

zooplankton as prey; j) oligo-mesotrophic water. *Aldrovanda* grows in shallow standing dystrophic waters, but only in loose stands of emergent vegetation (*Phragmites*, *Typha*, *Carex*) or in little bays among tussocks of denser vegetation. Generally, small habitat changes may result in the decline of *Aldrovanda*. Its decline has been caused mainly by water eutrophication, drainage, and filling in of water bodies.

Its outdoor culture mimics habitat conditions at natural sites. In a culture, about a 3 cm layer of litter of robust *Carex* species, placed over 5-8 cm of sand, is used as the bottom substrate. The container is loosely planted with sedges or common reed. Water depth is 20-30 cm. As *Aldrovanda* is susceptible to boron deficiency, boric acid must be added. Turions overwinter well in the refrigerator. As outdoor cultivation can be still problematic in-vitro culture offers hopeful perspectives to be used for scientific and nature conservation projects dealing with ecophysiological studies, keeping of gene-pool stock, and (re)introduction activities. Very recently, growing *Aldrovanda* in-vitro has been managed successfully.

Great effort has been made to select new suitable sites in the Czech Republic. The plants placed in nylon enclosures in three shallow dystrophic wetlands in N. and S. Bohemia grew rapidly and reproduced 8-34 times over the 1994 season. Approximately 10-50 % of the turions overwintered. When 30 *Aldrovanda* plants were introduced to the suitable sites in S. Bohemia (Trebou region) in 1995, the plants grew rapidly only in a *Carex rostrata*-dominated pool. Turions overwintered perfectly and in the 1996-1997 seasons, the plants propagated richly, forming an abundant population. Its total size was about 6,000 shoot apices in 1996 while 11,000 ones in 1997. Water level at the sites in summer has been found to be the crucial factor for rapid growth and propagation of *Aldrovanda*. The water level was very low in 1995, but high in 1996 and 1997. Thus, a new prolific site arose in S. Bohemia, where *Aldrovanda* had never grown.

Ecology and Distribution of *Utricularia* Species in India

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The genus *Utricularia* is known to occur in almost every country of the world, but the majority of the species are mostly distributed in seasonally wet and high rainfall receiving tropical and subtropical regions (Taylor 1989). India is known for its varied habitats and climate which is responsible for the high diversity in species of *Utricularia*. About 35 species are recognised under the genus for the Indian political boundary (Janarthanam & Henry, 1992). These belong to eight sections with high diversity seen in section *Oligocista* with 18 species for the region followed by section *Phyllaria* and *Utricularia* with five species each. Remaining sections are represented by either one or two species each.

Based on their habitats, the species can be broadly classified into one of the following categories: i) floating / suspended aquatics, ii) rooted marshy terrestrials and iii) partial epiphytes. The floating or suspended aquatics are distributed almost throughout the country, at least sporadically. Their habitat is usually stagnant or slow flowing fresh water. Rooted marshy terrestrials show high diversity in their habitats varying from wet lateritic rocks to moss covered water dripping rocks and fast flowing streams in which black boulders form the substrate. The whole of section *Oligocista* belong to this type. Most of these are distributed along the Western Ghats and West Coast of Southern India. There is lot of variation in microhabitats which is also reflected in inter and intraspecific variation. A high amount of intraspecific variation is seen in the species which are distributed widely and in several microhabitats. However, it is noticed that the marshy terrestrial species which are recorded across the continents are very rare and that two are recorded from lower to medium elevations from the inland. Based on the distribution and diversity, the following two centres of species diversity is recognised for the genus *Utricularia* in India: 1) Eastern Himalayas, where the partial epiphytes with appendaged seeds (sect. *Phyllaria*) are mostly distributed and 2) the Western Ghats and West Coast, where the species of section *Oligocista* with several endemic species are distributed. It is observed that the world's highest rainfall receiving station situated in the state of Meghalaya in North East is very poor in species diversity, suggesting that high rainfall alone

does not increase the species diversity in this group. The present paper deals with the ecology and distribution of the species of *Utricularia* in India and the observed positive correlation between the intra and interspecific variation on one hand and ecology and distribution on the other.

References

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The Diversity of Plant Communities on Tropical Inselbergs

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Inselbergs occur as frequently dome-shaped rock outcrops (like the "Sugar Loaf" of Rio de Janeiro) in all climatic and vegetational zones of the tropics. They comprise a broad spectrum of size classes with the largest inselbergs attaining a height of several hundred metres and covering several square kilometres. Consisting of Precambrian rocks, they form ancient (i.e. millions of years old) and stable landscape elements. Due to the lack of soil and desert-like microclimatic conditions, the vegetation of inselbergs differs markedly from that of the surroundings. During the last years the conceptual framework for an assessment and monitoring of the vegetation of inselbergs on a worldwide scale has been developed and floristic as well as ecological data were acquired for a number of tropical countries (e.g. Côte d'Ivoire, Zimbabwe, Venezuela, Brazil, Seychelles). The ecology of carnivorous plants occurring on inselbergs has largely been neglected hitherto.

Clearly defined inselberg plant communities (e.g. cryptogamic crusts, seasonal rock pools, monocotyledonous mats, ephemeral flush vegetation, wet flush vegetation) can be distinguished based on their physiognomy. Mats consisting of monocotyledonous plants (such as grasses and sedges), which occur like carpets on exposed and frequently steeply inclined slopes, are one of the most conspicuous communities of the inselberg ecosystem. Characteristically these mostly species-poor mats form clearly delimited, isolated vegetation fragments. Situated at the feet of steep slopes and benefiting from nutrient-poor seepage water, the ephemeral flush vegetation is characterized by the occurrence of a large number of short-lived species.

On African inselbergs the ephemeral flush vegetation is the most speciose plant community. The high number of carnivorous species (*Utricularia*, *Genlisea*, *Drosera*) is remarkable. In particular small-sized species of *Utricularia* (e.g. *U. pubescens*, *U. subulata*) may form dense stands over very shallow soil. Similarly, the genus *Genlisea* is a characteristic component of the ephemeral flush vegetation both on African and South American inselbergs. Most *Genlisea* species possess a small rosette of spatulate leaves and highly modified achlorophyllous subterranean leaves. It is traditionally assumed that these specialised leaves are traps for catching prey, but there has not been proof of carnivory. The dimensions of the traps led us to postulate that the subterranean leaves may function as highly specialised traps for catching protozoa. Both laboratory experiments and field studies proved that *Genlisea* can be regarded as a highly specialized protozoan trap.