



# The Ecology of the Gynema Lily (*Doryanthes excelsa* (Corr.)) Sentinel Plant of the Royal National Park

Sharon M Bowen and Margaret D Burchett

School of Environmental Science  
University of Technology Sydney

# Introduction



The name '*Doryanthes*' is from the Greek; "*doratos*" (a spear) and '*anthos*' (flower), '*excelsa*' is 'high' or 'far seen'

Joseph Correa de Serra (1802)

# Introduction



*D. excelsa* may be threatened by:

- Urban development and isolation
- Too frequent fire
- Some populations may be under pressure from harvesting of wild blooms for cut flower market

# Aim: to identify the key factors governing the environmental niche of *D. excelsa*



The major hypotheses posed in this study are:

1. There are a number of critical environmental factors that define the environmental niche of *D. excelsa*
2. There is a recognisable *D. excelsa* floristic sub-community in the Sydney Region
3. *D. excelsa* has life history strategies to persist in a fire prone environment
4. There is genetic isolation between geographically isolated populations of *D. excelsa* in the Sydney Region

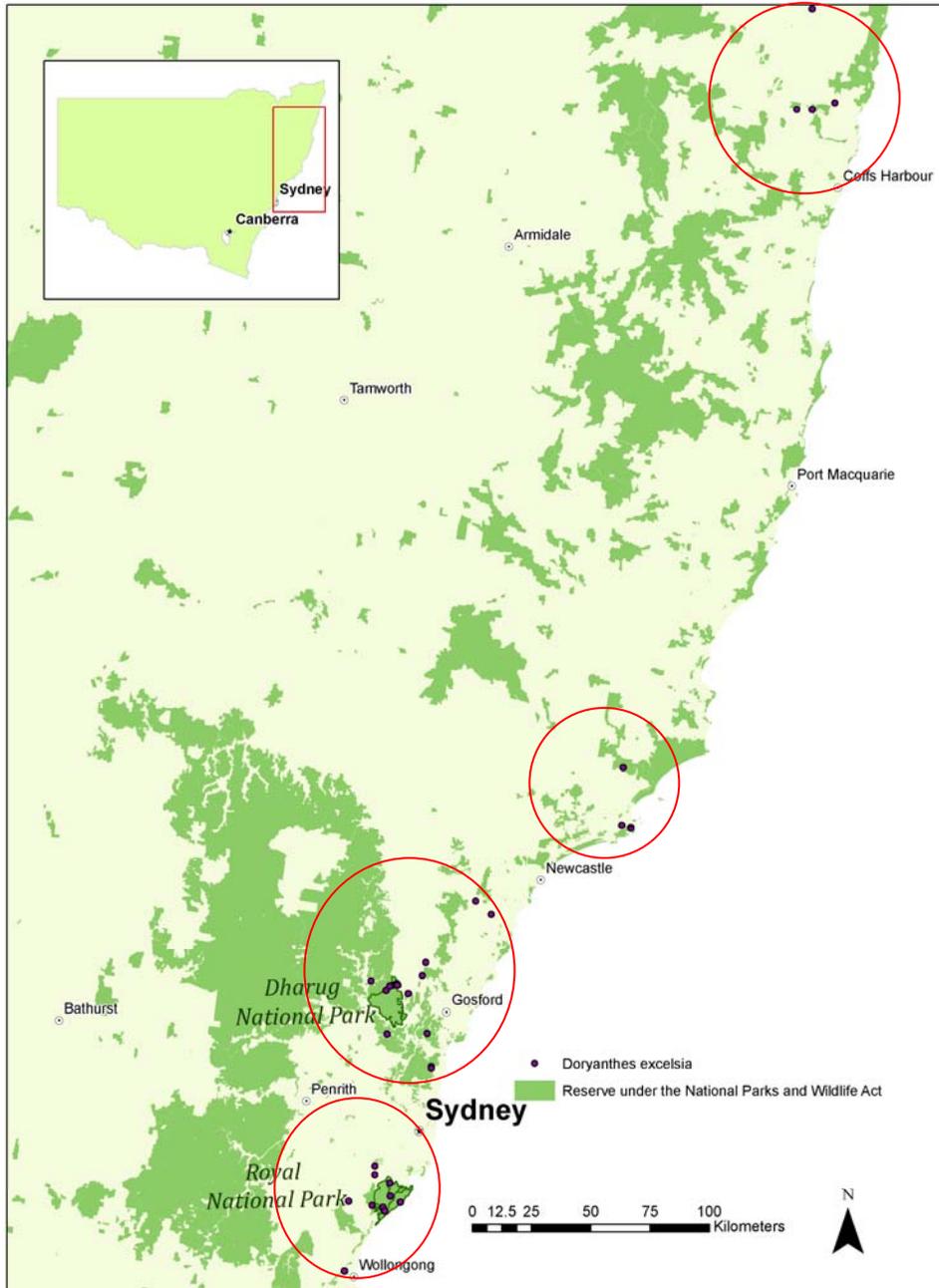
# Methods

## Distribution modelling

Corindi (north of Coffs Harbour) on the north coast of NSW to Wollongong on the central coast of NSW

Disjunct with no records of the species from an area of 2 degrees of latitude between the central coast and north coast populations

In the Sydney Region is largely absent between Port Jackson and Port Hacking



# Results – Habitat requirements

- Moderately deep sandy, earthy soil
- South to south east facing slopes, creek sides and gully sides, and sheltered plateaux and ridges,
- Open forest of *Angophora costata*, *Eucalyptus piperita* and *E. gummifera*, and woodland of *E. sieberi*, *E. punctata*, *A. costata* and *E. gummifera*,
- Moderate rainfall and temperature range
- A narrow altitudinal range 100-200 m
- Sandstone substrate



# Methods

- Vegetation community structure and floristics
- Soil physical and chemical characteristics (pH, organic carbon, exchangeable cations, structure)
- Seed germinability and early seedling growth rates in relation to pH and nutrient availability
- Morphometric measurements (leaf number, leaf dimensions, plant dimensions)



# Methods

Study Areas:

Dharug National Park, 60km to the north of Sydney

Royal National Park, 36 km to the south of Sydney



# Methods



Survey Sites:

Replicate *D. excelsa* Sites  
(North and South)

Replicate Non-*D excelsa*  
