richest habitat in species and individuals was the fertilised meadow.A distinctive decrease in activity occurred in autumn.

Nearly all observed spiders belonged to the families of *Lycosidae, Tetragnatidae,* and *Microphantidae*. The *Rycosidae* were scarce and their occurrence in fertilised meadows was apparently due to management. In this case too, a transfer of activity was found during summer.

Generally only few animals were found in the soil. In particular, the *Acaridae/Collembola* ratio was investigated; a positive relationship to water content was observed, being more marked in a nature-near vegetation.

The number of living microorganisms as well as the content of *Azotobacter* and *Clostridium* species, *fungi* and photosynthetical active *algae* was determined. Only the number of living microorganisms and *algae* was significantly higher in fertilised meadows than in straw meadows. Under laboratory conditions soil activity in fertilised meadows and straw meadows was about equal.

III. Four species (*Molinia coerulea, Carex hostiana, Potentilla erecta* and *Lolium multiflorum*) were cultivated one year long in A-Z-solution with different N-concentrations (0,5; 5; 50 mg N/l); the purpose of the experiment

was to examine if reed plants were able to transpire faster at low N-concentrations and accordingly take up more nutrients. For *Carex hostiana,* the morphological and physiolgical reactions at the lowest nutrient conditions were expressed by a low index of scleromorphy and a higher influx of water, i.e. transpiration intensity. These reactions were shown only partly by all the other plant species.

In conclusion, a pamphlet for a nature trail is suggested as a didactic evaluation of the obtained results. Legal and economical problems related to the nature conservation are also discussed.

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Freies Geobotanisches Kolloquium

gemeinsam mit dem Botanischen Garten der Universität

ENDRESS, P., Zürich: Die Regenwälder Ostautraliens und Neuguineas als Schatzkammer urtümlicher Blütenpflanzen.
26. Januar 1978.

HOCHULI, P., Zürich: Pollen-Stratigraphie und Entwicklung der Angiospermen in der Mittel-Kreide.
9. Februar 1978.

KRATTINGER, K., Zürich: Blütenbiologie, Genfluss und Populations-Dynamik von *Typha* (Rohrkolben).
16. Februar 1978.

LANG, G., Bern: Die Makrophyten des Bodensees als Zeiger für den Gütestand - Methoden und Ergebnisse von Langfrist-Untersuchungen.
19. Januar 1978.

SCHNELLER, J., Zürich: Biosystematische Untersuchungen an Waldfarn (*Athyrium filix-femina*).
2. Februar 1978.