

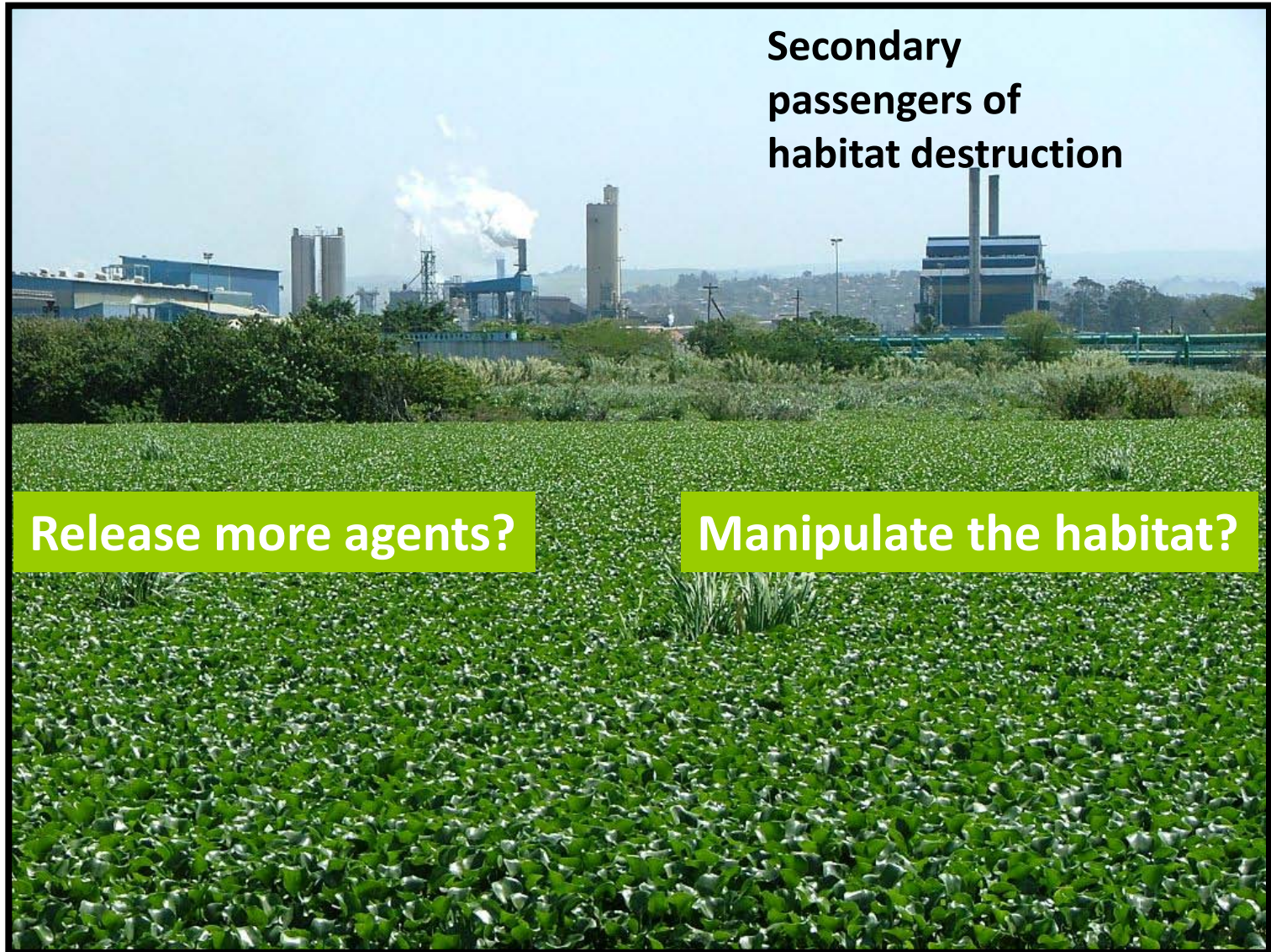
A photograph showing two hippos partially submerged in a dense field of green water hyacinth plants. The hippos are visible from the chest up, with their heads and ears above the water level. The background consists of tall green grasses and reeds.

The role of eutrophication in the biological control of water hyacinth in South Africa

JULIE A. COETZEE and MARTIN P. HILL



Enemy Release vs. Disturbance





Organisation for Economic Co-operation and Development

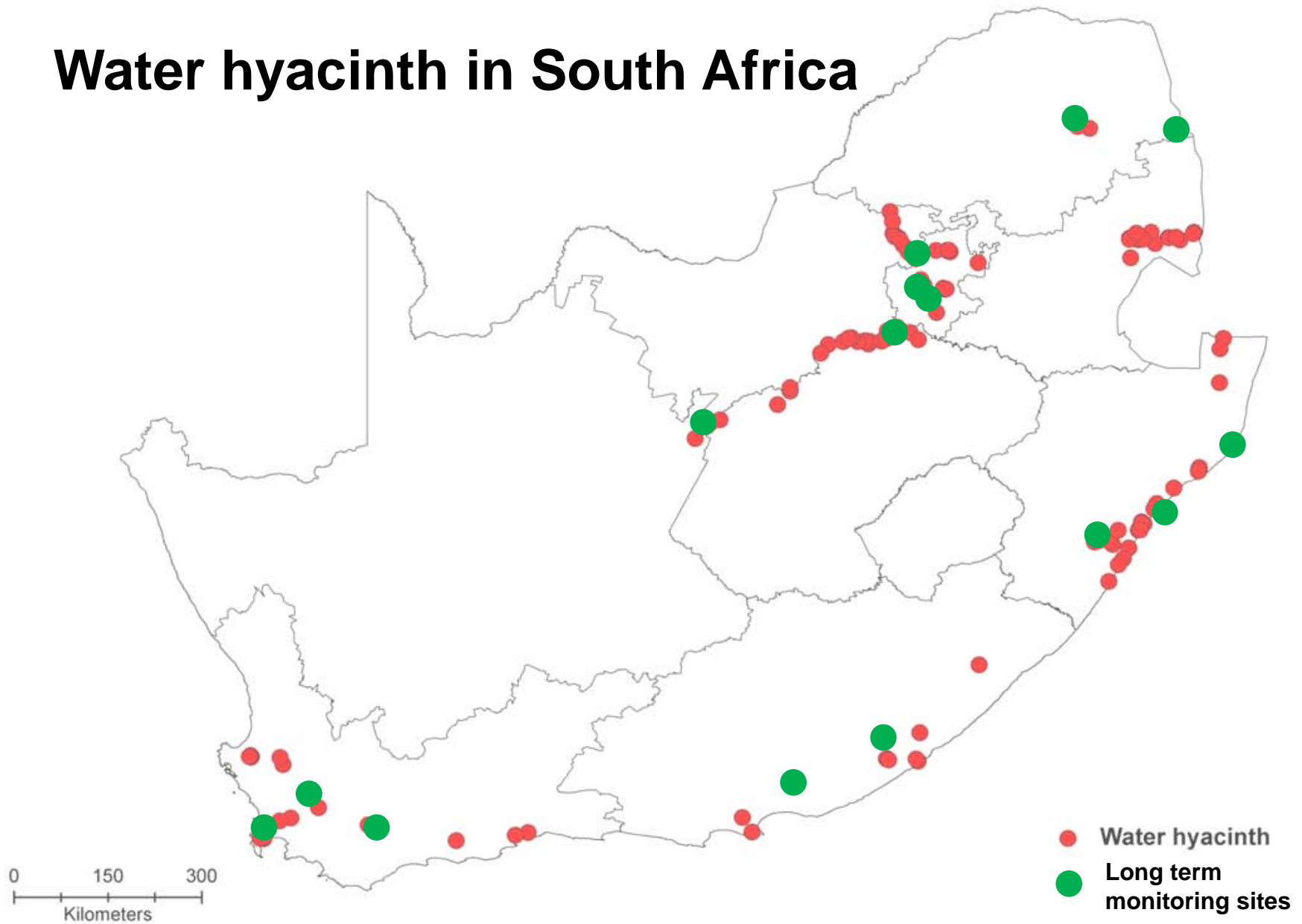
Classification	Phosphorus mg/l
Oligotrophic	0.004-0.01
Mesotrophic	0.01-0.035
Eutrophic	0.035-0.1
Hypertrophic	>0.1

