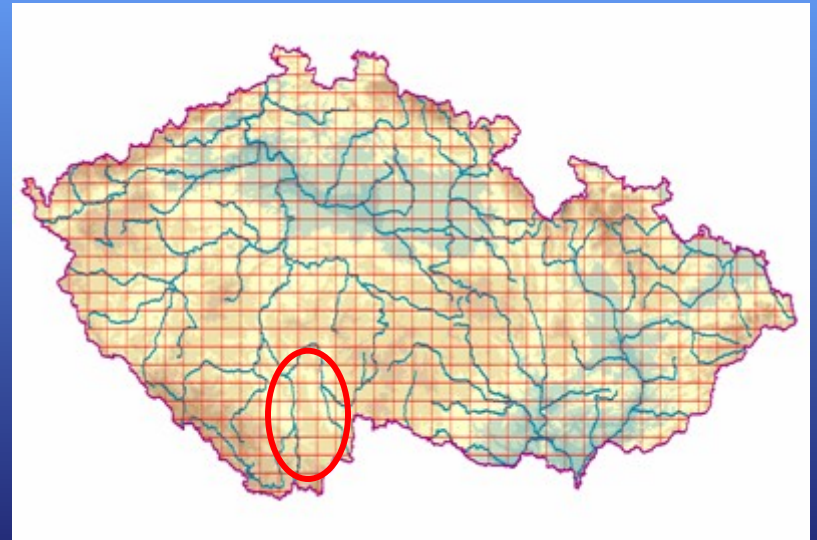
An aerial photograph showing a wide river meandering through a landscape. The river is dark blue and flows from the top left towards the bottom right. The banks are lined with dense forests, some of which are in autumn, showing yellow and orange foliage. In the background, there are green fields and some buildings, suggesting a rural or agricultural area. The overall scene is a mix of natural and human-made environments.