sites in similar broad  
vegetation community  
categories.

# Results –Vegetation community structure and floristics

- *D. excelsa* sub-community identified:
- Sheltered microhabitats within dry sclerophyll communities
- Understorey species include other auto-regenerating long lived sprouters (e.g.: *Xanthorrhoea* spp. *Telopea speciosissima*)
- Groundcover species require moist habitat (orchids, ferns, lilies)



# Results – Soil characteristics

- Exchangable Ca and Na ↓ in *D. excelsa* sites
- All sites low pH (4.1)
- % OCC ↓ in *D. excelsa* sites (all sites very low).
- Exchangeable Mg and K had correlations with floristic data - didn't separate *D. excelsa* and non-*D. excelsa* sites
- Trend of ↓ Mg/K from non-*D. excelsa* sites - *D. excelsa* sites



# Results – Recruitment Strategies

- All live seeds viable and non dormant (mean 86 % germination rate) – transient seed bank
- Seedling growth slow
- Early seedling growth greatest at low pH (Ph 4.1)
- > pH 4.1 - growth rate not increased by addition of nutrients (N/P/K)
- Growth retarded at high levels of N/P/K.



# Results –Phenotypic Variation

- Phenotypic variation no greater between northern and southern Sydney Region populations than within populations – no genetic separation
- This has recently been confirmed by research into genetic variation.

Dimech A.M, Ades P.K Taylor P.W.J., Cross R and Ford R (2009) Population diversity of *Doryanthes excelsa* (*Doryanthaceae*) in eastern Australia *Cunninghamia* 11( 2): 213–219



# Discussion- Environmental Niche



- **Response to fire:**  
Auto regenerating long lived sprouter – longevity as adult  
Transient seed bank
- **Environmental factors**  
Low nutrient / low pH for seedling recruitment and growth  
Sheltered moist microhabitat

# Conclusions



- Narrow range of environmental parameters define environmental niche
- Relict species from wetter climate
- Confined to moist sheltered microhabitats in fire prone communities
- Opportunistically recruits and can use disturbance event but not immediate post fire period
- Persists in the environment by longevity of individuals, vegetative reproduction and resistance to fire/drought of adults.

# Acknowledgements

- Peter Bowen , Narelle Richardson, Michael Bedward, Murray Ellis, Pauline Wong, Tony Auld, Dominic Siversten, Technical Staff of the School of Environmental Sciences, University of Technology Sydney, David Morrison, PWG OEH Royal National Park and Dharug National Park.



UNIVERSITY OF  
TECHNOLOGY SYDNEY