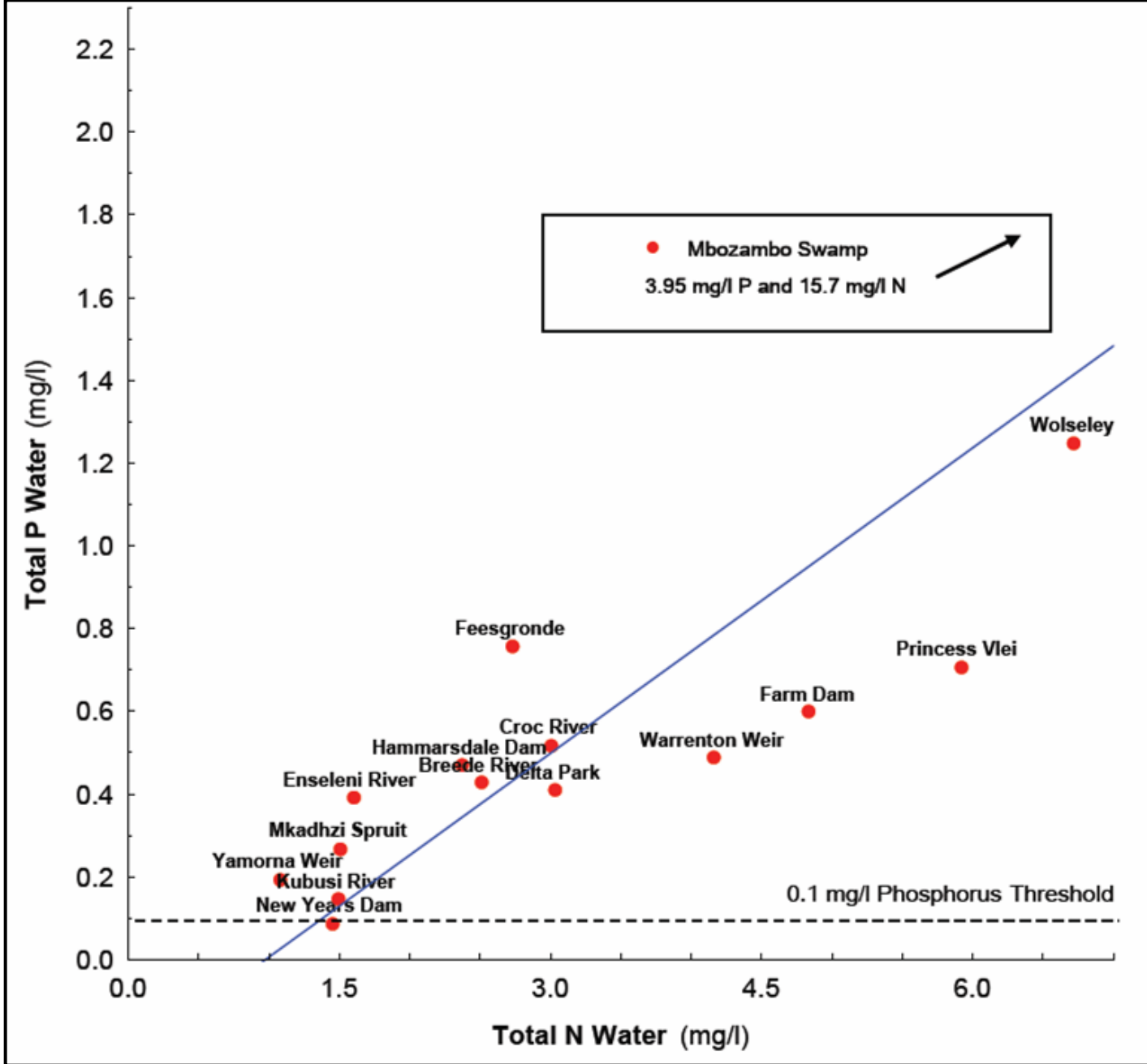
South African Water Quality Guidelines

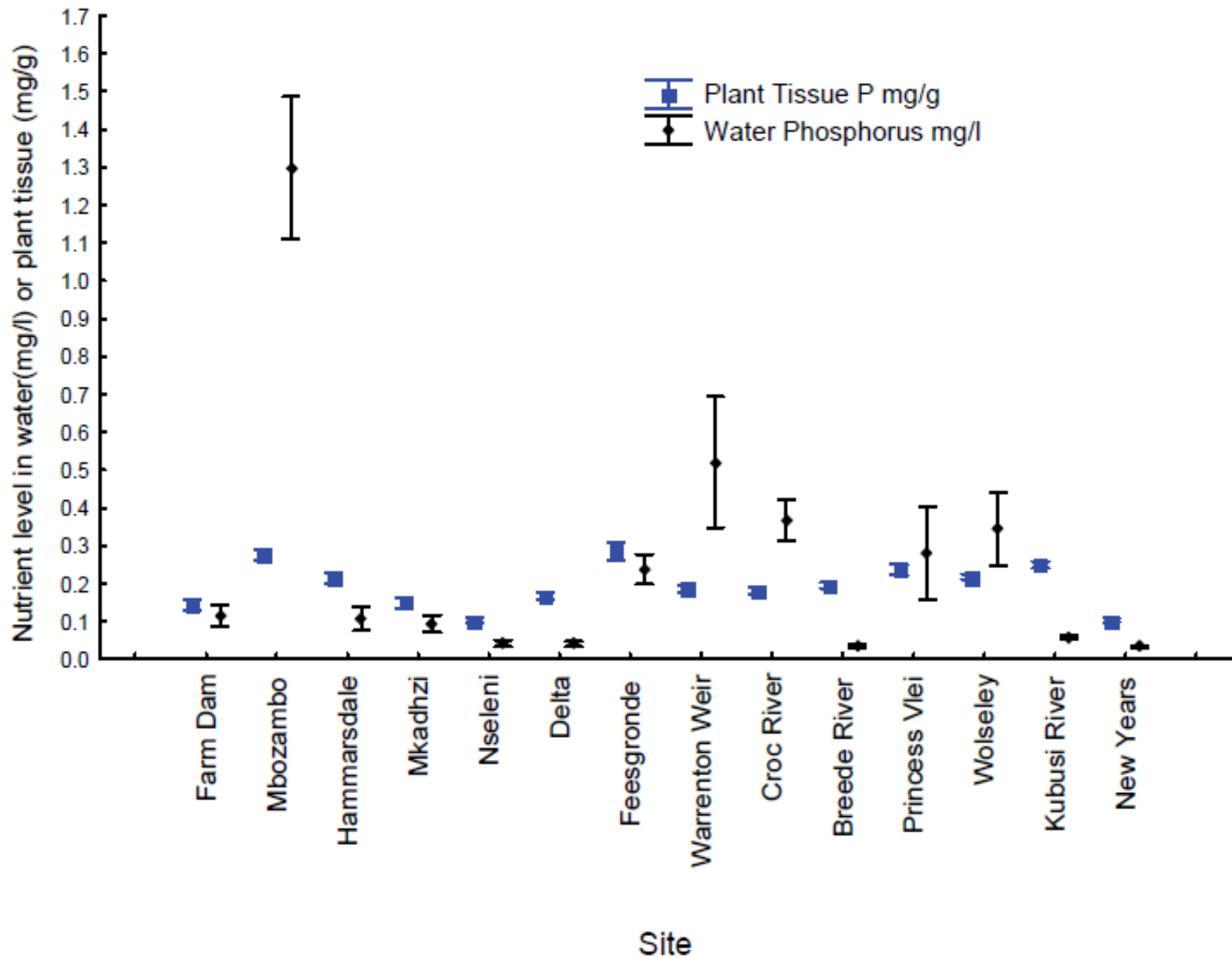
Classification	Nitrogen mg/l	Phosphorus mg/l
Oligotrophic	<0.5	<0.005
Mesotrophic	0.5-2.5	0.005-0.025
Eutrophic	2.5-10	0.025-0.25
Hypertrophic	>10	>0.25



Water hyacinth in South Africa







Agents released in SA



Neochetina eichhorniae
(Curculionidae)



Neochetina bruchi
(Curculionidae)



Orthogalumna terebrantis
Galumnidae



Niphograptia albiguttalis
(Pyralidae)



Eccritotarsus catarinensis
(Miridae)



Cercospora piaropi





New agents



Cornops aquaticum
