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## 6. ENGLISCHE ZUSAMMENFASSUNGEN DER IM BERICHTS- JAHR 1989 ABGESCHLOSSENEN DISSERTATIONEN UND DIPLOMARBEITEN (Summaries of Ph D and Diploma Theses)

### 6.1. Dissertationen (Ph D Theses)

GUNTLI Albert P. Ligningehalt und andere Merkmale des Schilfhalmes (*Phragmites australis* [Cav.] Trin. ex Steudel) in Beziehung zur Röhrichtbewirtschaftung. Veröff.Geobot.Inst.ETH, Stiftung Rübel, Zürich 103, 65 S.  
*Content of lignin and other characteristics of reed stalks (Phragmites australis [Cav.] Trin. ex Steudel) depending on management.*

1. On the Bodensee (Lake of Constance) experiments were carried out on reeds in various beds that had been treated differently (mowing, burning or no treatment): the lignin was measured, the reed morphology and some aspects of the infection with harmful insects were investigated.
2. To measure the lignin a new preparation technique was developed: by grinding a reed thinly several smooth sections of 40 micrometres could be obtained simultaneously. After a process of dyeing with phloroglucine/hydrochloric acid the lignin could be optically determined as an element of stability.
3. The height, diameter and number of nodes of the reeds are bigger in untouched areas than in burned or mown beds; the dry substance and the number of reeds, however, are the smallest in untouched areas; the biggest amounts of the latter are found in mown areas.  
The infection of reeds with harmful insects (the formation of "cigars" around their panicles) amounts to 52% in untouched areas, 39% in mown and 24% in burned ones.
4. The optical measurements of the content of lignin were made on reeds which had grown in more or less eutrophic and oligotrophic places, as well as in differently treated areas of reed.  
The amount of lignin in reeds was the same approximately, regardless of "eutrophic" or "oligotrophic" soil. Its quantities in untouched areas are slightly bigger than in mown or burned beds; in burned reed they are the smallest.  
Consequently, the burning of reed areas may have a negative effect on the stability of the stalks.
5. The cross-sectional analyses showed differing quantities of lignin depending on the direction of the compass: they were the biggest in the southern sector of the stalk, the second biggest in the eastern and the smallest in the western part.  
Generally, there is less lignin in both wind-directions West and North (according to the movements of the waves and the wind) than in the corresponding "leeward" directions East and South.
6. The amount of lignin in the lowest six internodes is somewhat bigger than in internodes 7 to 13. The strong mechanical pressure of waves and wind therefore has a positive effect on the woodenness of the stalks.
7. According to the season the quantities of lignin vary a little. During summer (June to September) the amount increases; it remains stable in autumn (September to November) and afterwards it is reduced.

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## 6.2. Diplomarbeiten (Diploma Theses)

BLANKE Martina. Systemökologische Modelle der Koexistenz von Pflanzen in Trespen-Halbtrockenrasen. 103 S. (Polykopie)

*Simulation of the coexistence of plant species in a limestone grassland.*

With a simulation model the coexistence of the plant species *Arrhenatherum elatius* (L.) J. et C. Presl., *Bromus erectus* Huds., *Lotus corniculatus* L. and *Salvia pratensis* L. was investigated. The model was primarily based on empirical data on limestone grassland near Schaffhausen, where the species mentioned occur. Seed production was assessed in the field for the present study.

The structure of the model is a two-dimensional cellular automata. It was built on the basic assumptions that a) all species occur with the same frequency, b) the mortality of the individual plants depends on the species and age and not on environmental factors, c) the establishment of new plants depends only on the density of the particular species and its seed production.

Six simulation experiments with 350 runs over 100 timesteps each were performed. With the basic assumptions alone the four species cannot coexist, only one can survive.

As a first extension, an annually varying seed production was introduced into the model: then coexistence of species increased.

As a second extension, a differentiation between two annually changing niches (e.g. with and without small rodents) was introduced into the model: then two species can coexist.

The model thus shows that for the coexistence of plant species perturbations, such as changing weather conditions leading to varying seed production, or varying activity of small rodents, are essential.

