Flooding events and rising water temperatures increase the significance of the reed pathogen *Pythium phragmitis*

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Reed (*Phragmites australis*)

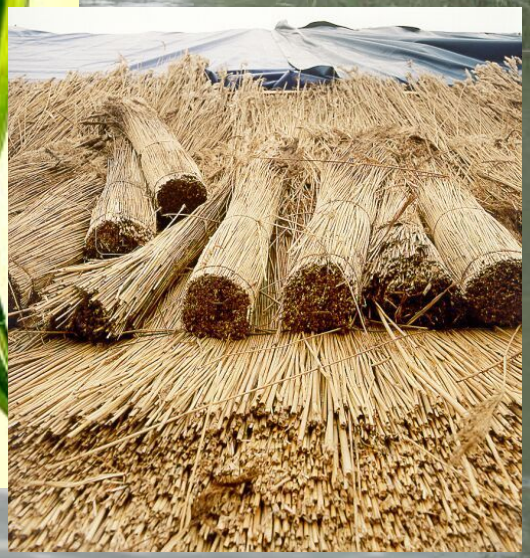
Perennial grass

Worldwide distribution

Littoral sites, up to 2m deep water

Economic value

Ecological value

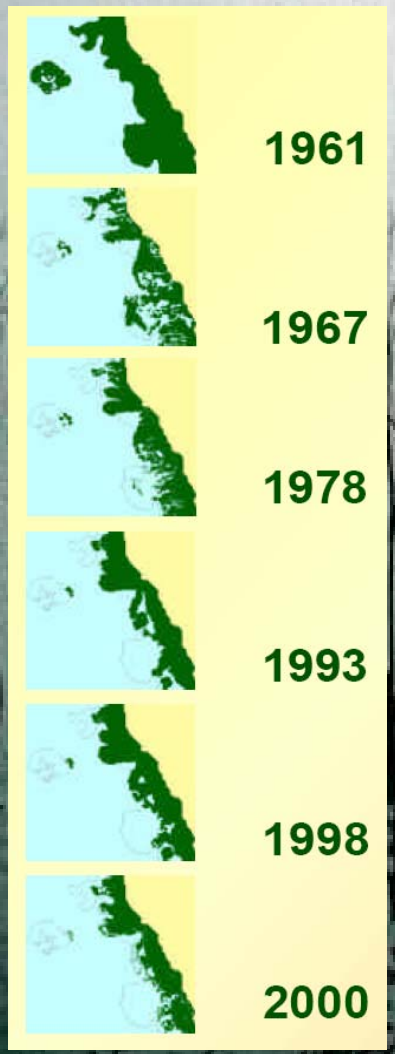


Reed (*Phragmites australis*)

Lake Constance (Bodensee)

Surface area	536 km²
Max. depth	254 m
Shore length	273 km
Max. length	63 km
Max. breadth	14 km

Reed Decline



from: Dienst & Schmieder, www.bodensee-ufer.de

Lake Constance reed belt area loss 1998-2000:
approx. 24 % (Germany)

Hypotheses:
- mechanical damage (recreation, boats, floating debris)
- water eutrophication
- animal feeding (insects, birds)
- reed damage shown to be related to flood duration, time and depth
- oxygen deficiency, anaerobic metabolism

→ „flood-induced reed dieback“ (Ostendorp, Dienst & Schmieder, 2003)