(Acrididae)



Megamelus scutellaris
(Delphacidae)



***Thrypticus* sp.**
(Dolichopodidae)



Taosa inexacta
(Dictyopharidae)



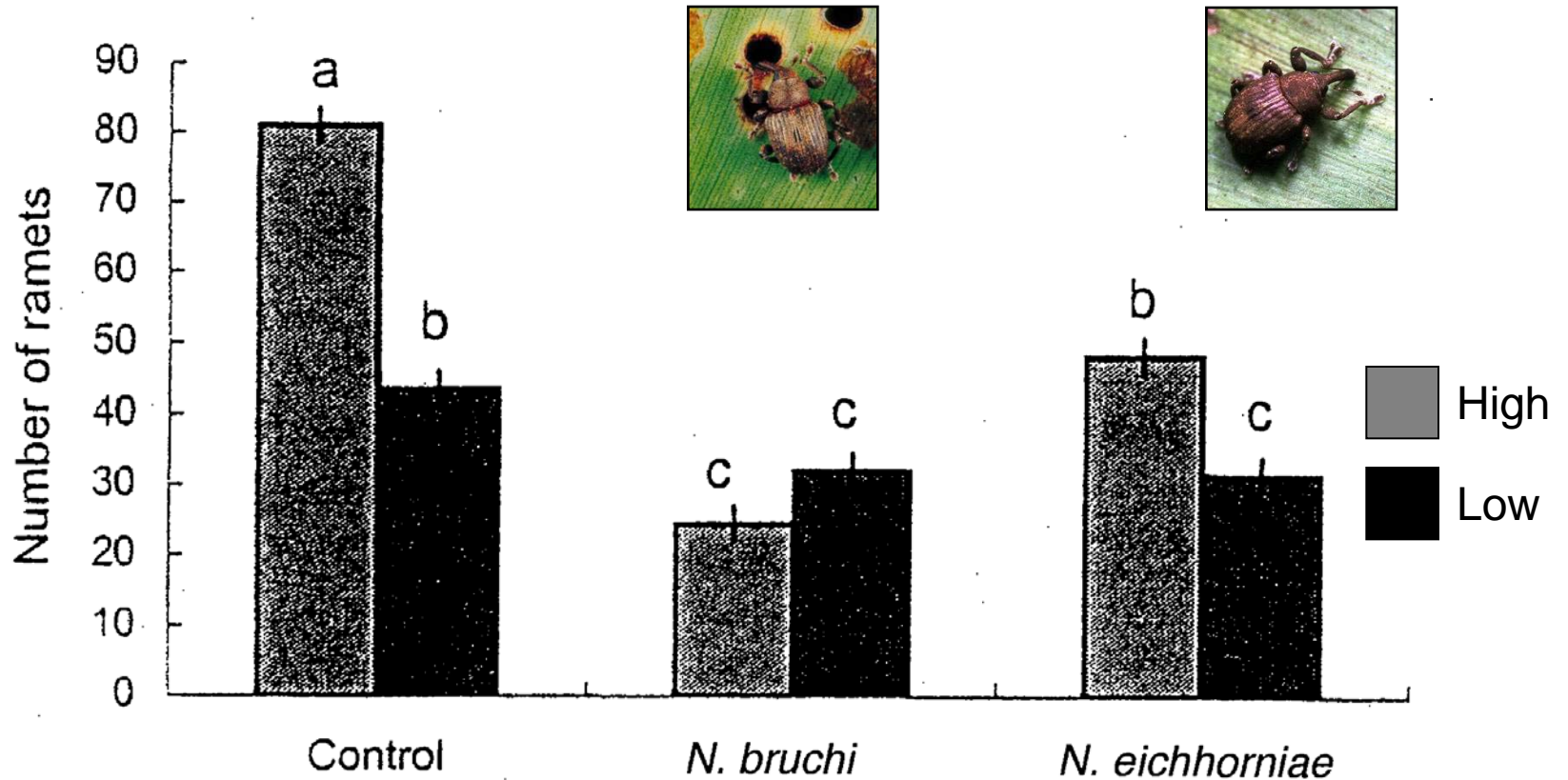
Authors	Nitrogen mg/l		Phosphorus mg/l	
	High	Low	High	Low
Reddy et al. 1989,1990	50.5	0.5	10.06	0.06
Xie et al. 2004	10	5	1	0.5
Heard & Winterton 2000	1.6	0.4	1	0.025
Wilson et al. 2006	4	0.4	0.57	0.057
Coetzee et al. 2007	50.5	0.5	2.56	0.02
Center and Dray 2010	8.5	0.5	0.03	0.004
Bownes PhD 2009 unpub.	7.6	0.034	1.37	0.024
Canavan et al 2009 unpub.	48.5	0.5	0.48	0.01
Coetzee & Snow 2009 unpub.	48.5	0.5	0.48	0.01



