establishment of plant organ cultures. Since then protocols have been developed for cultivating many genera of carnivorous plants *in vitro*, including: *Aldrovanda*, *Byblis*, *Cephalotus*, *Darlingtonia*, *Dionaea*, *Drosera*, *Drosophyllum*, *Genlisea*, *Heliamphora*, *Nepenthes*, *Pinguicula*, *Sarracenia*, and *Utricularia*.

However, the purposes for growing carnivorous plants *in vitro* are quite diverse. It is useful to subdivide these in the following categories:

- commercial mass propagation
- *ex situ* conservation
- physiological examination under sterile conditions, especially for understanding the nutrition of carnivorous plants
- study and production of secondary metabolites.

The applied techniques and the exploited mechanisms for reaching a particular goal are consequently as different as the purposes themselves. For the first two categories clonal propagation is achieved using techniques which minimize somaclonal variation e.g. the shoot tip culture or the single node technique. Organ cultures are used for the third category, whereas undifferentiated fast growing cell cultures are preferred for the production of natural products.

In our laboratory, we have established *in vitro* cultures of several carnivorous plants and their close non-carnivorous relatives in the order Nepenthales (incl. Polygonaceae, Plumbaginaceae, Nepenthaceae, Ancistrocladaceae, Dioncophyllaceae, Drosophyllaceae, and Droseraceae) for the purpose of studies on their secondary metabolism. The members of this group are marked by their ability to produce acetogenic quinones like plumbagin, 7-methyljuglone, or emodin. Furthermore, the families Ancistrocladaceae and Dioncophyllaceae (incl. *Triphyophyllum peltatum*) are notable for containing the unique naphthylisoquinoline alkaloids (Bringmann & Pokorny 1995) investigated in our group.

First experiments with callus cultures have shown that acetogenic metabolite production can be elicited by exogenous stimuli.

The carnivorous syndrome of one of the above mentioned species, *viz. T. peltatum* has hitherto not been demonstrated conclusively because the uptake of organic matter was not proven experimentally. For this reason labelled alanine (an amino acid commonly found in animal protein) was fed to the insect-trapping organs of *T. peltatum* during a field trip to the Taï National Park in Ivory Coast (Bringmann & al. 1996). After GC/MS analysis of extracts from different parts of fed and control plants, incorporation and redistribution of the label was demonstrated unambiguously. *T. peltatum* is a part time carnivorous plant with all required attributes.

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The Effect of *Bacillus cereus* on the Digestion of Prey by Carnivorous Plants

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Carnivorous plants catch and digest insects. This digestion of prey is due to enzymes produced by the carnivorous plants, to enzymes produced by bacteria, or a combination of both, depending on the species. Carnivorous plants rarely secrete all the enzymes needed for total digestion of prey (Juniper 1989, p.190;

Heslop-Harrison 1976, p.119). Thus, bacterial enzymes improve the digestive system of most carnivorous plants.

I tested the bacterial influence on the digestion of the prey, using *Bacillus cereus* as a test organism, in a project for the "Swiss Contest for Young Scientists". Many different carnivorous plants were examined in order to find out if *Bacillus cereus* lives in the digestive system. The occurrence of *Bacillus cereus* was tested using agar plates in 131 samples of digestive liquids and trap partitions of carnivorous plants (samples of *Heliamphora*, *Cephalotus*, *Nepenthes*, *Sarracenia*, *Dionaea*, *Pinguicula*, *Drosera*, *Drosophyllum*), 15 samples from substrate around the carnivorous plants (water, soil, moss), and 20 samples from potential prey. In the samples of *Heliamphora*, *Bacillus cereus* was always present. It was proven that *Bacillus cereus* is ubiquitous. Moreover, it was confirmed with special cultures that *Bacillus cereus* is a facultative anaerobic bacterium. Experiments have also shown that *Bacillus cereus* produces and secretes amylases (method: "coloured starch-agar-plates", Birkenbeil, 1983, p.95), lipases (method: "optical change and change of the pH-value of a supernatant-oil-mixture", Stellmach, 1988) and proteases which can digest polypeptides and peptides (photospectroscopical measurements and gel electrophoresis). Besides there was an effort to clean and measure the size of the amylases of *Bacillus cereus* and to compare the size with the protein sizes in different digestive liquids of carnivorous plants. By different plate-cultures we observed that when numerous colonies of *Bacillus cereus* are present, nearly no other bacteria were able to grow. Final conclusion: *Bacillus cereus* and other bacteria probably play an important role in the digestive system of carnivorous plants.

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Flora and Fauna of the "Bernrieder Filz" Nature Reserve (Southern Bavaria, Municipality of Seeshaupt)

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The "Bernrieder Filz" is a characteristic prealpine raised bog with a vegetation dominated by mountain pine (*Pinus mugo* TURRA), heath (*Calluna vulgaris*) and different *Sphagnum* communities.

The high diversity of habitats makes it suitable not only for most of the native carnivorous plant species, but also for a large quantity of other plants and animals adapted to bog ecosystems.

During a research period of two years, the author investigated the flora and fauna of the "Bernrieder Filz" and the local mobility of the animal and plant species found. Special emphasis was laid on the vegetation and fauna of the different biotope types lying on the edge of the asymmetric peat bog.

About 400 different species were found in an area of approx. 0.5 km^2 (130 acres) and mapped out in a topographical 1:5000 map. Furthermore, aerial pictures were analyzed and the vegetation communities found were assigned to 17 sub-units.

For each of the subunits, the percentage of endangered animal and plant species was calculated using the "red lists" of endangered species for Bavaria (P. Schönfelder, 1988; G. Heusinger, 1992). In addition, the extent of their local mobility was measured.

Using these data, a protection and management concept for the "Bernrieder Filz" was developed and an extension of the nature reserve area was proposed.