**PVC tape discolouration
method of recording
relative water-table depth:
advantages and constraints
in fens**

Jana Navrátilová, Michal Hájek, Josef Navrátil

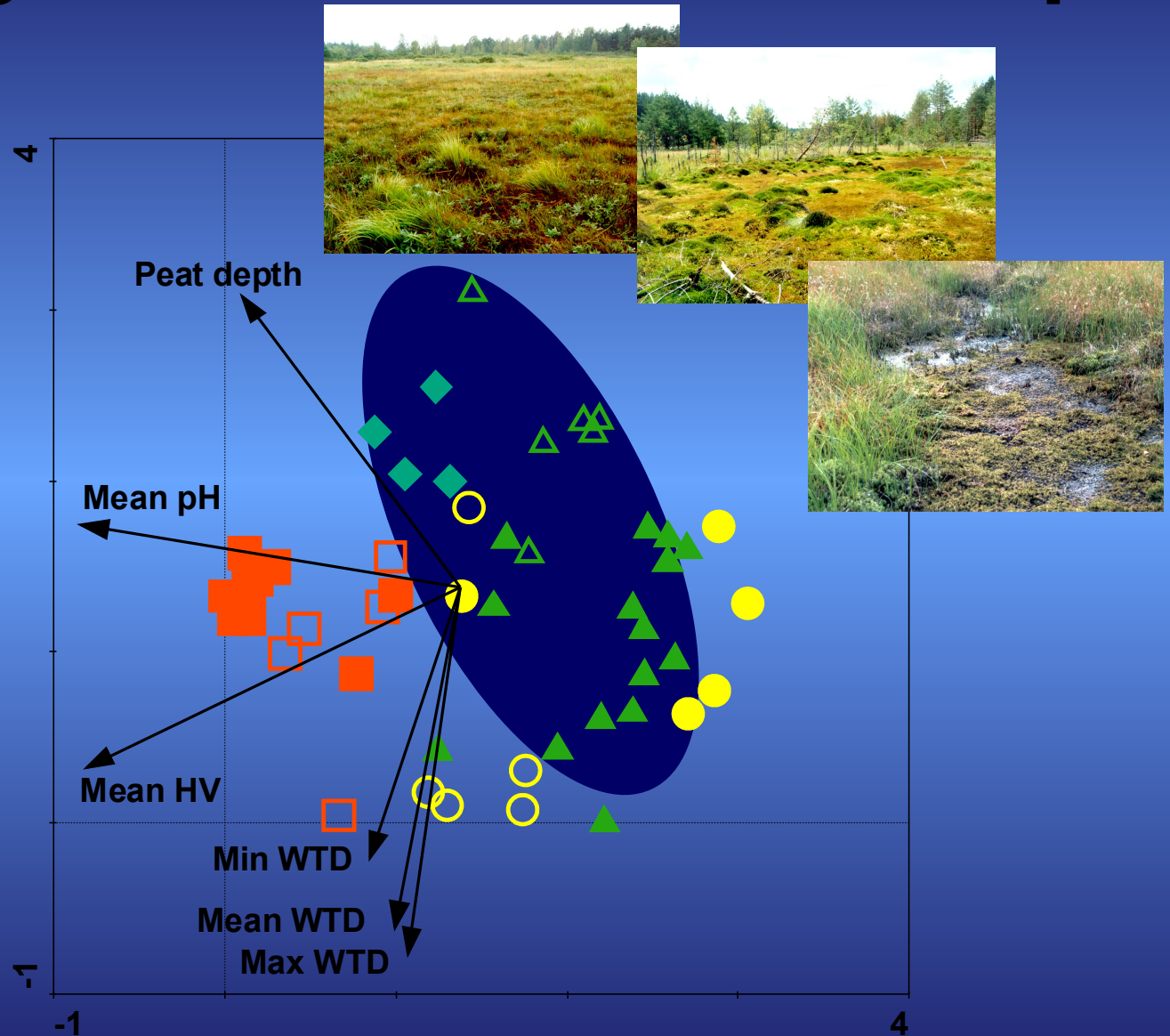
Recording relative water table depth

- Water table dept is one of the major factors influencing the composition of mire vegetation
- In our study area (**Třeboň Basin**, The Czech Republic) it is usually environmental factor secondary importance, after pH, for fen vegetation variation
- The species composition pattern and environmental correlates found in our study area are similar to those in other European mires.