Authors	Nitrogen mg/l		Phosphorus mg/l		
	High	Low	High	Low	
Reddy et al. 1989,1990	50.5	0.5	10.06	0.06	H
Xie et al. 2004	10	5	1	0.5	E
Heard & Winterton 2000	1.6	0.4	1	0.025	M
Wilson et al. 2006	4	0.4	0.57	0.057	O
Coetzee et al. 2007	50.5	0.5	2.56	0.02	
Center and Allen Dray 2010	8.5	0.5	0.03	0.004	
Bownes PhD 2009 unpub.	7.6	0.034	1.37	0.024	
Canavan et al 2009 unpub.	48.5	0.5	0.48	0.01	
Coetzee & Snow 2009 unpub.	48.5	0.5	0.48	0.01	

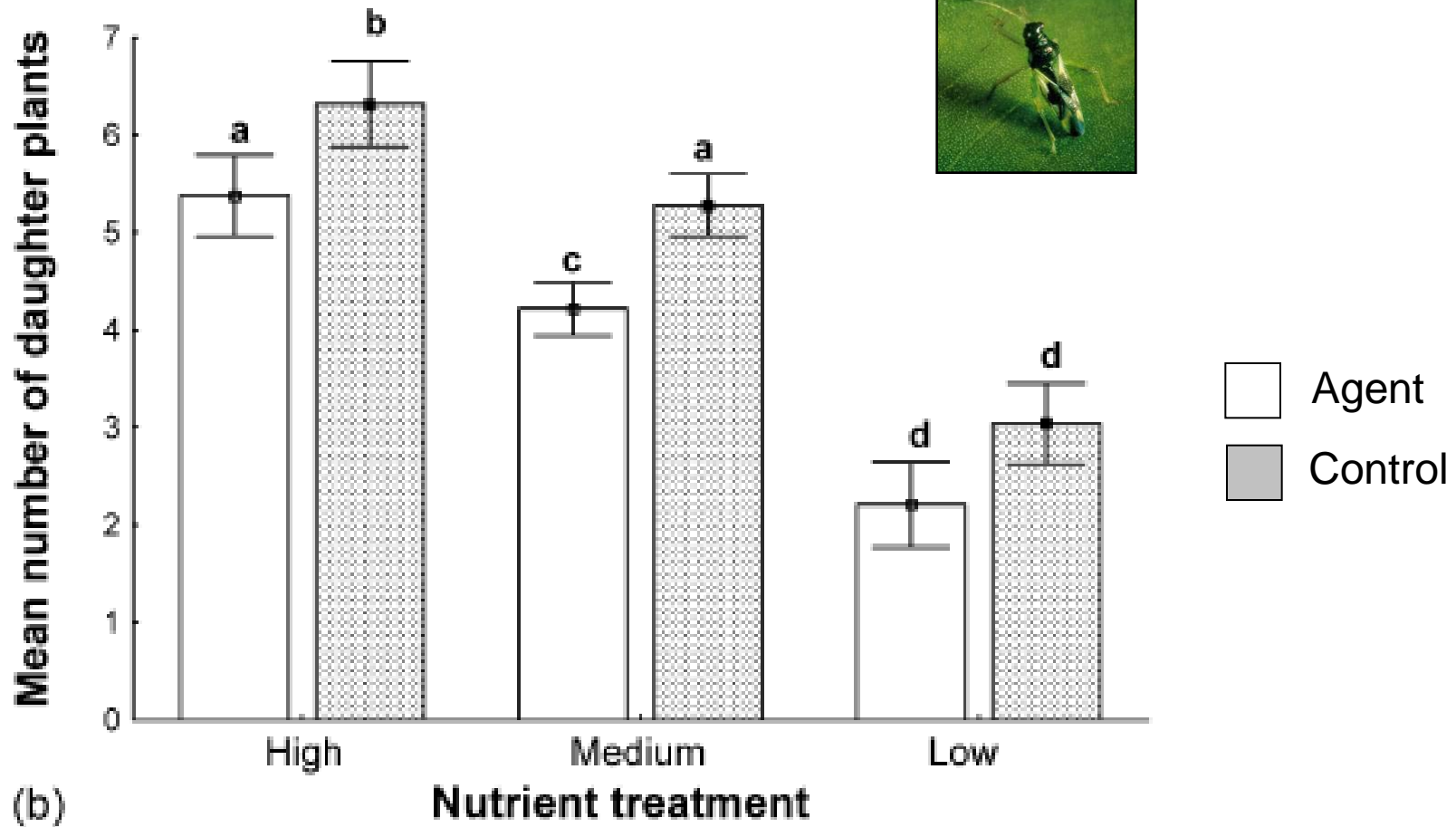


Heard and Winterton 2000



Coetzee et al. 2007

Eccritotarsus catarinensis

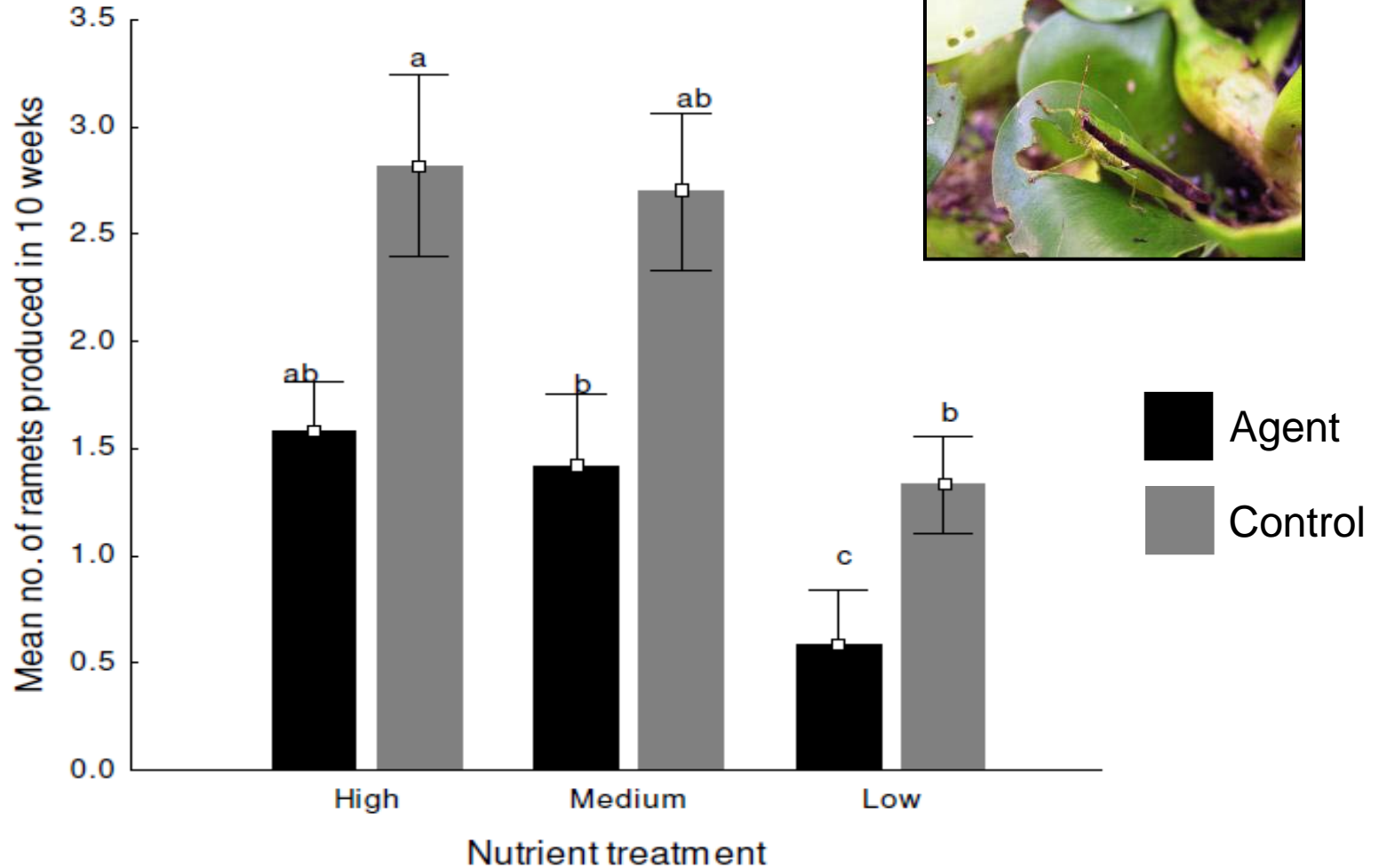


(b)