The Reed Pathogen: *Pythium phragmitis*

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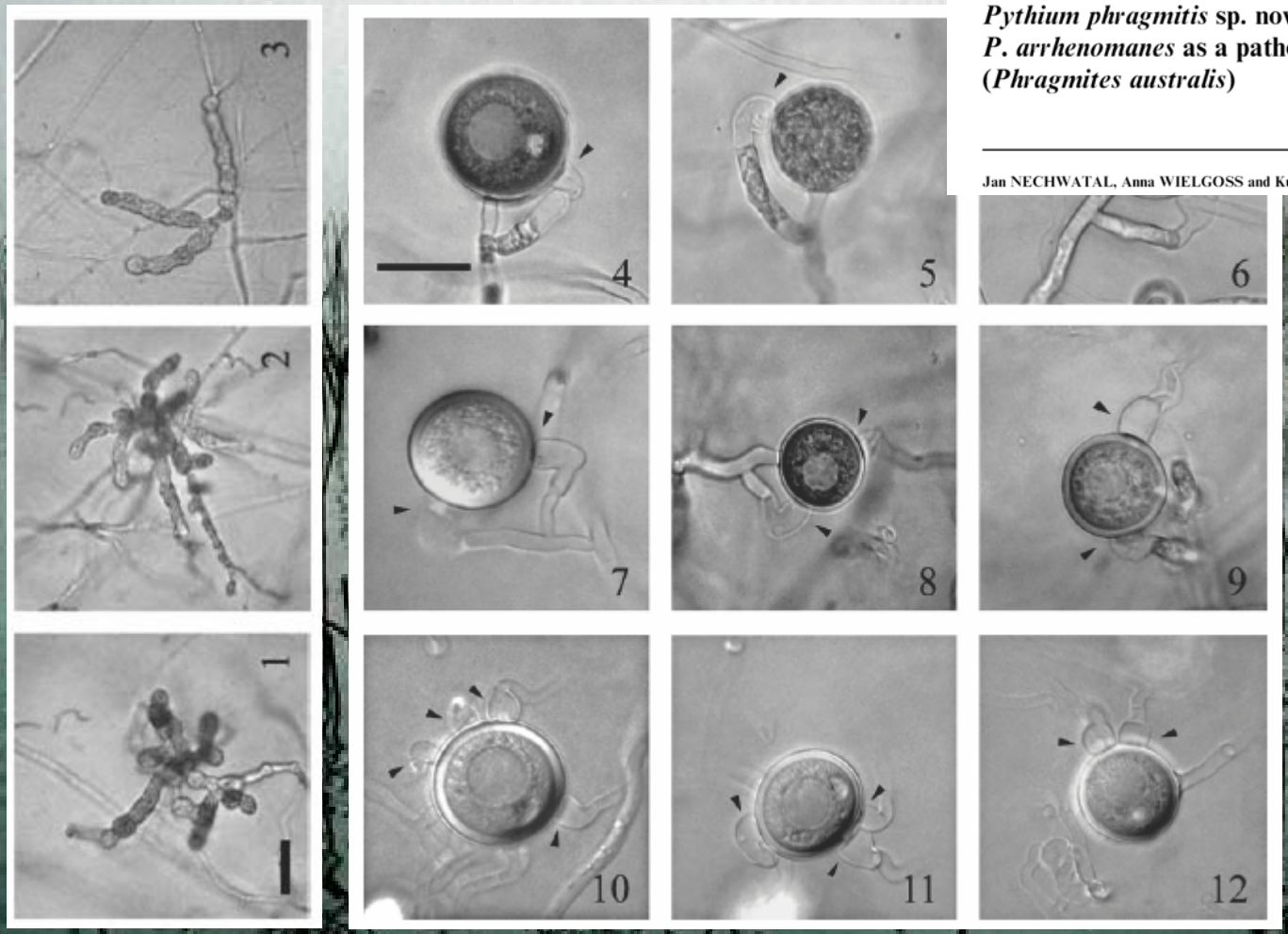
doi:10.1017/S0953756205003990 *Printed in the United Kingdom.*

Pythium phragmitis sp. nov., a new species close to _P. arrhenomanes_ as a pathogen of common reed (_Phragmites australis_)

