

# Water Relations of NZ Vascular Epiphytes



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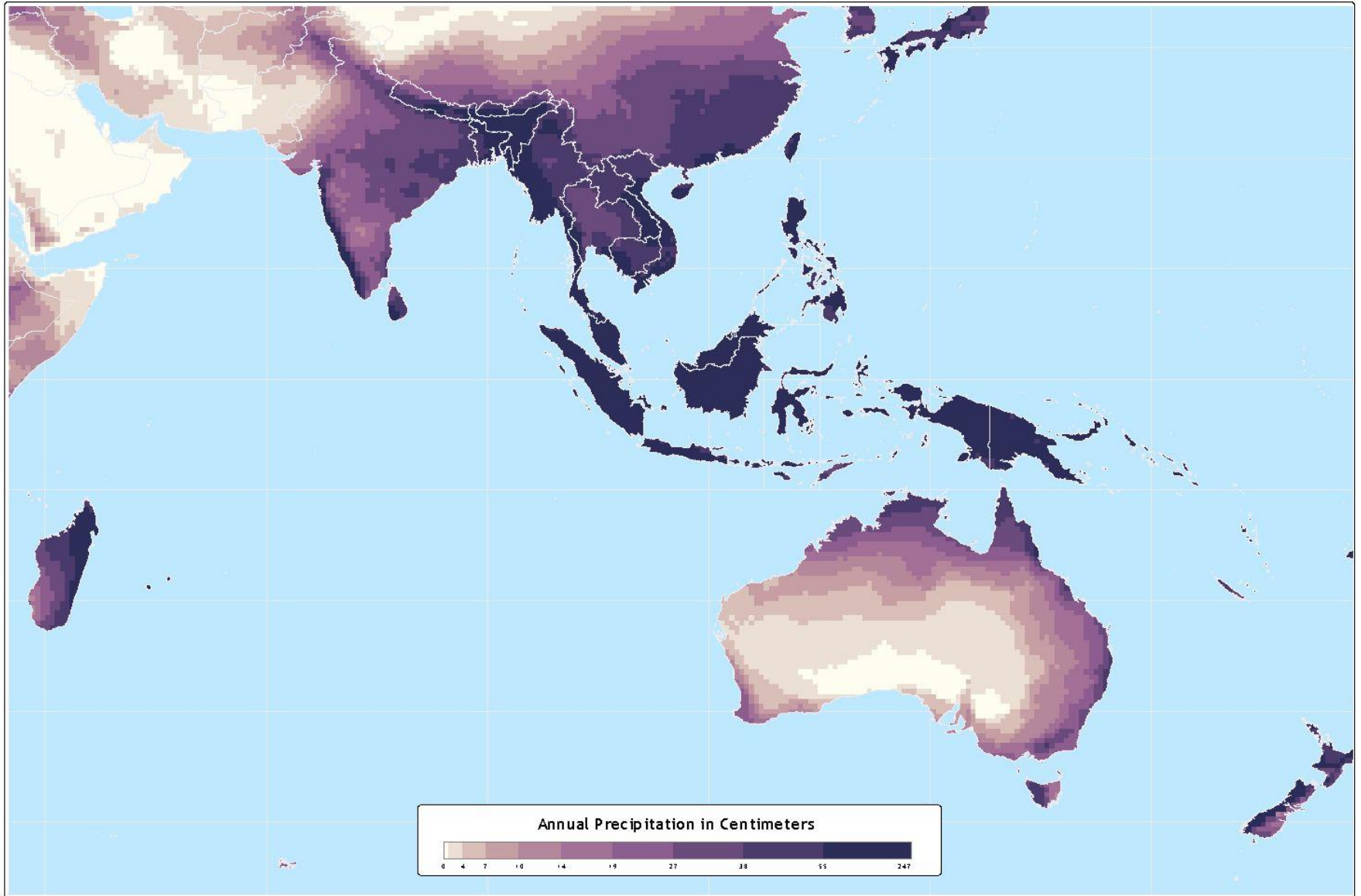
# Water as a limiting factor for epiphytes