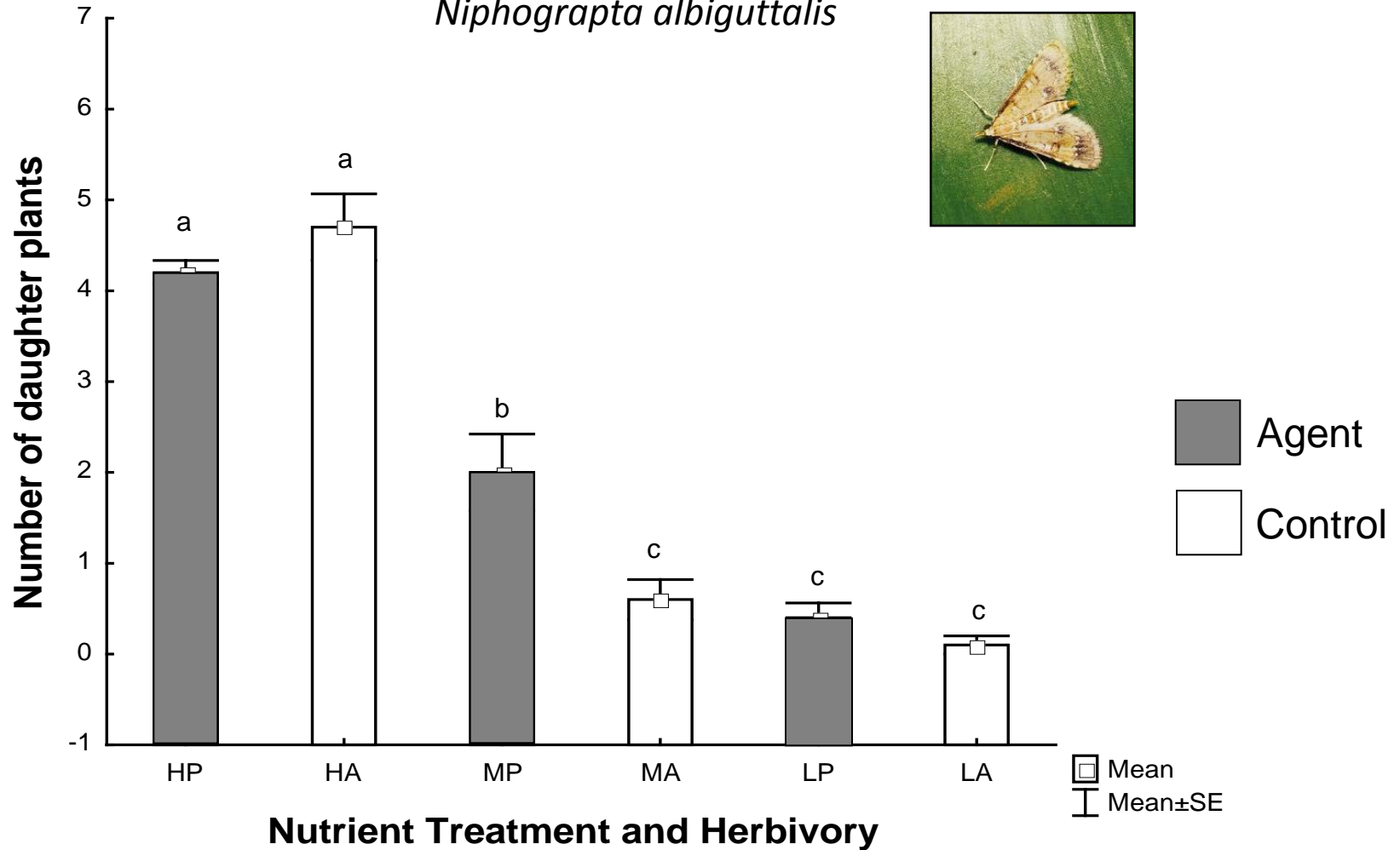
Bownes PhD 2009, unpub.