Jan NECHWATAL, Anna WIELGOSS and Kurt MENDGEN

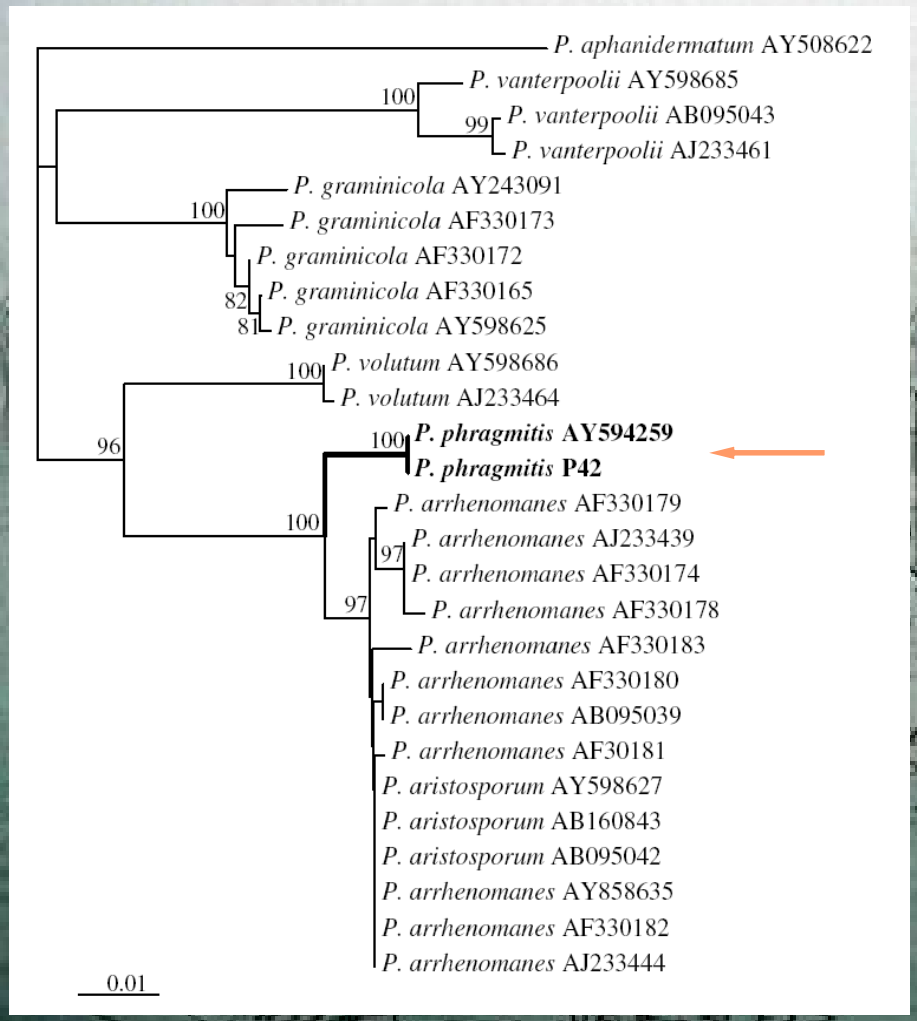


Nechwatal *et al.*, 2005

sporangia

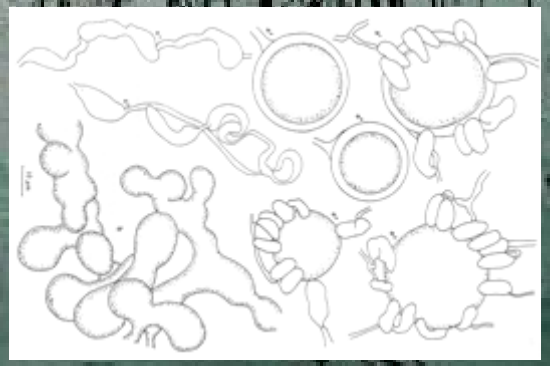
oospores

The Reed Pathogen: *Pythium phragmitis*



Nechwatal *et al.*, 2005

Grass-associated clusters B1d and B1e (Lévesque & de Cock, 2004)