## Outline:

- Role of water in shaping the NZ epiphyte flora
- Adaptations to water shortage and NZ epiphytes
- Responses of NZ shrub epiphytes to drought

# Annual Total Precipitation

Oceania



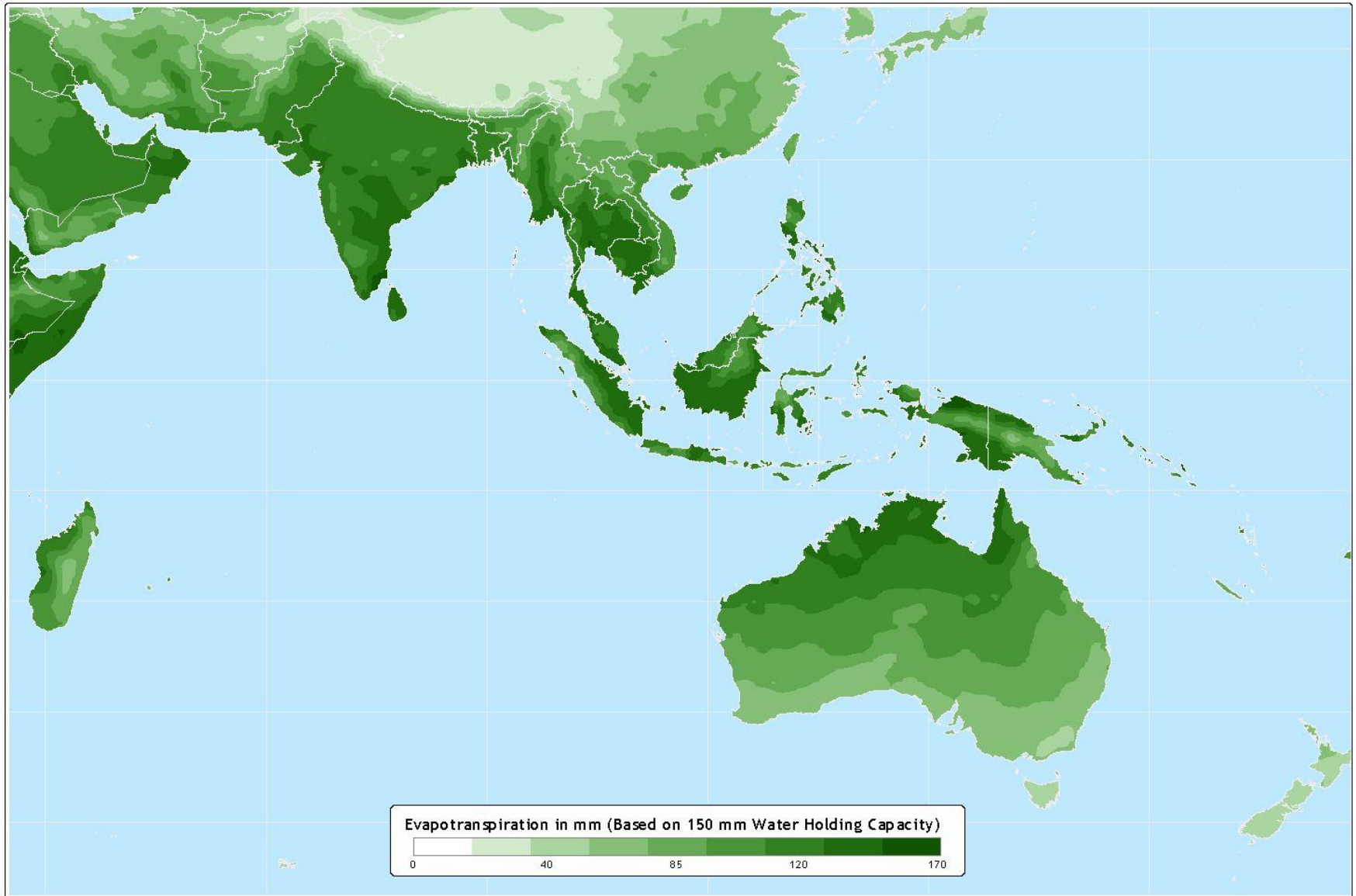
Data taken from: CRU 0.5 Degree Dataset (New et al)