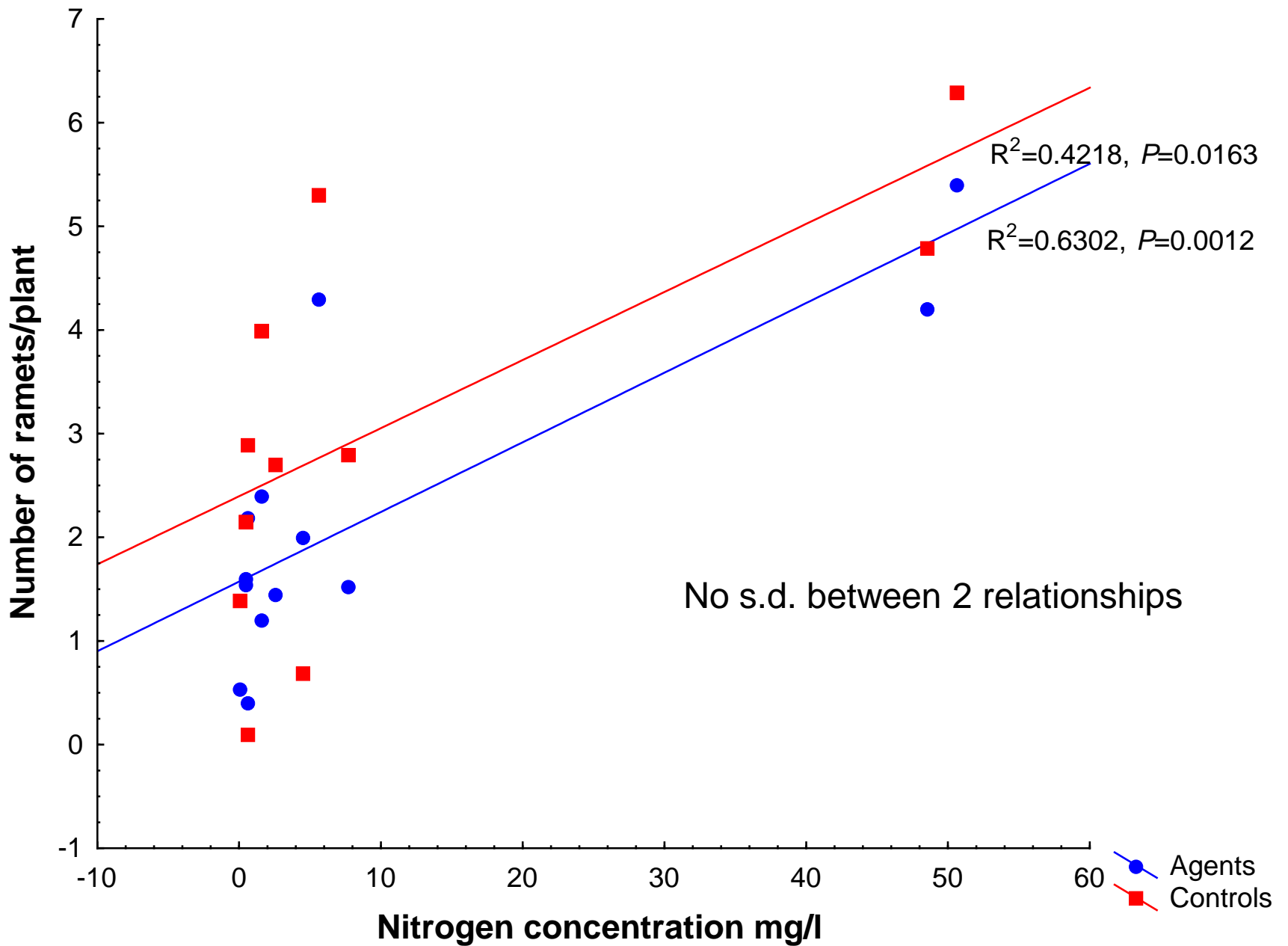
Cornops aquaticum

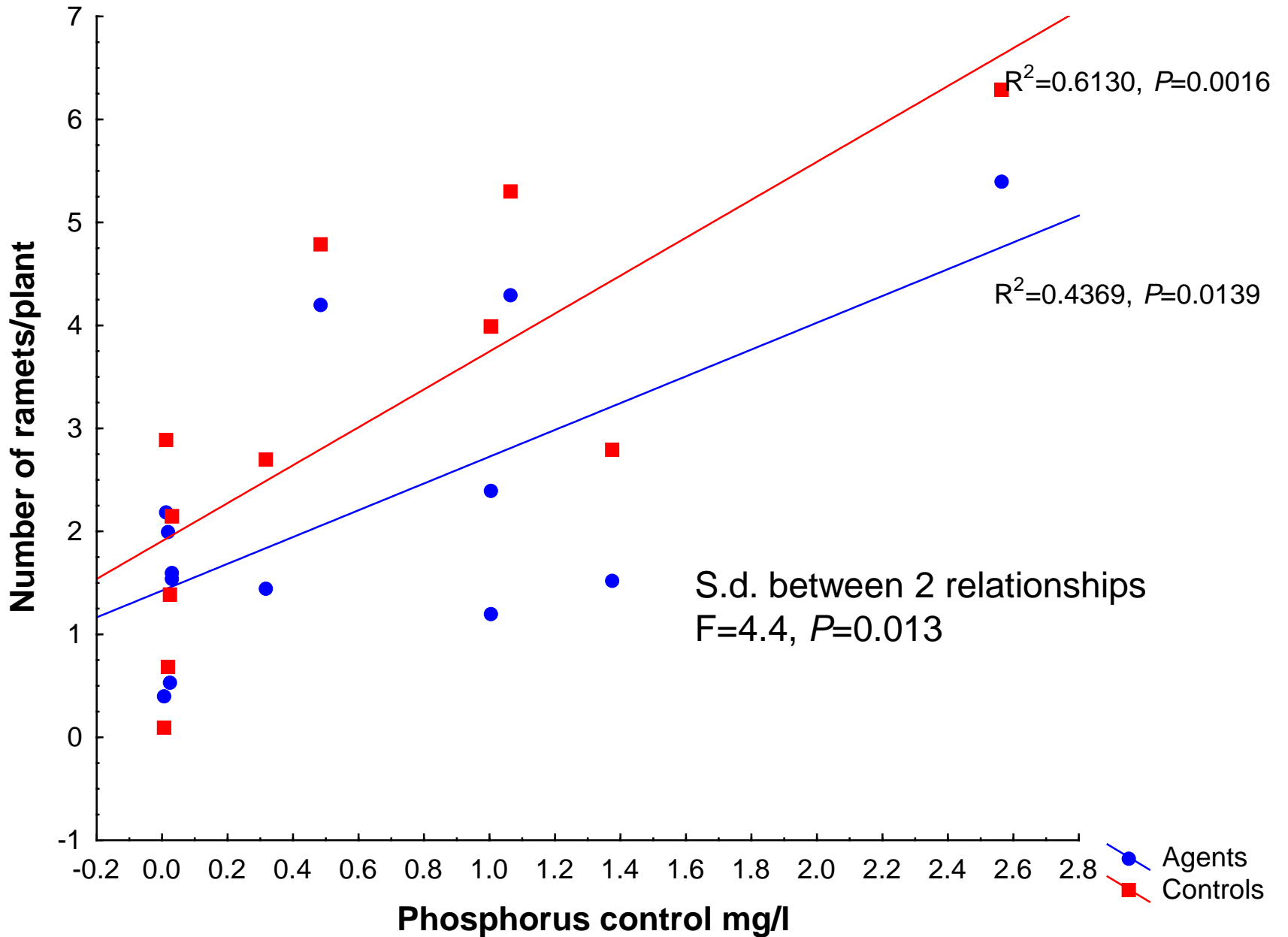


Canavan et al. 2009, unpub.