Recording relative water table depth

DCA ordination diagram of vegetation samples



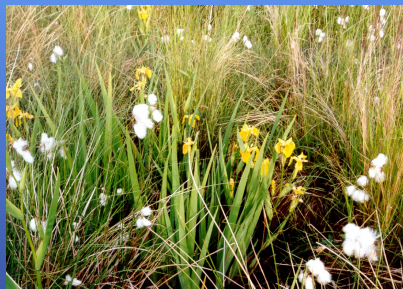
• Poor fen

alliance: *Sphagno recurvi-Caricion canescentis*

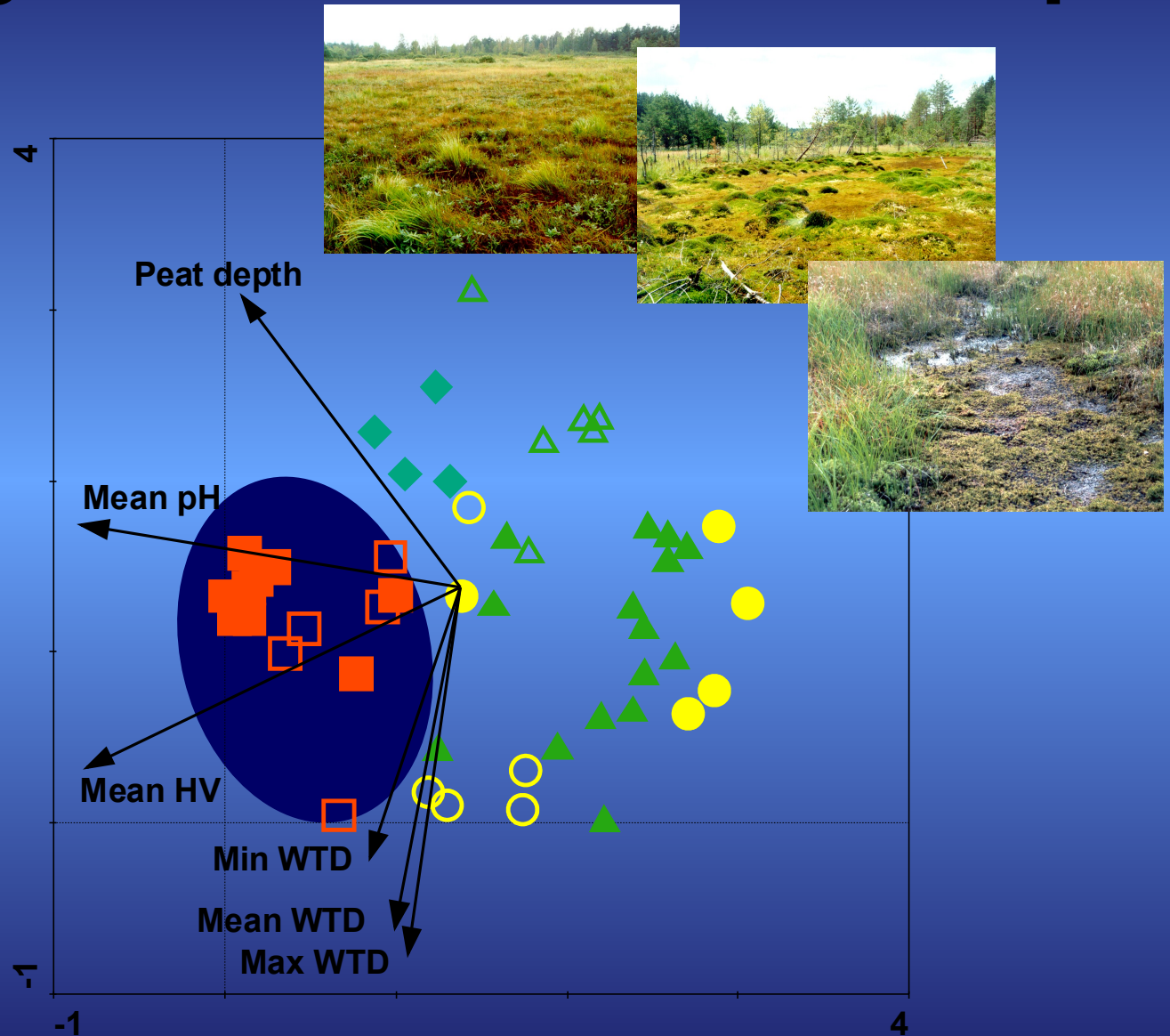
• most common mire vegetation in Třeboň basin; oligotrophic transitional mires