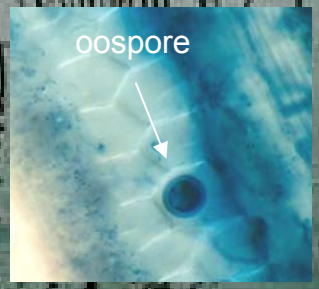
Van der Plaats-Niterink, 1981

P. arrhenomanes Drechsler (1928)

P. phragmitis: The Damage it Causes

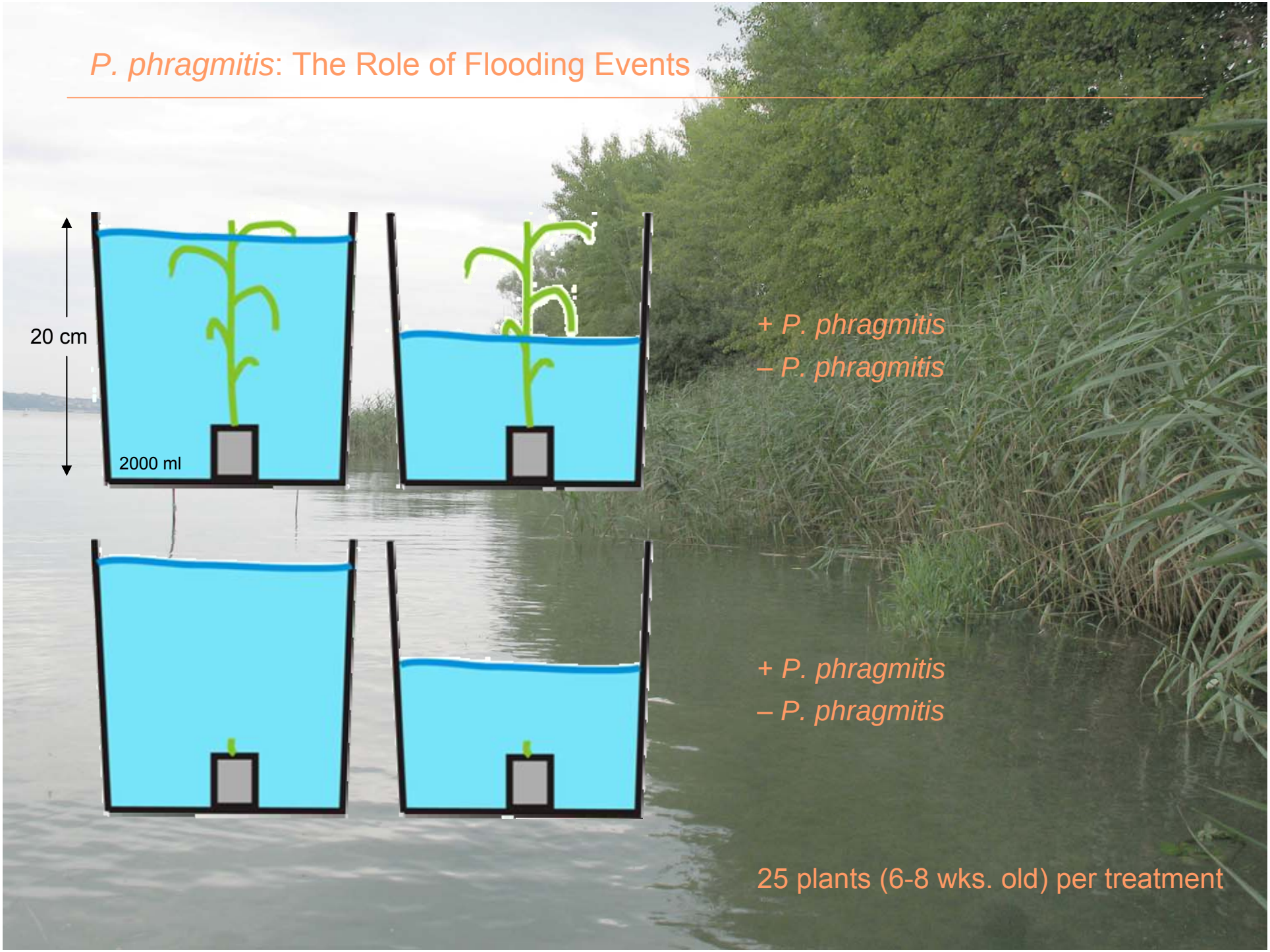
… to seedlings

… to mature leaves



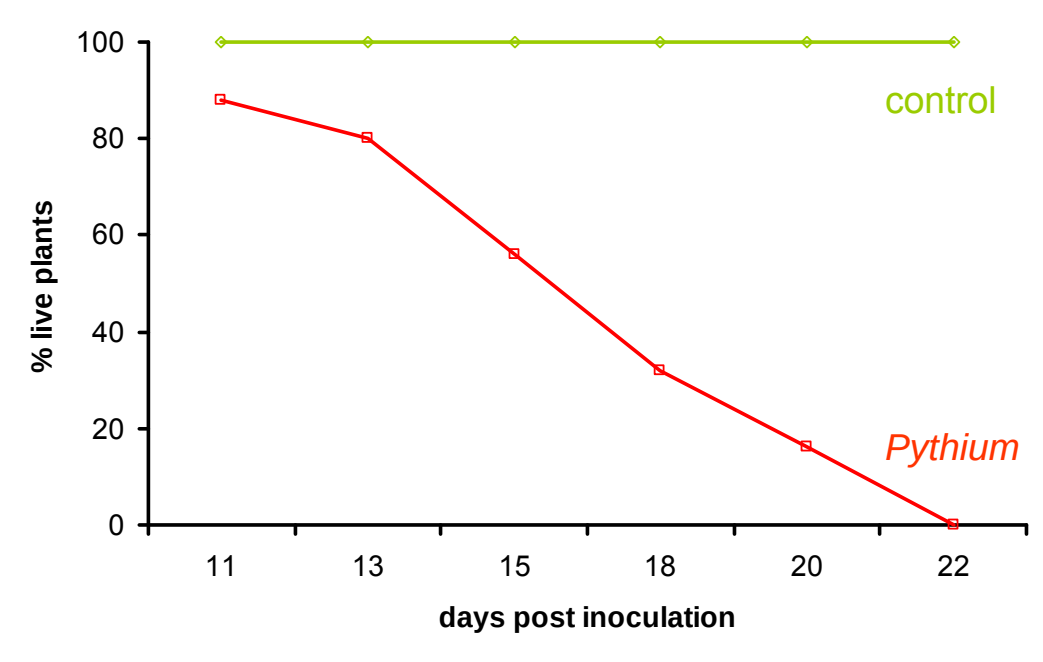
… no damage to roots and rhizomes → infection mainly *via* leaves

P. phragmitis: The Role of Flooding Events



P. phragmitis: The Role of Flooding Events

1. plants fully submerged, all leaves below water line, 3 weeks



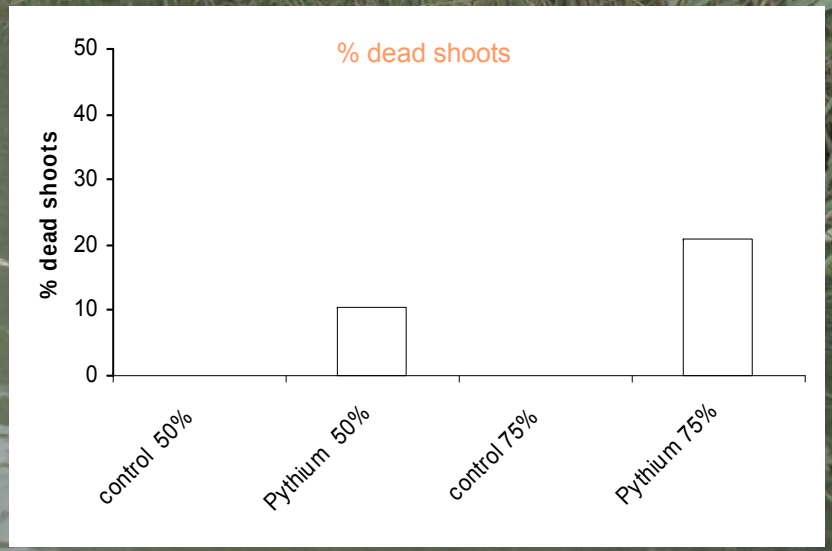
Regeneration shooting, 2 wks. after harvesting (= 36 dpi)