Niphograptia albiguttalis

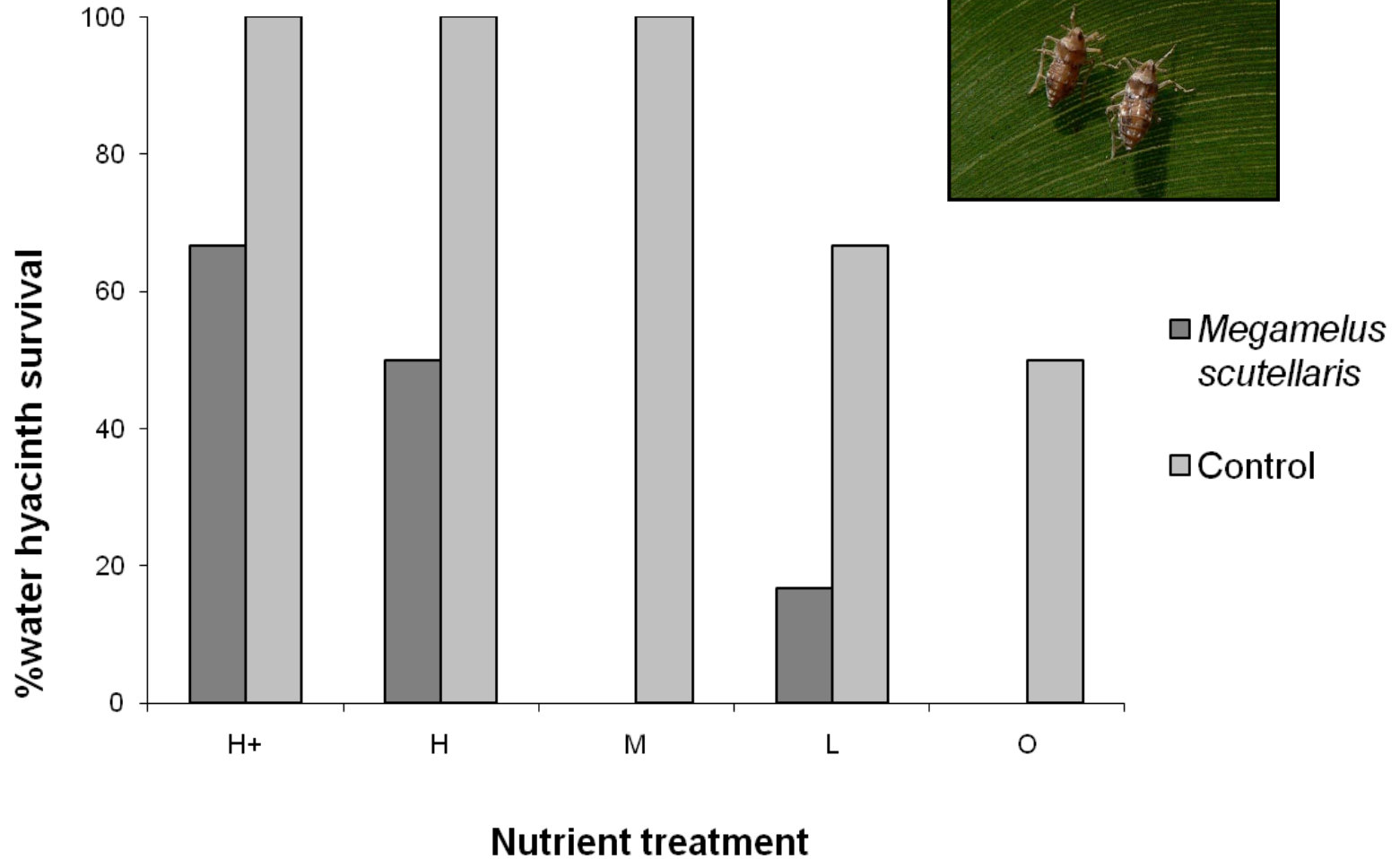






Coetzee 2009, unpub

Megamelus scutellaris





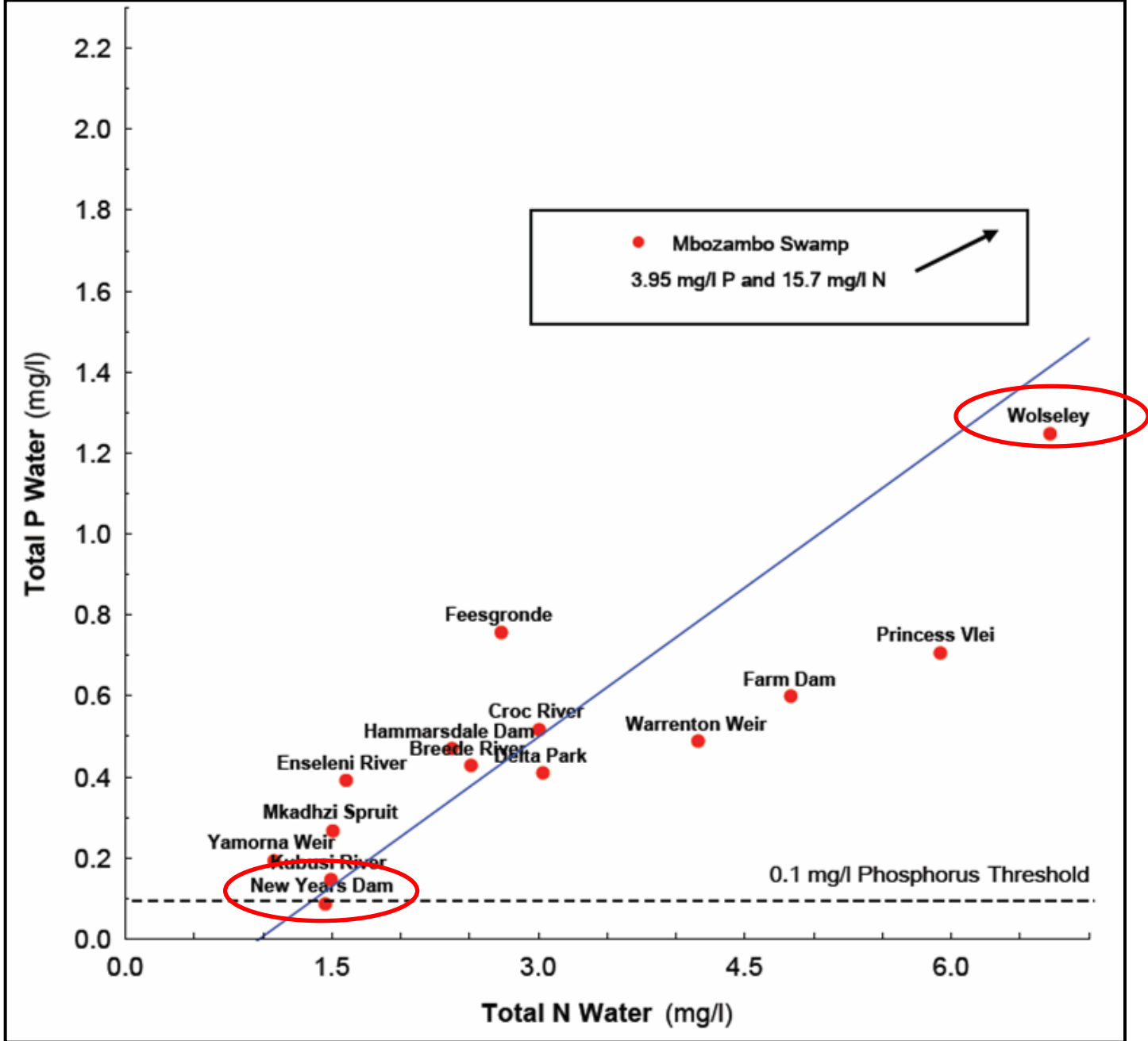
1997





2001







February 2005



March 2010

Release effort

Tongaat, Wewe Siphon Dam January 2008




Picture: Des Conlong

Tongaat, Wewe Siphon Dam May 2008



Tongaat, Wewe Siphon Dam January 2009

A wide river flows through a lush green landscape. In the background, a concrete bridge with a single central pier spans across the river. The banks are lined with dense trees and vegetation. The sky is clear and blue. The water is calm, reflecting the surrounding greenery and the bridge.

Release more agents?

Manipulate the habitat?







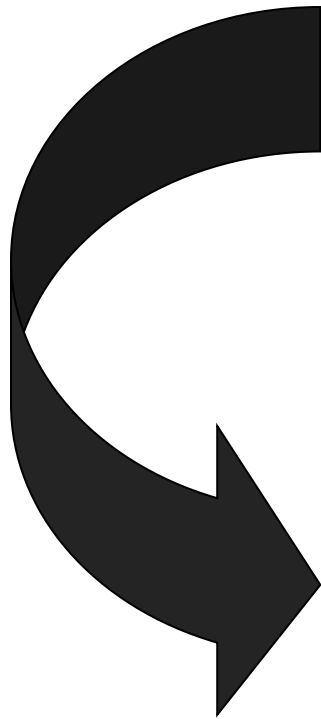
Warrenton Weir, Vaal River



October 2004

Alternative stable states

Light



Nutrients



Scheffer et al 2003
PNAS





February 2009

Myriophyllum spicatum
(Haloragaceae)
Eurasian watermilfoil



February 2009

Acknowledgements



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