Recording relative water table depth

DCA ordination diagram of vegetation samples



- Poor fen
- Moderately rich fen

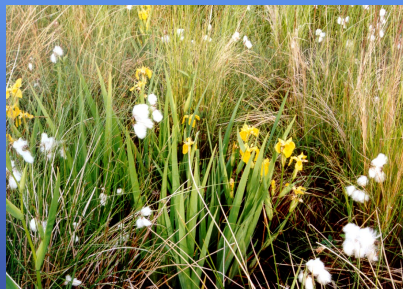


alliance: *Eriophorion gracilis*; *Magnocarition elatae*

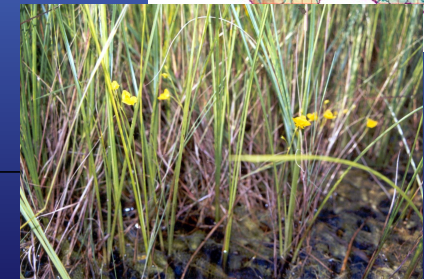
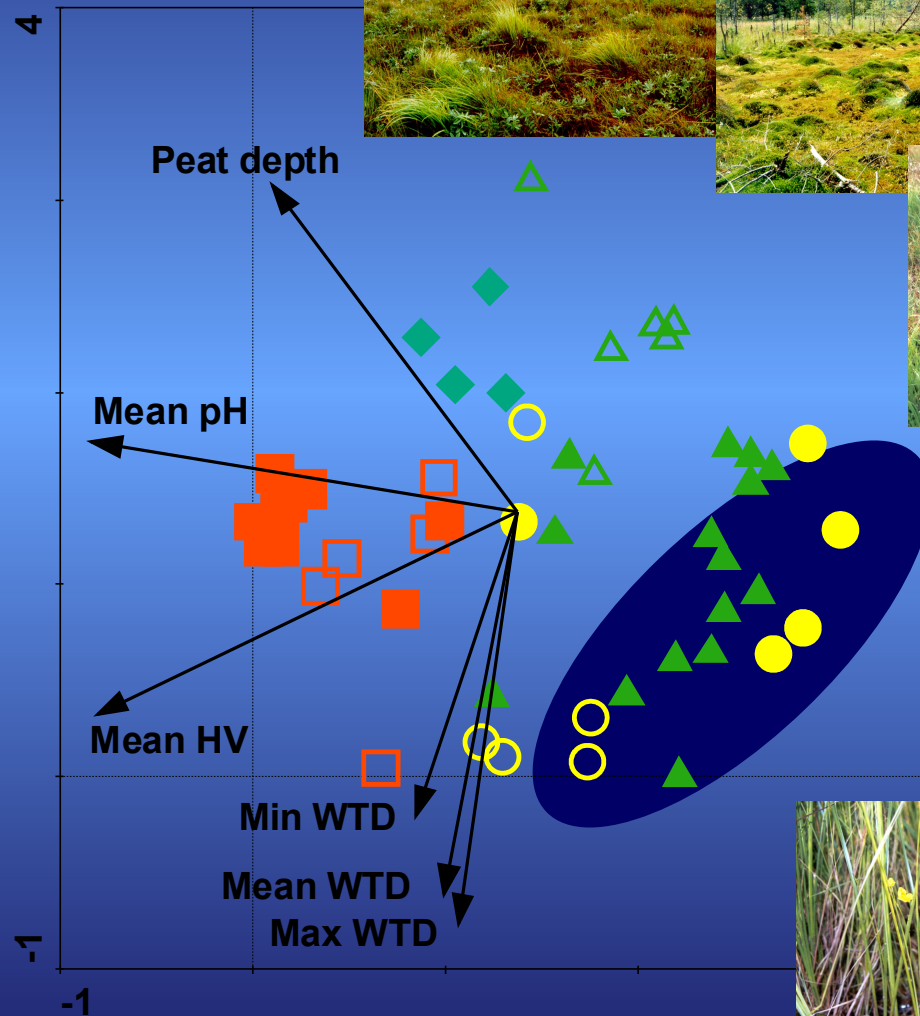
• medium-rich fens dominated by sedges and mosses; occurs in stands saturated with mineral-rich groundwater

Recording relative water table depth

DCA ordination diagram of vegetation samples



- Poor fen
- Moderately rich fen
- Flooded fen



alliance: *Sphagno-Utricularion*; *Rhynchosporion albae*

• initial successional stage on sandy deposits or fen peat permanently flooded by water

Recording relative water table depth

Direct methods:

are quite time or money spending

Indirect methods:

The PVC tape discolouration method (Belyea, 1999, *Funct. Ecol.* 13: 431-434): is cheap and flexibility of use



- based on discolouration of PVC (which incorporates metal ions) caused by reducing conditions
- as reducing conditions are often highly correlated with WTD in mires the discolouration of PVC can indirectly indicate basic characteristic of the water regime

Recording relative water table depth

Direct methods:

are quite time or money spending

Indirect methods:

The PVC tape discolouration method (Belyea, 1999, *Funct. Ecol.* 13: 431-434): is cheap and flexibility of use



- was used in ombrotrophic bog
- than we tried to verify its reliability (by correlation between direct measurement of water fluctuation and indirect measurement using PVC tape) in minerotrophic fens.