Control: 5-8 cm per plant

Pythium: 0

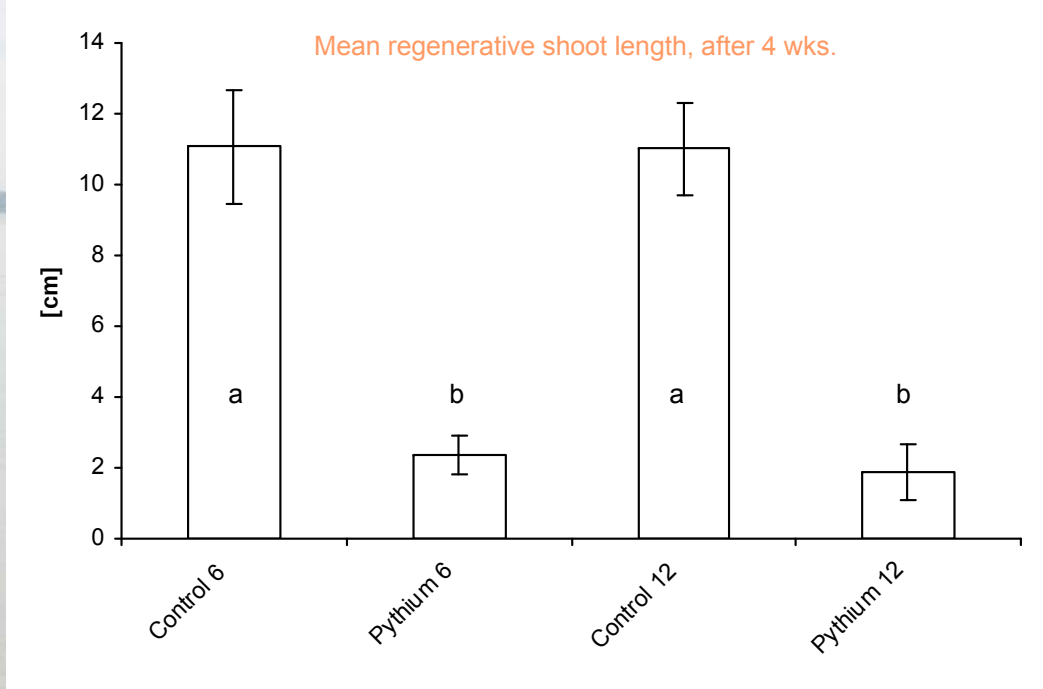
P. phragmitis: The Role of Flooding Events

2. plants partly submerged, 50 or 75% of plant height, 4 weeks



P. phragmitis: The Role of Flooding Events

3. plants clipped before flooding to 6 or 12cm above soil line, 4 weeks



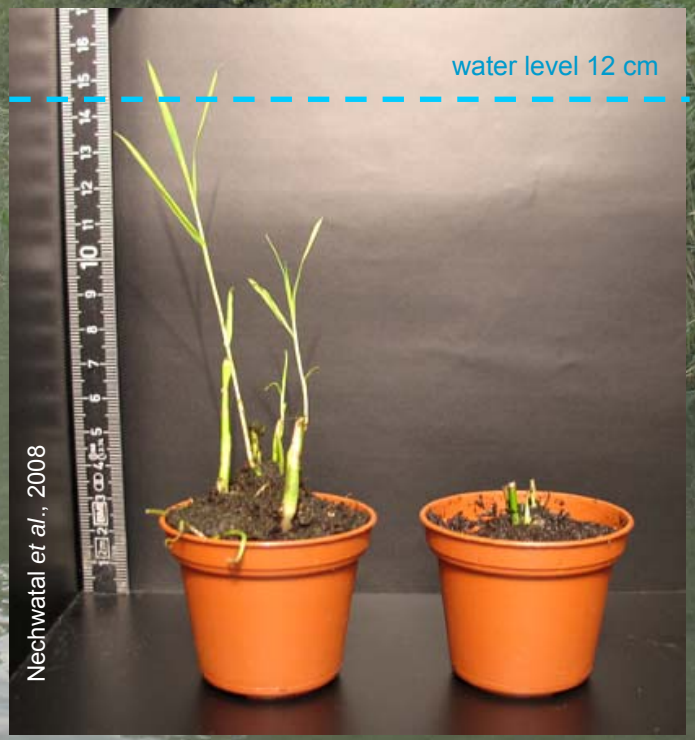
Plant death, after 4 wks.:

