Several ecophysiological observations in *Genlisea*

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Thanks to successful cultivation of *Genlisea* species, it is possible to complement field research with important details. This can be helpful particularly in acquiring better knowledge of life functions. Six species (*G. filiformis, G. hispidula, G. pygmaea, G. repens, G. roraimensis and G. violacea*) are cultivated in the Bot. Gardens Liberec (CR).

According to occasional field observations,*Genlisea* species often grow in water. Nevertheless, one must question if they are true aquatic plants or if they are in some sense semiterrestrial. We can look for stomata which are considered special aerial organs. Stomata are mostly absent in submerged plants but there are several exceptions having rudimentary stomata.

Lloyd (1942) writes: "All the species are small plants which inhabit swampy places and apparently live mostly submersed in shallow water; only the inflorescence, as in *Utricularia*, projecting above the surface. This is to be inferred from the absence of stomata .....". In contradiction to this opinion, Elsa Fromm-Trinta (1979) published photographs of distinct stomata in *G. filiformis, G. pygmaea, G. repens and G. violacea*. She writes: "Stomata are only in the dorsal epidermis of *G. repens and G. pygmaea.*" I have also studied *G. repens and G. pygmae and G. hispidula and G. roraimensis*. I have also found stomata, but I have been surprised by observing the stomata only in the lower (abaxial) surface of leaves. According to Czech authorities (e. g. Dostál 1954, etc.), the "dorsal" near the upper surface of a leaf. The term "dorsal" is evidently used in different meaning in botany!

It is better to say that stomata occur in the abaxial surface of leaves. That is however an arrangement which is normal in many purely terrestrial plants. I have found both open and closed stomata in various specimens of *Genlisea*. I believe,therefore that stomata are working and are not rudimentary. *Genlisea* species are semiterrestrial plants, green leaves of which are aerial organs. They can survive also below water for long periods, but I have never observed morphological adaptations to that condition. Many semiterrestrial Utricularias (*U. graminifolia, U. prehensilis* etc.) make short aerial terrestrial leaves and very long ribbon-shaped aquatic leaves. These plants, related to *Genlisea*, are probably more adapted to aquatic life in comparison with *Genlisea*.

The investigation of traps in cultivated specimens is of interest, I have compared two most different species, namely *G. hispidula* and *G. pygmaea*. You find only one type of trap in *G. hispidula*, but in *G. pygmaea* there are two evidently different types of traps. The traps of the first type are very long, with very small vesicles, narrow necks and with long arms. They are in a vertical position. The traps of the second type are short, but the vesicles are three times larger and the necks are three times wider than in the first type. The arms are also very short, with fewer windings. These traps are more or less horizontal.

Analysis of contents in the traps has been surprising. The traps of *G. hispidula* have been quite empty, but the traps of *G. pygmaea*, cultivated in the same soil and in the same conditions, have been full of prey. In the vesicles I have seen remains of two species of Nemathelmintes, Arthropoda, and also single-cell algae (Baccillariophyzae and Desmidiales). In necks, I have frequently observed living Nematodes. Comparing

the two studied species, we can draw two conclusions:
1. There is specialisation of different prey in the species, because only one of them has consumed prey from the uniform culture system..

2. Prey is not wholly necessary because all specimens of *G. hispidula* (without any prey in traps) have been in good form and frequently flowered.

A further step of my research has been connected with the published hypothesis about active capture of prey in *Genlisea* (Meyers-Rice 1994). I have performed a simply experiment, using intact specimens of *G. pygmaea*. The plant was removed from soil and traps of the one were submerged into water with very finely dispersed particles of a red pigment. After 20 minutes . . . several traps of both small and large types were cut and observed microscopically. I have never observed any red grains or soil particles in the traps.I could not confirm Meyers-Rice's hypothesis this way. I believe that the traps are passive. The soil particles in traps, mentioned in literature (Juniper, Robins and Joel 1989), could be pushed to the vesicles by captured animals or in consequence of artificial compressions during transport of the plants from the wild.

The fact that glands in the vesicles in *Genlisea* are different from the active traps in *Utricularia* also speaks against the hypothesis; especially the group of two-armed glands, which should be responsible for the pumping of water in *Utricularia*, is absent in *Genlisea*. Because the glands in the vesicles of *Genlisea* are very similar to the glands known in *Pinguicula*, the speed of absorption is probably comparable.

I can also comment on the description of growth in the traps of *Genlisea*, published by Lloyd (1942). How do the traps penetrate into soil? According to Lloyd, in the begin the *Genlisea* trap grows like a root. The meristem is also in the apex of the tubular organ, which is covered by mucilage produced by numerous very small glands. Most interesting is the last part of development, when arms start to grow. According to Lloyd, there is rotation of the growing arms. I have found two near-by traps with arms screwed one into another. It seems to be a demonstration, that the arms penetrate into soil like an auger into wood.

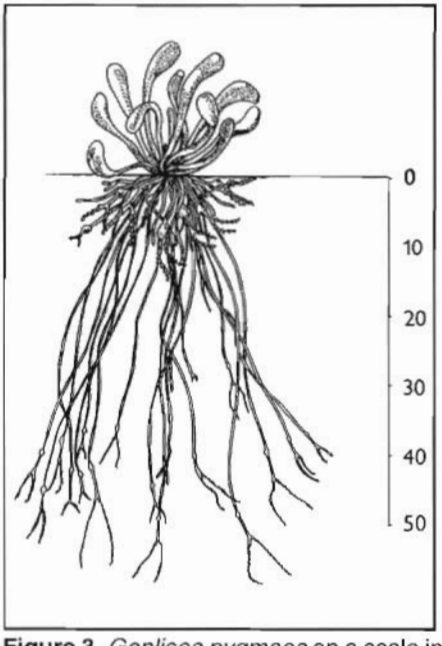

Figure 3. *Genlisea pygmaea* on a scale in millimetres. Two different types of traps in one plant. (Drawing by R. Novotná.)

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