

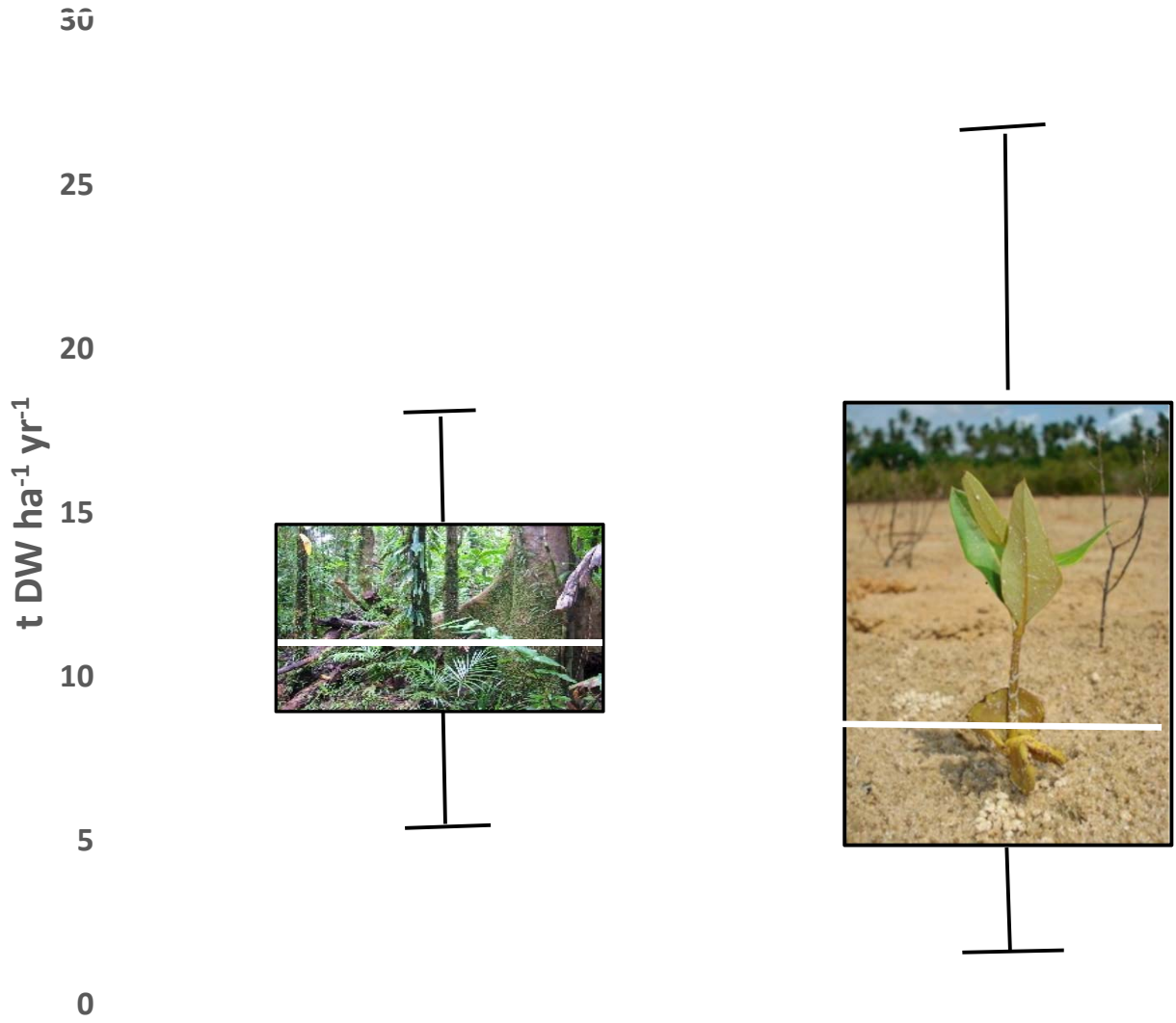
Kropotkin's Garden: How important is facilitation in mangroves?