Recording relative water table depth

Methods:

- 49 permanent plots in the six localities in fens described above
- The WTD was measured in perforated PVC tubes at 20 days intervals from March to October 2003 (during vegetation season)
- A strip of PVC red electric insulating tape (RS Components Ltd, Corby, UK) attached lengthwise to a fresh bamboo stake, was installed near each tube (March to October 2003)
- After recovery, the colour of the strips was compared subjectively with a common standard (fresh tape and fully discoloured tape)

Recording relative water table depth

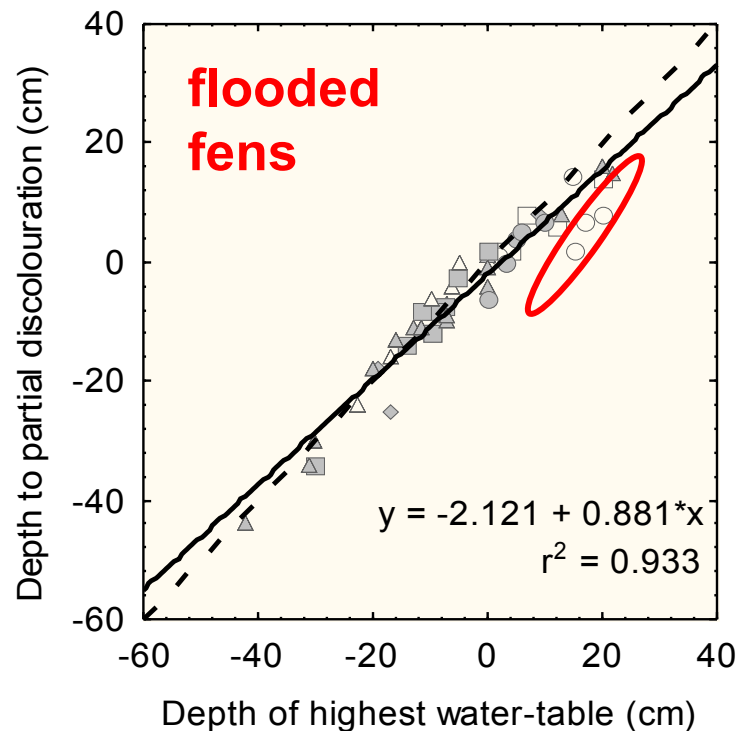
Methods:

- (a) Maxima, (b) minima and (c) means of directly measured water level were correlated with (a) depth to first sign of discolouration (indicating the depth to the highest water table), with (b) depth to complete discolouration (indicating the lowest water table), with (c) the depth calculated from the level of the initial PVC tape discolouration and total PVC discolouration.

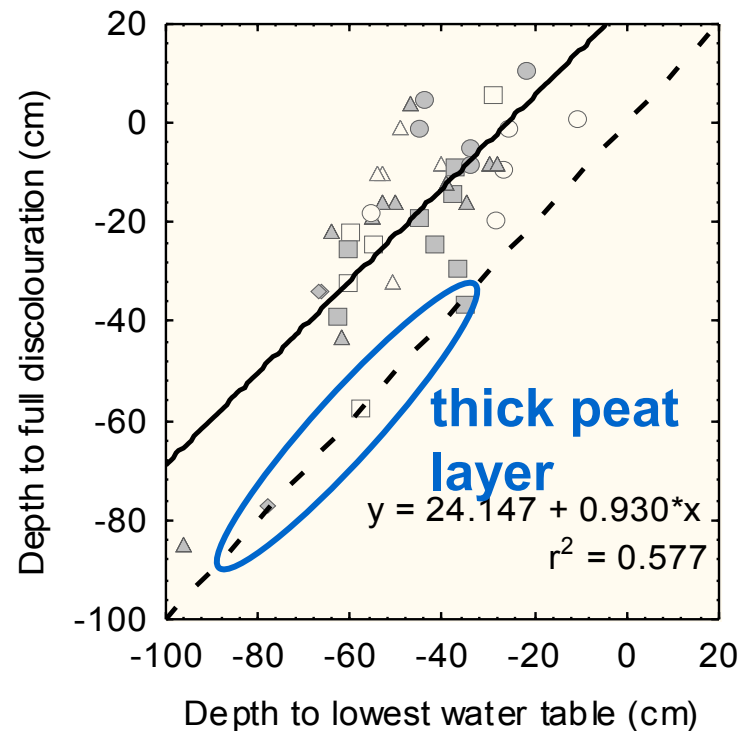
Recording relative water table depth

The PVC tape discolouration method reliably indicates the water-table maxima in fens, but minima are strongly biased.