## Atlas of the Biosphere

Center for Sustainability and the Global Environment  
University of Wisconsin - Madison

# Potential Evapotranspiration

Oceania



Data taken from: Willmott and Matsuura (2001)

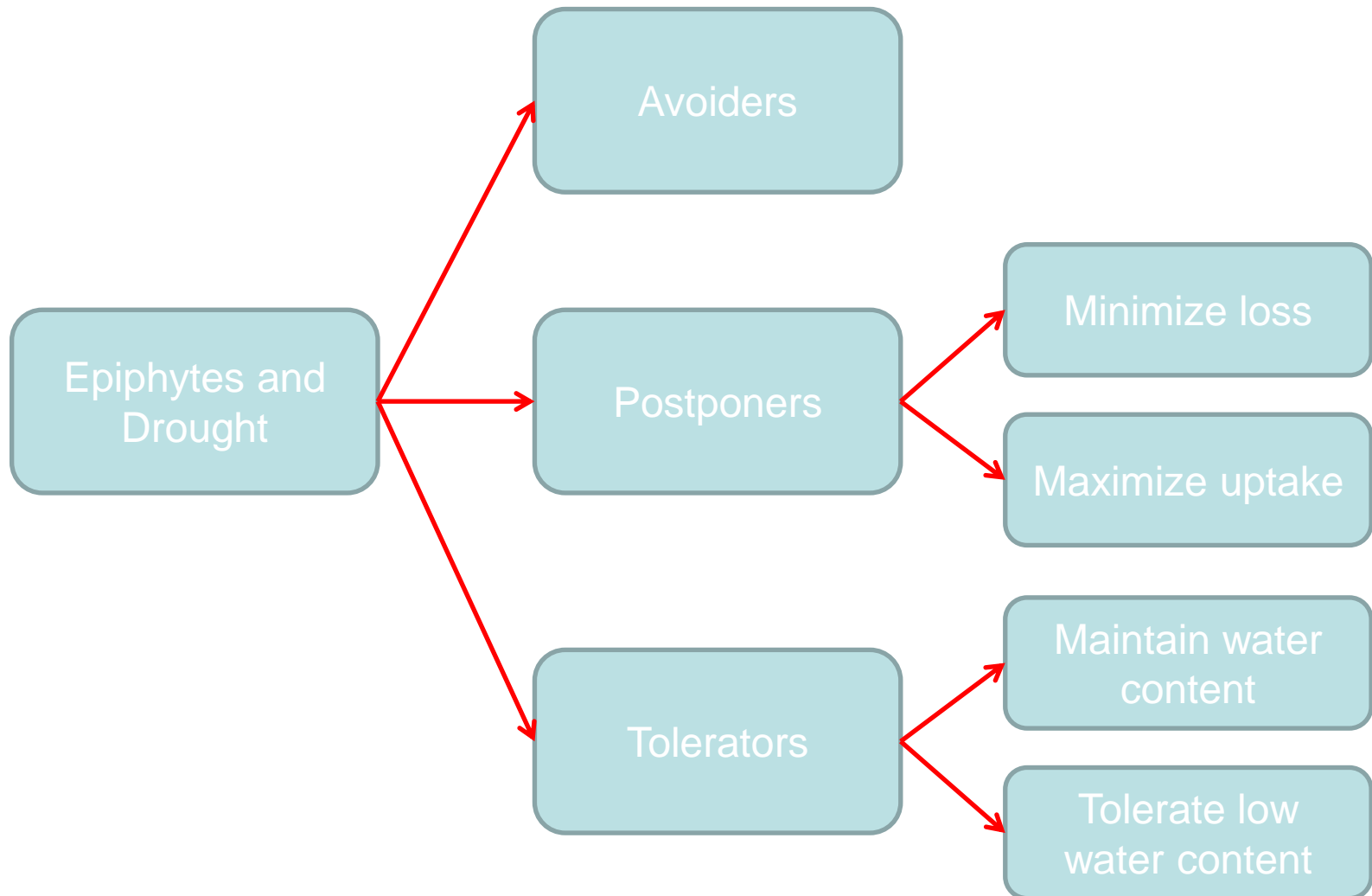
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# Questions

- How important is water availability in the shaping of the NZ epiphyte flora?
- Does our epiphyte flora display the same suite of adaptations to water stress as documented for epiphytes elsewhere?