Mark Huxham



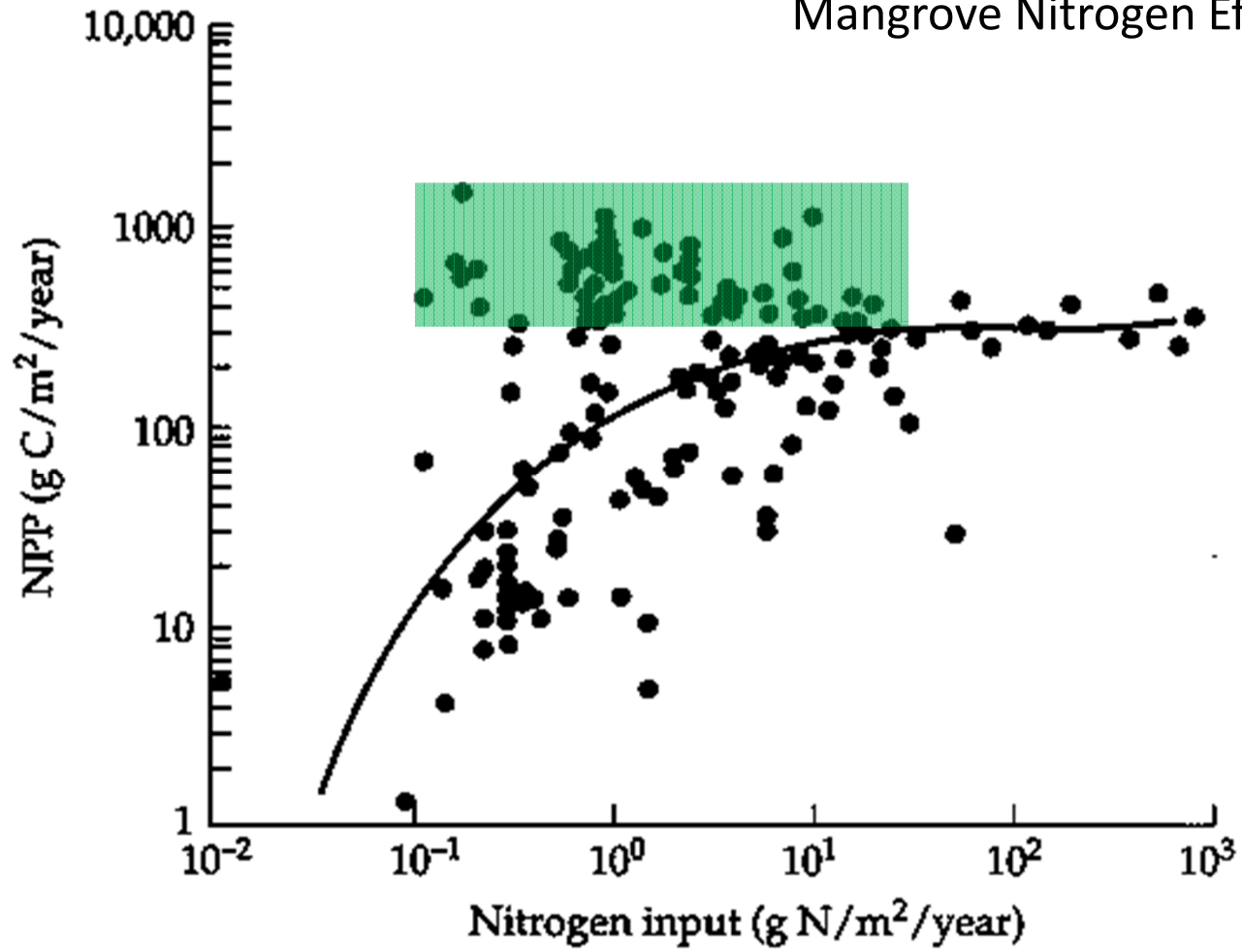
"Peter Kropotkin circa 1900" by F. Nadar - NYPL. Licensed under Public Domain via Commons - https://commons.wikimedia.org/wiki/File:Peter_Kropotkin_circa_1900.jpg#/media/File:Peter_Kropotkin_circa_1900.jpg

Is there a 'productivity paradox?'