PVC – Max ($r = 0.97$; $p < 0.001$)



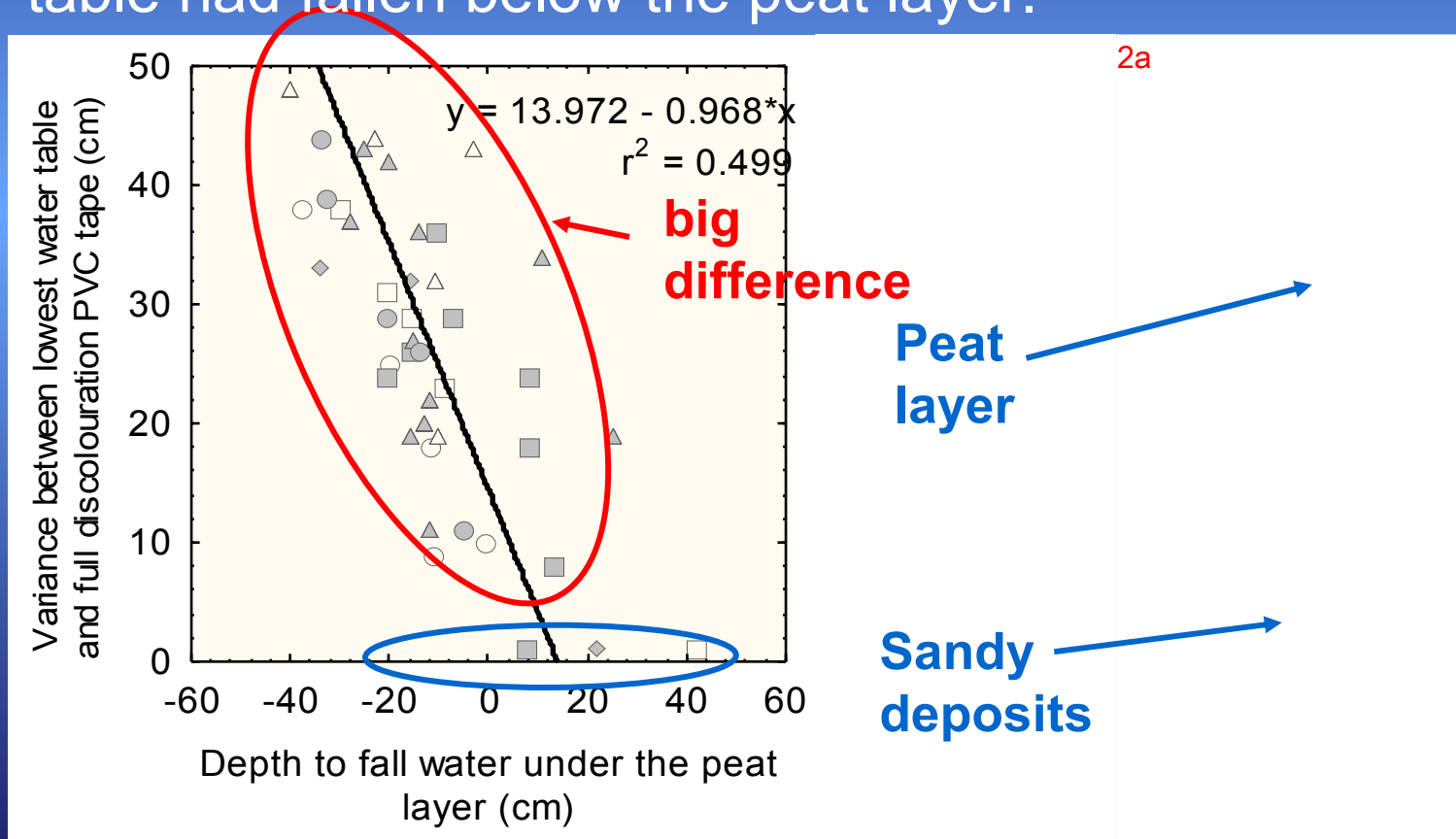
PVC – Min ($r = 0.77$; $p < 0.001$)



Recording relative water table depth

The exactness of the minimum water-table measurement depends on the thickness of the peat layer.