# Adaptations to water shortage







Avoiders





Photo by Phil Bendle

<http://www.terrain.net.nz>

*Astelia* and *Collospermum* - NZ's version of water impounding avoiders?





Postponers:

Thick fleshy leaves, impermeable cuticles, succulent roots and stems, sensitive stomatal responses, CAM photosynthesis



[nzpcn.org.nz](http://nzpcn.org.nz)

Tolerators:

Often share characteristics with postponers

Extreme example – resurrection after complete dessication

NZ *Hymenophyllum*

# NZ shrub epiphytes and drought

- Two experiments tested the drought tolerance of NZ shrub epiphytes
- *Griselinia lucida* (Puka) compared with *Griselinia littoralis* (Kapuka)
- *Pittosporum kirkii* (Kirk's kohuhu) compared with *Pittosporum cornifolium*
- Grown in pots, subjected to no, moderate and severe drought, growth and physiological responses recorded





*Griselinia lucida*



*Griselinia littoralis*

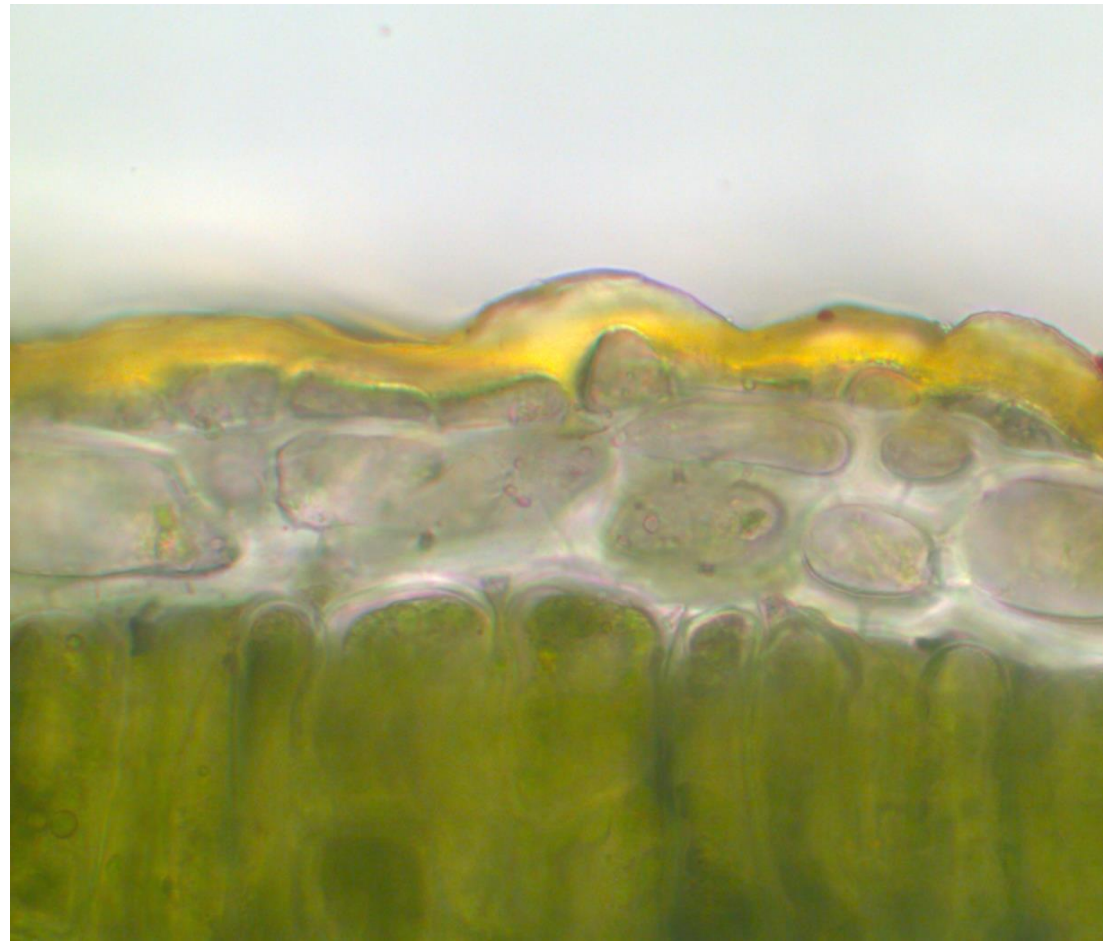
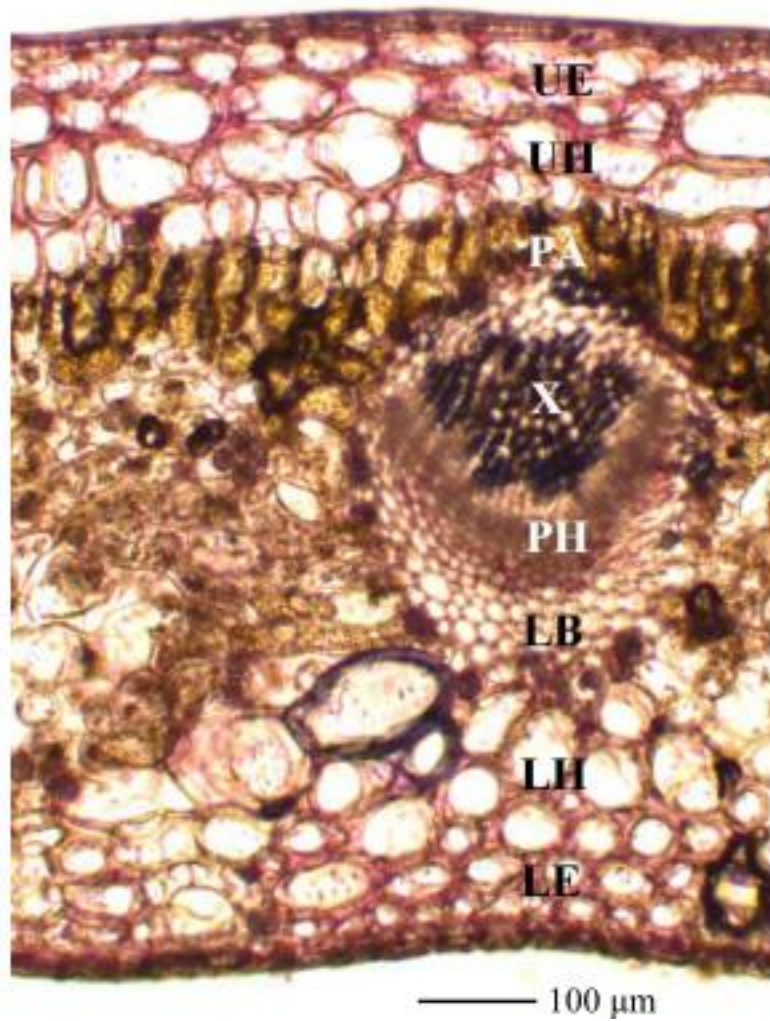