Control 6: 0
Control 12: 0
Pythium 6: 36%
Pythium 12: 40%

P. phragmitis: The Role of Flooding Events

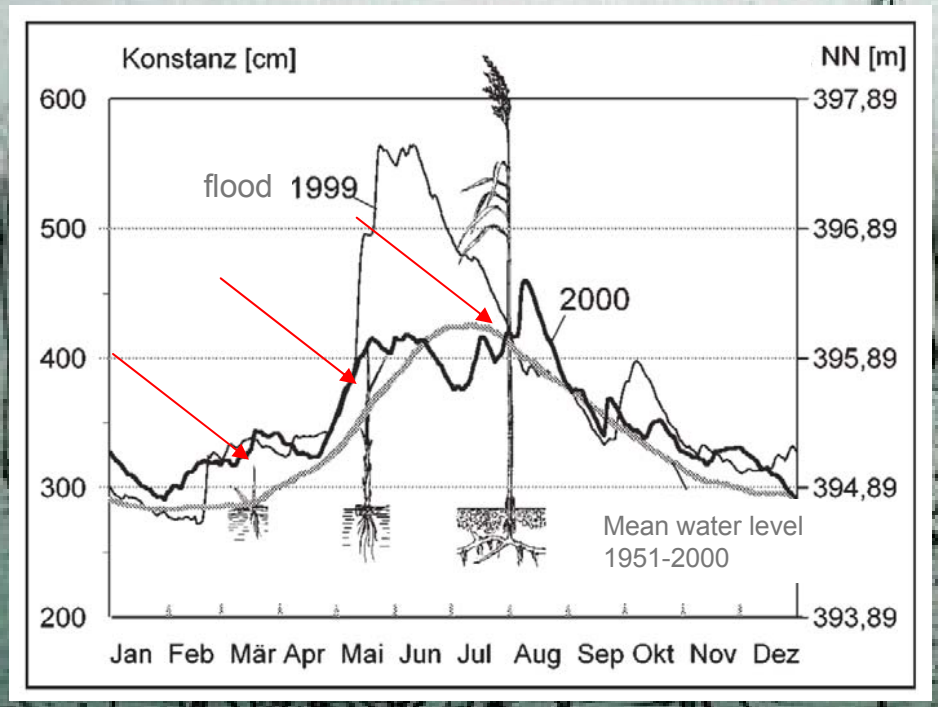
3. plants clipped before flooding to 6 or 12cm above soil line, 4 weeks

control *Pythium*

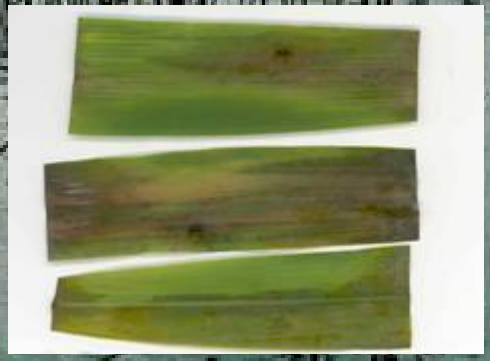


control *Pythium*

P. phragmitis: The Role of Flooding Events



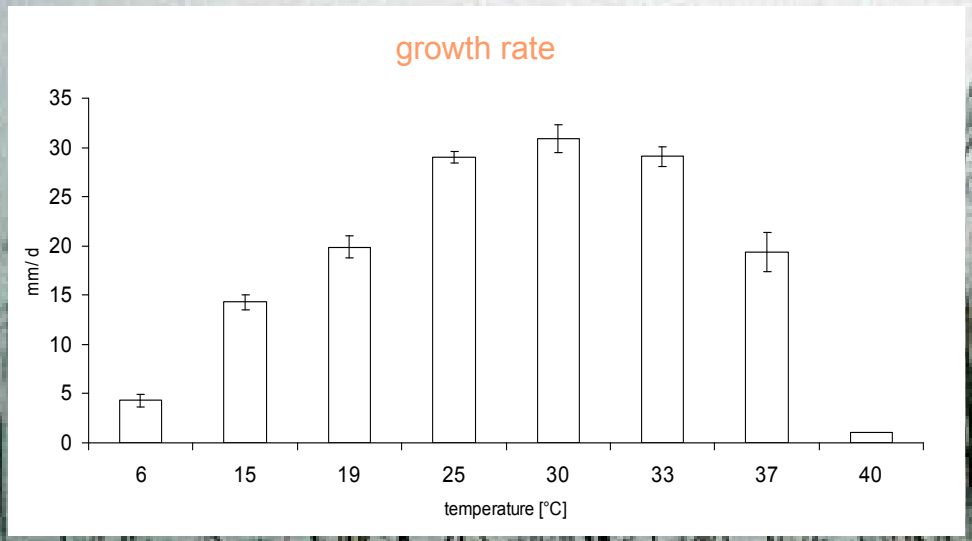
Schmieder et al., 2002: Limnologica 32, 131-146



- Reed damage shown to be related to flood duration, time and depth
- High susceptibility of submerged leaves to *P. phragmitis*
- No damage in the absence of the pathogen