The disagreement was more pronounced when the water table had fallen below the peat layer.



The depth of unmineralized organic peat was recorded in each sampling plot with soil probe.

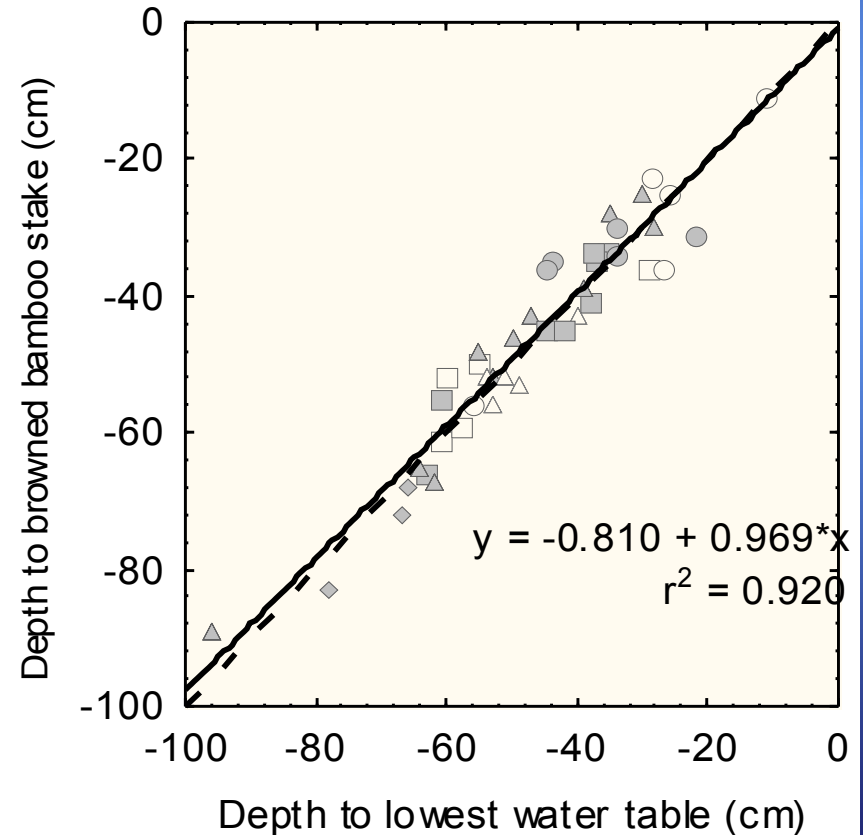
Recording relative water table depth

The depth of green bamboo discolouration is an alternative indicator of the minimum water-table, even on mineral soils.



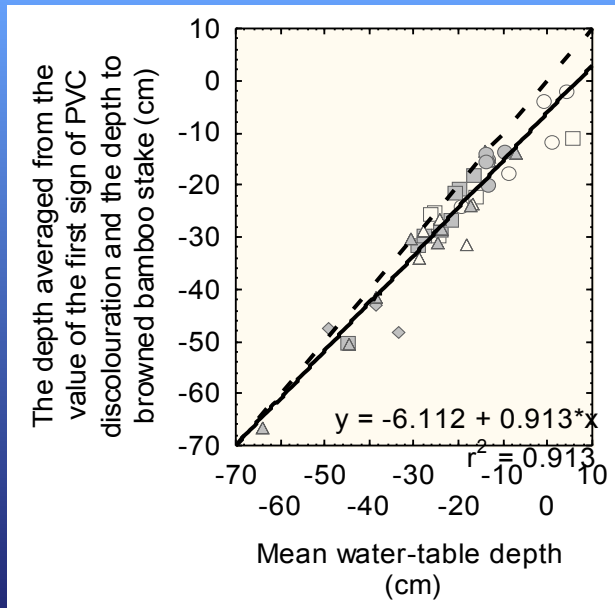
Bamboo – Min
($r = 0.96$; $p < 0.001$)