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SAILER Uwe. Vegetationsentwicklung auf Brachflächen der Stadt Zürich. 92 S. + 1 Karte. (Polykopie). Siehe Beitrag in diesem Band.

*The establishment of vegetation in fallow lands in the city of Zürich. See contribution in this volume.*

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THOMMEN Frank B. Systematisch-ökologische Untersuchungen an schweizerischen *Drosera*-Arten. 49 S. (Polykopie). Siehe Beitrag in diesem Band.

*Taxonomical-ecological studies on Swiss Drosera species. See contribution in this volume.*

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TSCHANDER Bettina. Wachstums- und Fortpflanzungsstrategien bei *Cirsium spinosissimum*. 113 S. (Polykopie).

*Growth and reproduction strategies of Cirsium spinosissimum.*

Ramet growth and the seedling reproduction of two natural populations of the alpine plant *Cirsium spinosissimum* were investigated. One of the populations grew on dolomite, the other one on silicate soil. The regeneration ability of the rhizomes was tested in the experi-

mental garden in Zürich and under natural conditions on the two population sites. The production of ovules and seeds was estimated by counting the amounts produced in a number of flower heads. The harvested seeds were used in a series of experiments to study their germination.

In spite of different growth and death rates the clones reached very similar ramet densities in both populations towards the end of the growing season.

The rhizomes of *Cirsium spinosissimum* were fairly short and thick, and they looked like a wound rope. Rhizomes of different sizes differed in form and direction of growth. Small rhizomes generally had none or only few branches, their shape was longish and they usually grew vertically. In contrast, larger rhizomes were very massive or ramified and grew in horizontal-radial directions. These differences also manifested themselves in a more allo-rhiz respectively more homorhiz kind of rooting. The excavation of the rhizomes gave some indications that the clones of *Cirsium spinosissimum* can reproduce vegetatively by spontaneous fragmentation. The regeneration ability of the rhizomes was very good after mechanical fragmentation.

The number of produced flower heads varied between the two populations and between clones of different sizes. The small clones produced more heads in relation to their size than the larger ones. It remains open whether the number of ovules or seeds per head differed between small and large clones.

URBANSKA's concept (1989) was adopted to record the reproduction by seed. The reproductive offer, the total number of seeds, the number of fertile seeds and the reproductive efficiency increased from the bottom to the top of the head. One reason for this is that the total number of capitules with fertile or infertile seeds was larger at the top of the head. On the level of the separate capitules of a head, other results were found. A capitule at the bottom of the head had more ovules, respectively ovaries and fewer fertile seeds than a capitule at the top. A possible explanation for this is competition between the ovaries of one capitule, and this competition is higher where there are more ovaries. As a result there were fewer fertile seeds in capitules with many ovaries. The top capitules were infested frequently by the beetle *Larinus sturnus*. A possible connection between the infestation and the higher production of fertile seeds of these capitules is discussed. It is supposed that *Larinus sturnus* is one of the potential pollinators of *Cirsium spinosissimum*.

The seeds of *Cirsium spinosissimum* germinated slowly and not very well. The seeds from dolomite germinated better than the seeds from silicate, both in the laboratory and under natural conditions. Differences also occurred between the different positions in the flower head. In comparison with the very low mortality of established young plants and clones the genet mortality seems to be of importance especially during the seedling and establishing stage.

Although the resource allocation and the reproductive effort were not directly studied, the present paper gives some indications. Growth and reproductive processes varied little between the two populations and seemed to show an adjustment to the local conditions. By comparing the two populations a certain trade-off was found between the reproduction by seed and the clonal growth. But in both populations the recruitment of new individuals probably occurs mainly by the seed production and only rarely by clone fragmentation.

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WISKEMANN Christian. Vegetation auf verdichteten Böden in der Stadt Zürich. 59 S. (Polykopie). Siehe Beitrag in diesem Band.

*Vegetation on compact ground in the city of Zürich. See contribution in this volume.*

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# **BERICHTE**

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