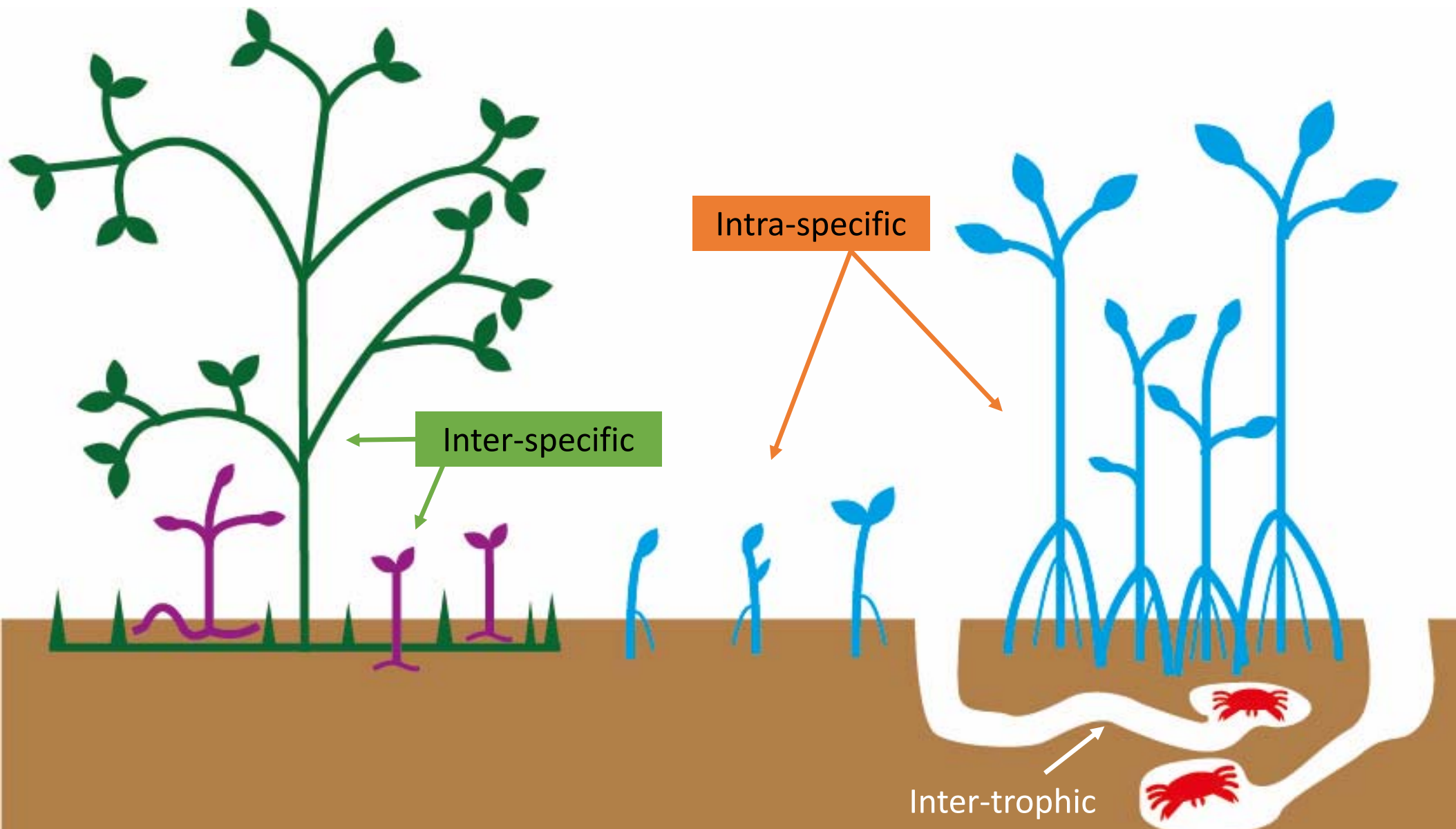


Adapted from Alongi 2009

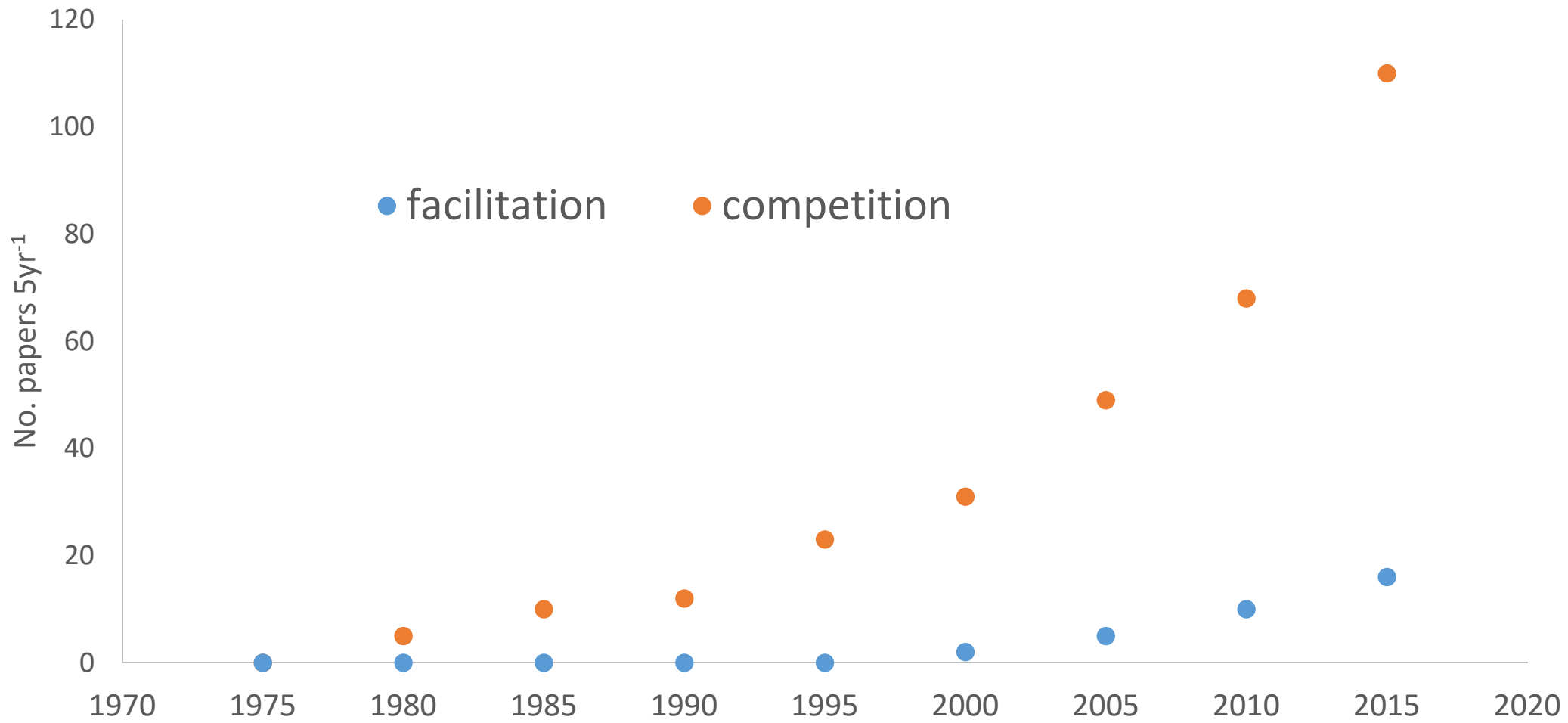
Mangrove Nitrogen Efficiency

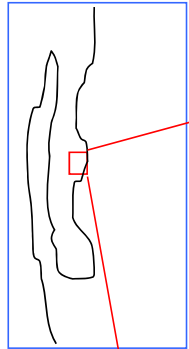
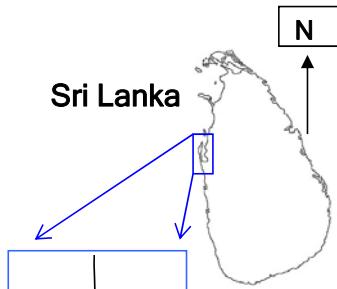


After Schlesinger 1997



ISI Web of Science 'topic' search





Puttalam lagoon

Species

Rhizophora mucronata

Density

0.4 m [d1]

0.6 m [d2]

0.8 m [d3]

1.2 m [d4]