*Pittosporum kirkii*

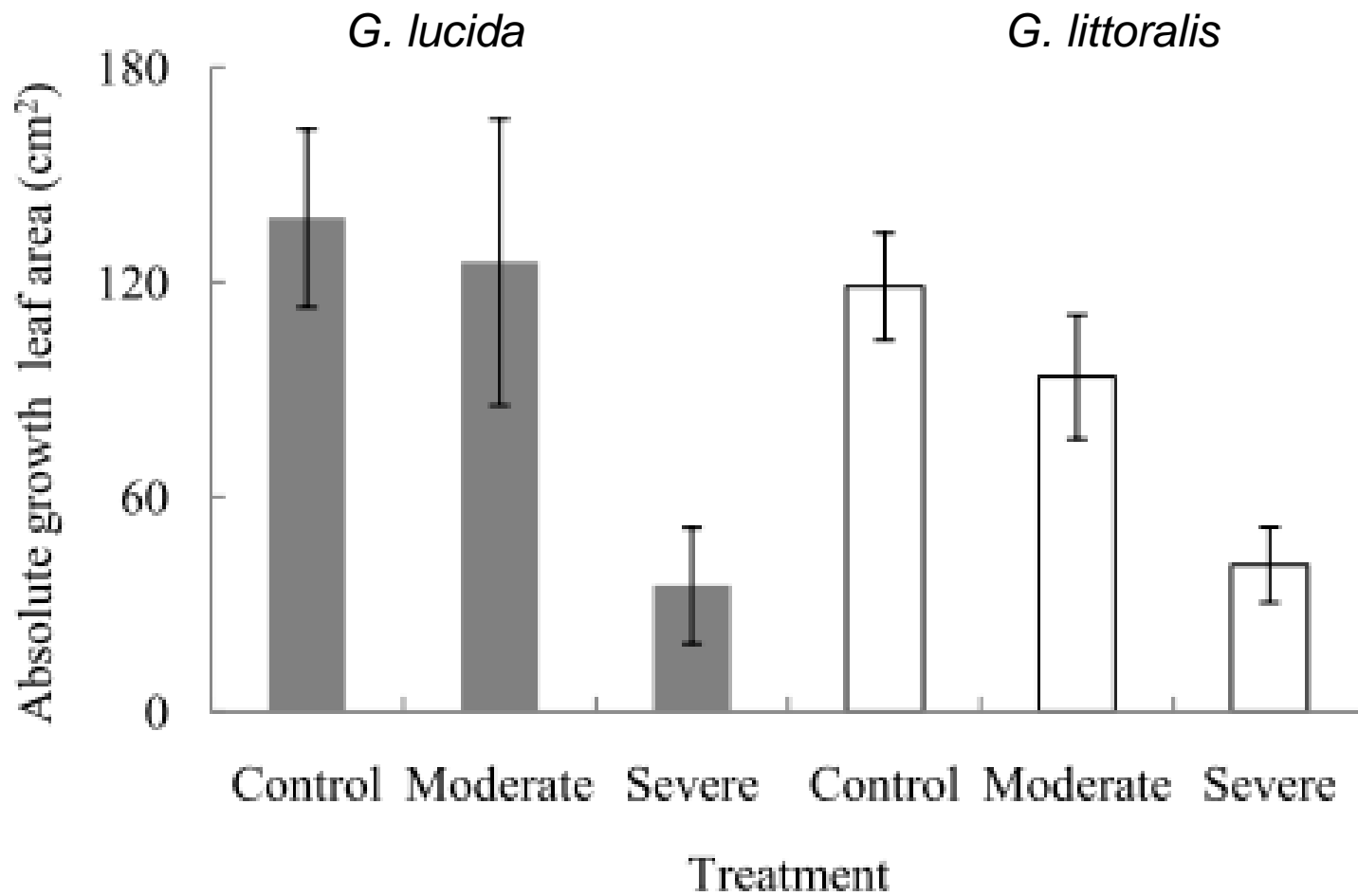


*Pittosporum cornifolium*



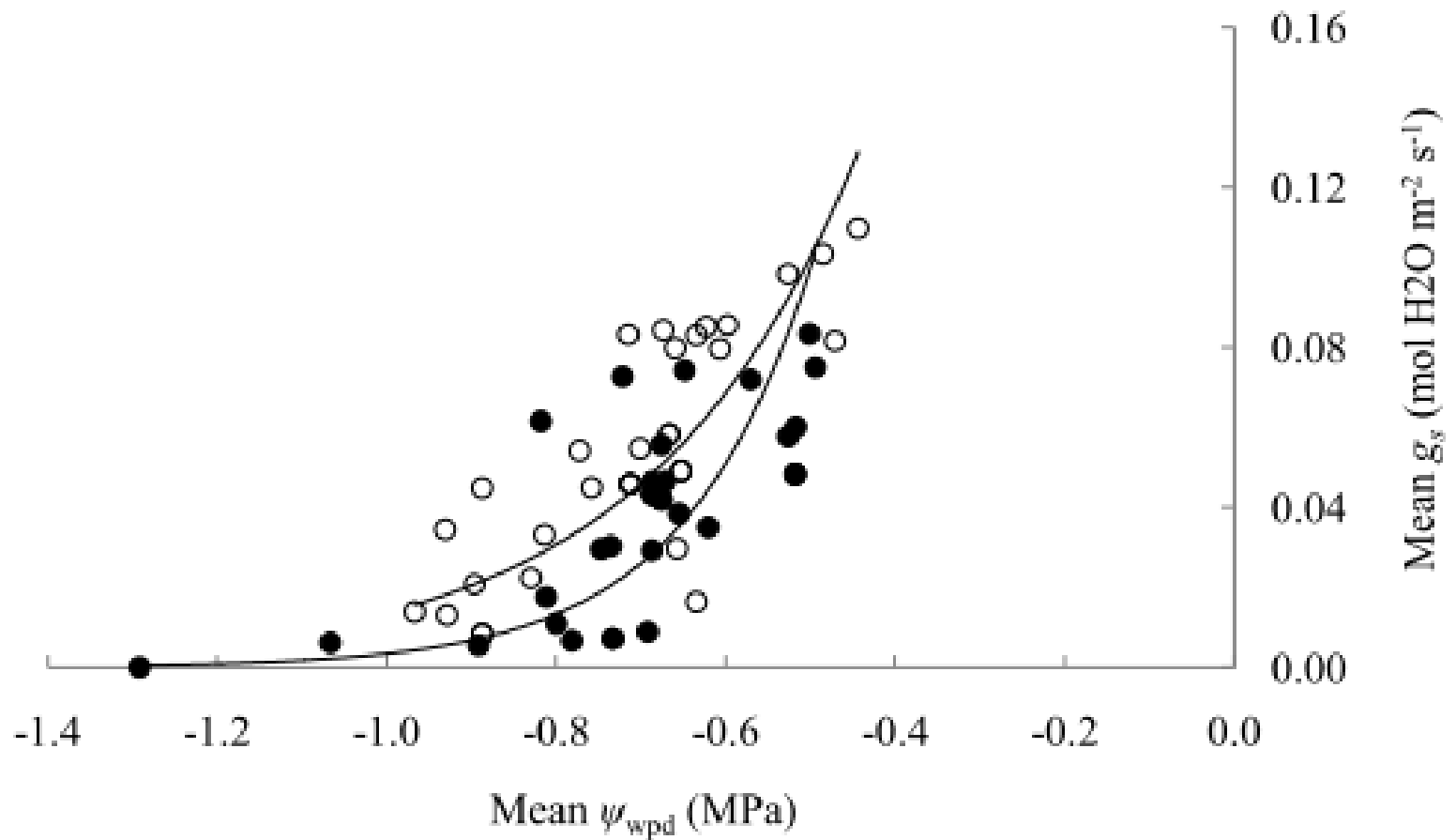


Thick leaves, well developed cuticle and hypodermis

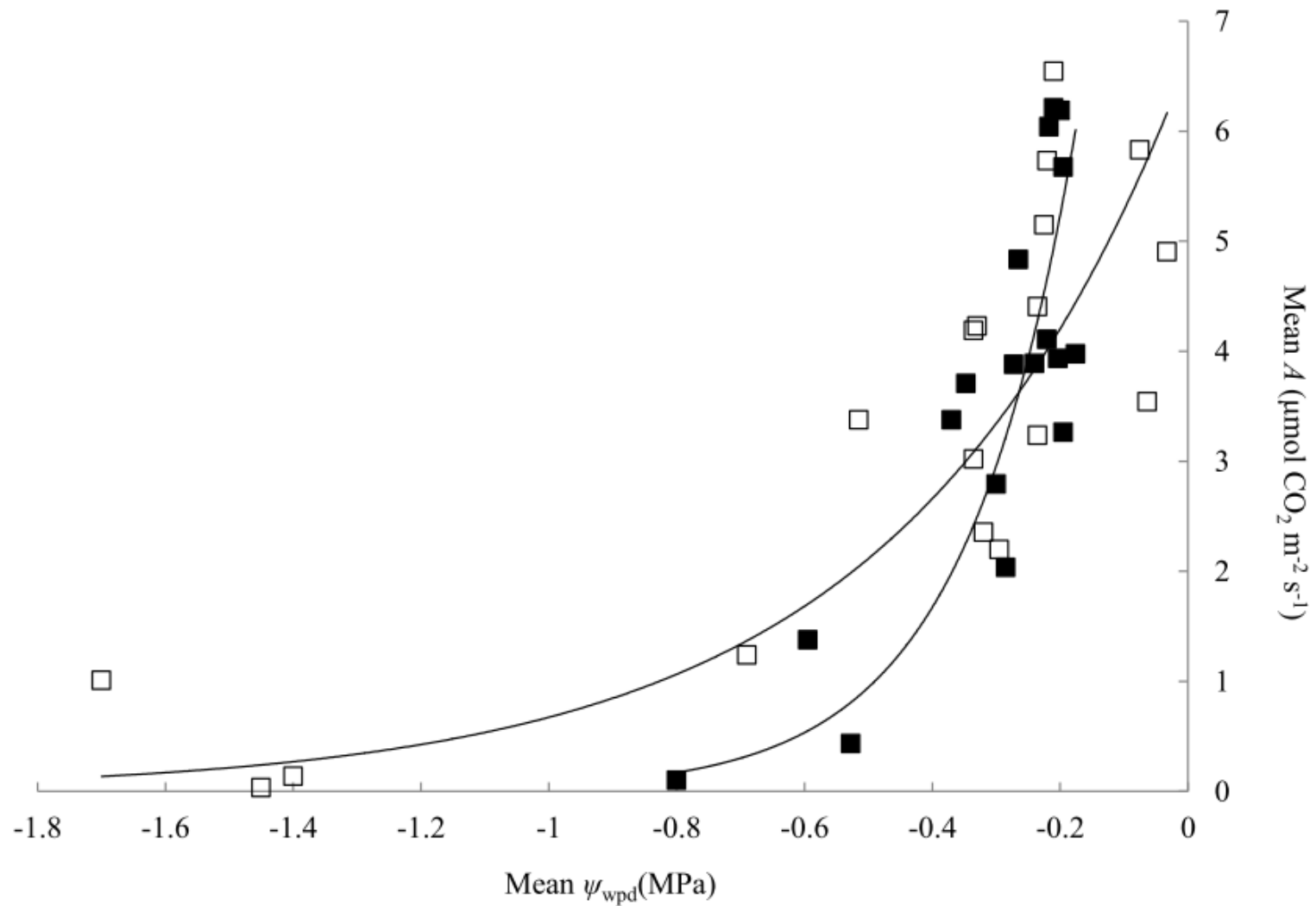


Growth in leaf area of *G. lucida* and *G. littoralis* under three levels of drought





Stomatal response of *G. lucida* (closed symbols) and *G. littoralis* (open symbols) to soil drying



Photosynthetic response of *P. kirkii* (closed symbols) and *P. cornifolium* (open symbols) to soil drying



10 weeks without water    One day after rewatering    Three days after rewatering

Recovery of *G. lucida* after drought



# NZ shrub epiphytes and drought

*G. lucida* and *P. kirkii* :

- Thicker leaves, high elasticity, less osmotic adjustment, higher (less negative osmotic potentials)
- Faster stomatal closure, better control of water loss
- Less leaf loss, faster recovery after drought
- Unusual root traits (especially *G. lucida* – root pruning?)
- Typical drought ‘postponers’?
- Still require relatively moist humid environments

Ranking of the three epiphytes for drought tolerance:

- *G. lucida* > *P. kirkii* > *P. cornifolium*

# Questions

- How important is water availability in the shaping of the NZ epiphyte flora?

?

- Does our epiphyte flora display the same suite of adaptations to water stress as documented for epiphytes elsewhere?

Yes, but we have much more to learn ...

# Contact

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