→ ***P. phragmitis* as a contributing factor in „flood-induced reed decline“**

P. phragmitis: The Influence of Temperature



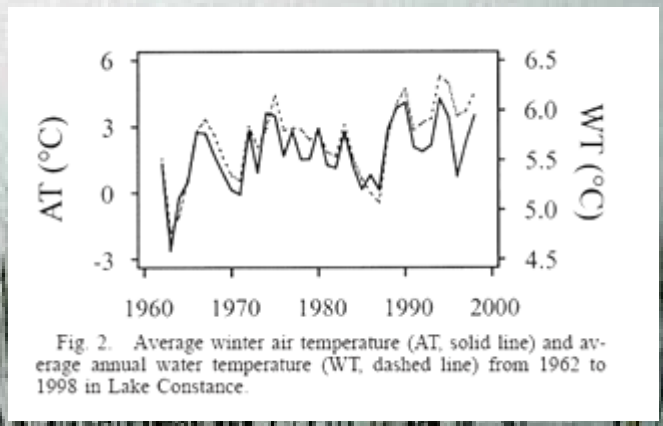
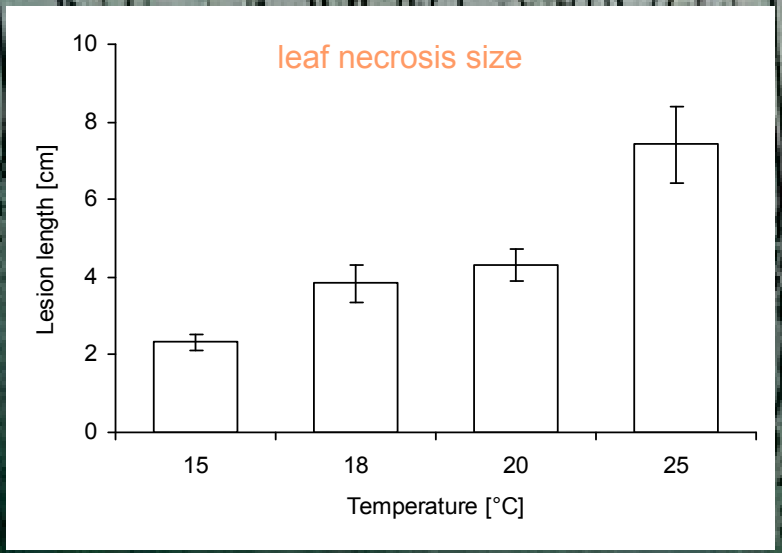
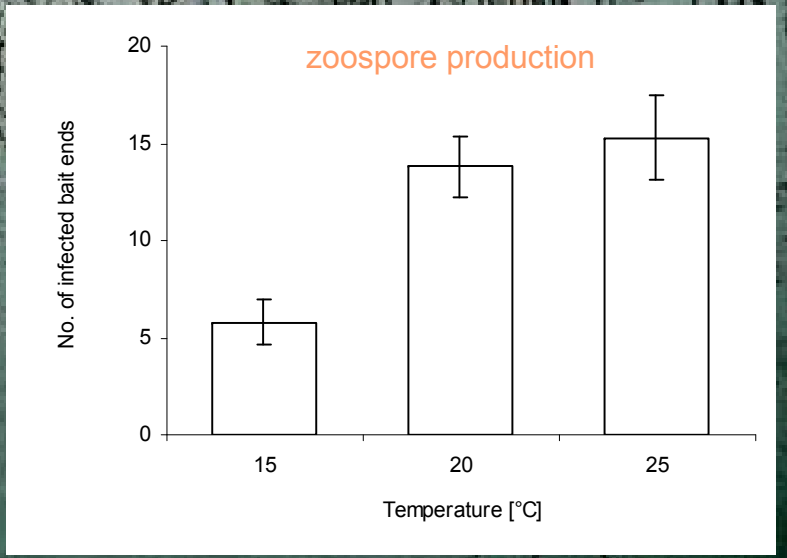


Fig. 2. Average winter air temperature (AT, solid line) and average annual water temperature (WT, dashed line) from 1962 to 1998 in Lake Constance.