Min



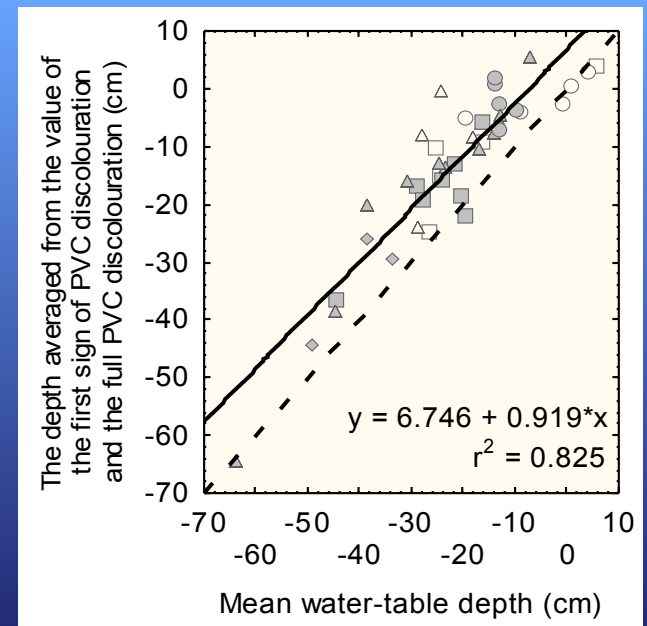
Recording relative water table depth

Measured mean water table correlated significantly with the depth calculated from the level of the first PVC discolouration and the depth to the browned bamboo stake. Poorer correlation was found between measured mean water table and the depth calculated from the level of the initial PVC tape discolouration and total PVC discolouration.



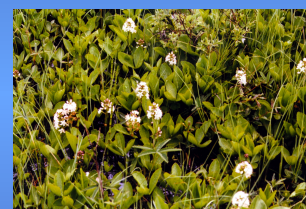
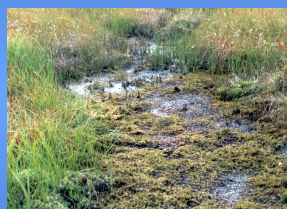
PVC/bamboo – Mean
($r = 0.96$; $p < 0.001$)

PVC/PVC – Mean
($r = 0.91$; $p < 0.001$)



Recording relative water table depth

- Accuracy rate of PVC tape/bamboo discolouration method is dependent on vegetation type.
- Comparison of regression slopes and Pearson's correlation coefficients (in brackets) with respect to the response of PVC tape/bamboo discolouration to water level among three main vegetation types.



Vegetation type:	Poor fens	Moderately rich fens	Flooded fens
First sign of PVC discolouration – highest water table	0.938 (0.98)	0.927 (0.97)	0.561 (0.71)
Full PVC discolouration – lowest water table	1.193 (0.84)	0.735 (0.58)	0.259 (0.35) n.s.
Browned bamboo stake – lowest water table	1.027 (0.97)	0.858 (0.93)	0.779 (0.87)
Mean value of the first sign of PVC discolouration and the full PVC discolouration – mean water-table	1.113 (0.94)	0.773 (0.87)	0.201 (0.47) n.s.
Mean value of the first sign of PVC discolouration and the depth to browned bamboo stake – mean water-table	0.949 (0.96)	0.756 (0.92)	0.766 (0.88)

Recording relative water table depth

Conclusions:

- The PVC tape discolouration method reliably indicates water table maxima in fens, but minima are not accurately indicated.
- The depth of the green bamboo discolouration is suggested as a new alternative indicator of the minimum water table, even in fens and mineral soils.
- Combining both methods enables efficient monitoring of water table dynamics at a large number of mire sites.



Photo: J. Ševčík