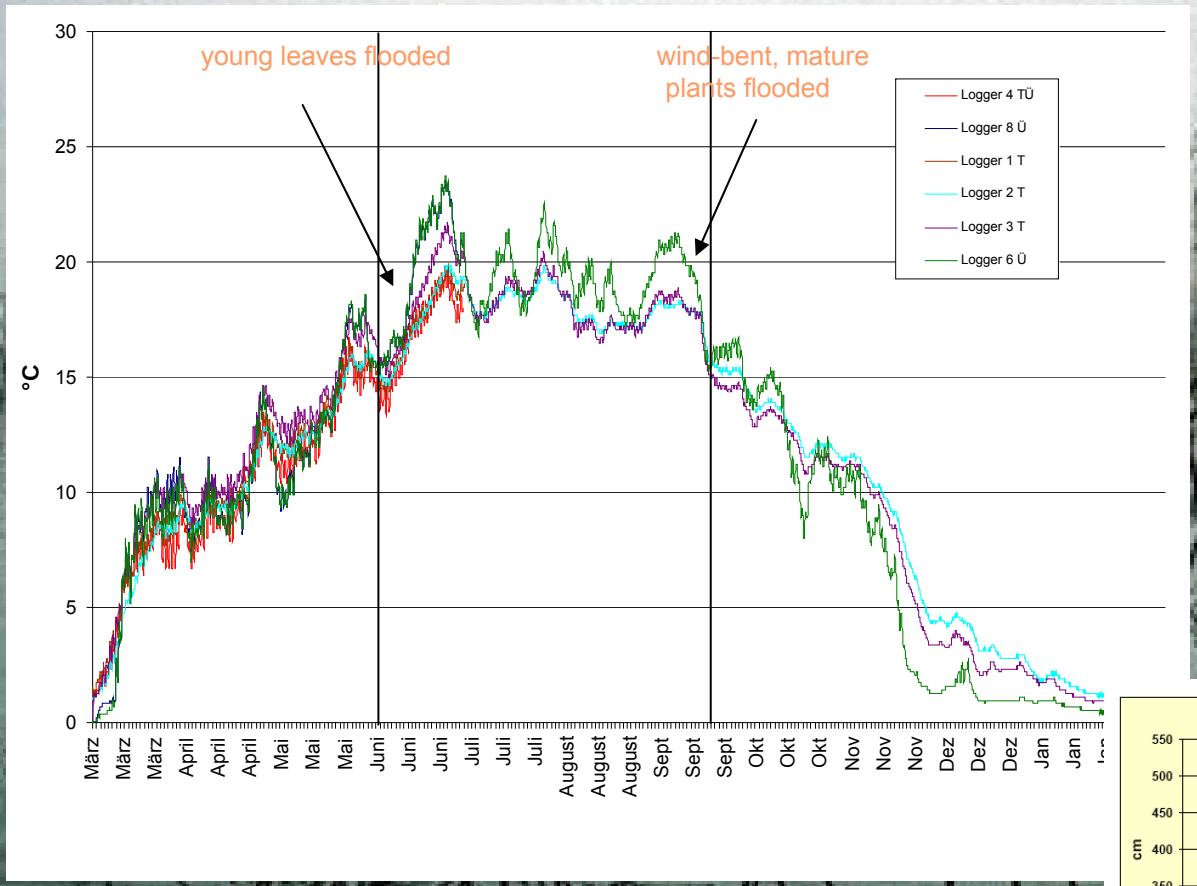
Straile *et al.*, 2003: Limnol. Oceanogr. 48, 1432–1438



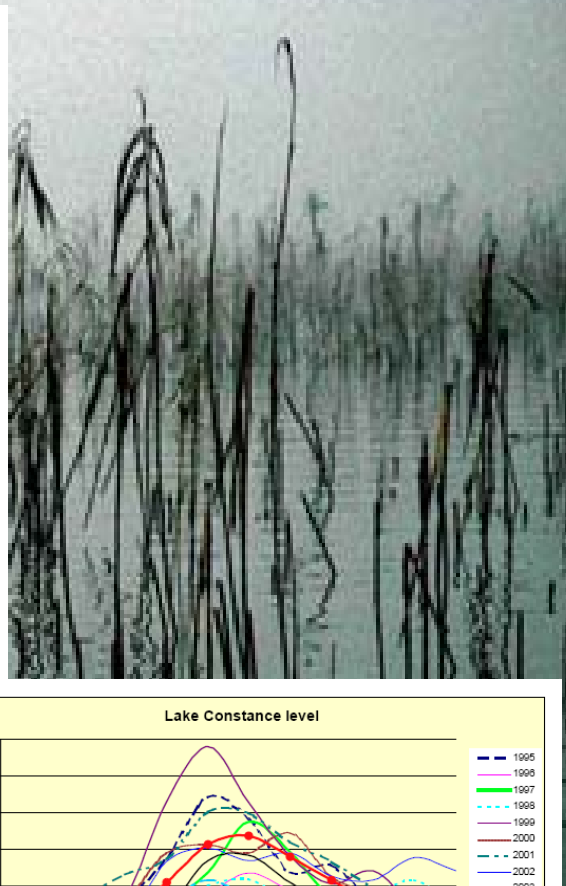


Nechwatal *et al.*, 2008: Hydrobiologia 613, 109-115

P. phragmitis: The Influence of Temperature



Temperature logger data 2005 (littoral water and sediment)



Mean temperature above 15°C ≈ mean highest lake water line (June – Sept.)

→ optimum infection conditions

Flooding events and rising water temperatures increase the significance of the reed pathogen *Pythium phragmitis*

- *Pythium phragmitis* as an aggressive pathogen of common reed
- seedlings as well as mature leaves are susceptible
- negative impact of flooding on reed only in the presence of the pathogen
- flooding periods often equal periods of optimum temperature for the pathogen
- optimum infection conditions

- loss of plant vigour
- losses in reed belt area
- → symptoms of reed decline

-`climate change`: effect on flooding events (earlier in the year – younger plants!)
-`climate change`: temperature effect on pathogen (growth, sporulation, virulence)

Thank you …

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‚Littoral Zone of Lake Constance'

The role of fungi during development and decay of reed (*Phragmites australis*)