control

Replicate

R1

R2

R3

R1

R2

R3

R1

R2

R3

R1

R2

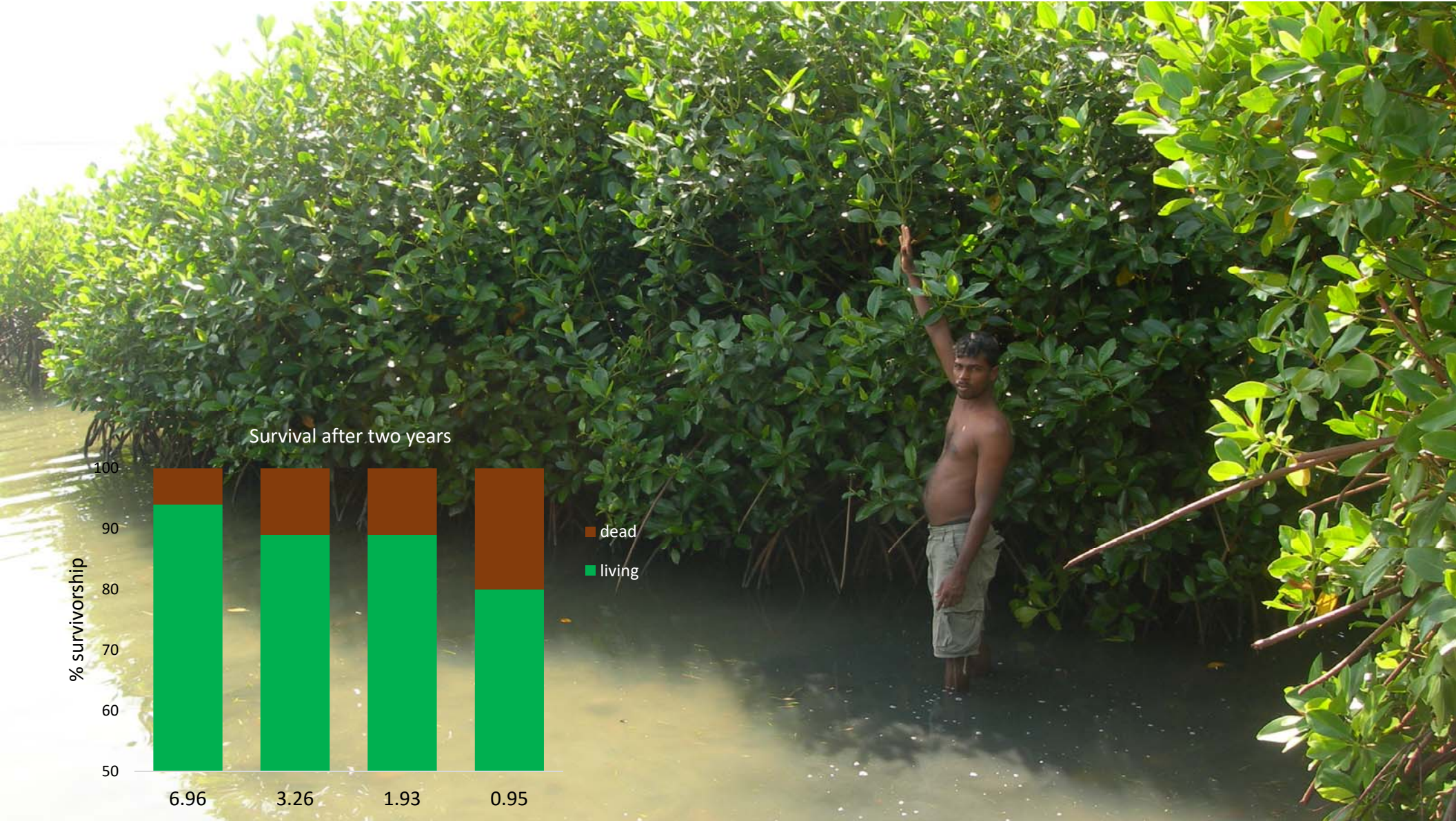
R3

R1

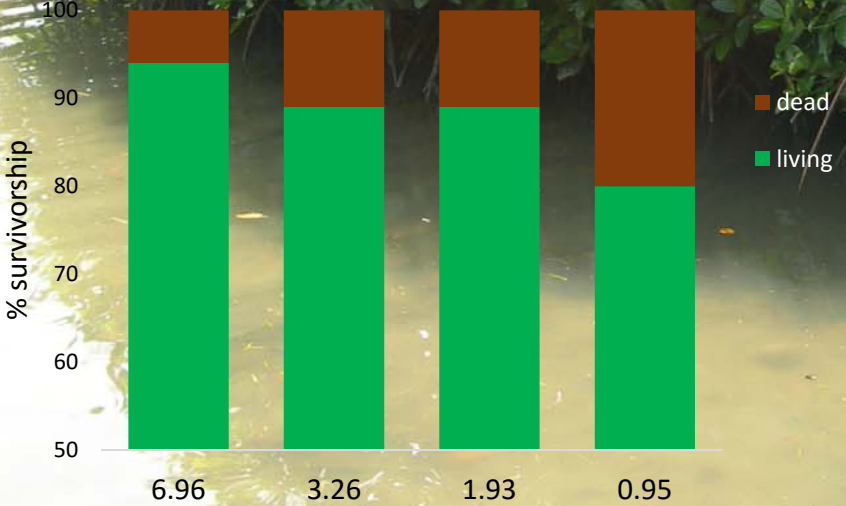
R2

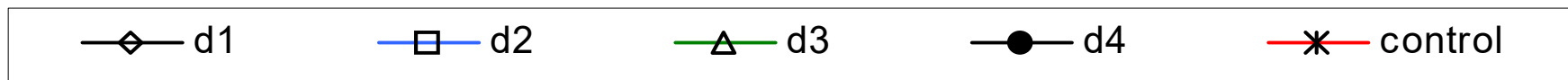
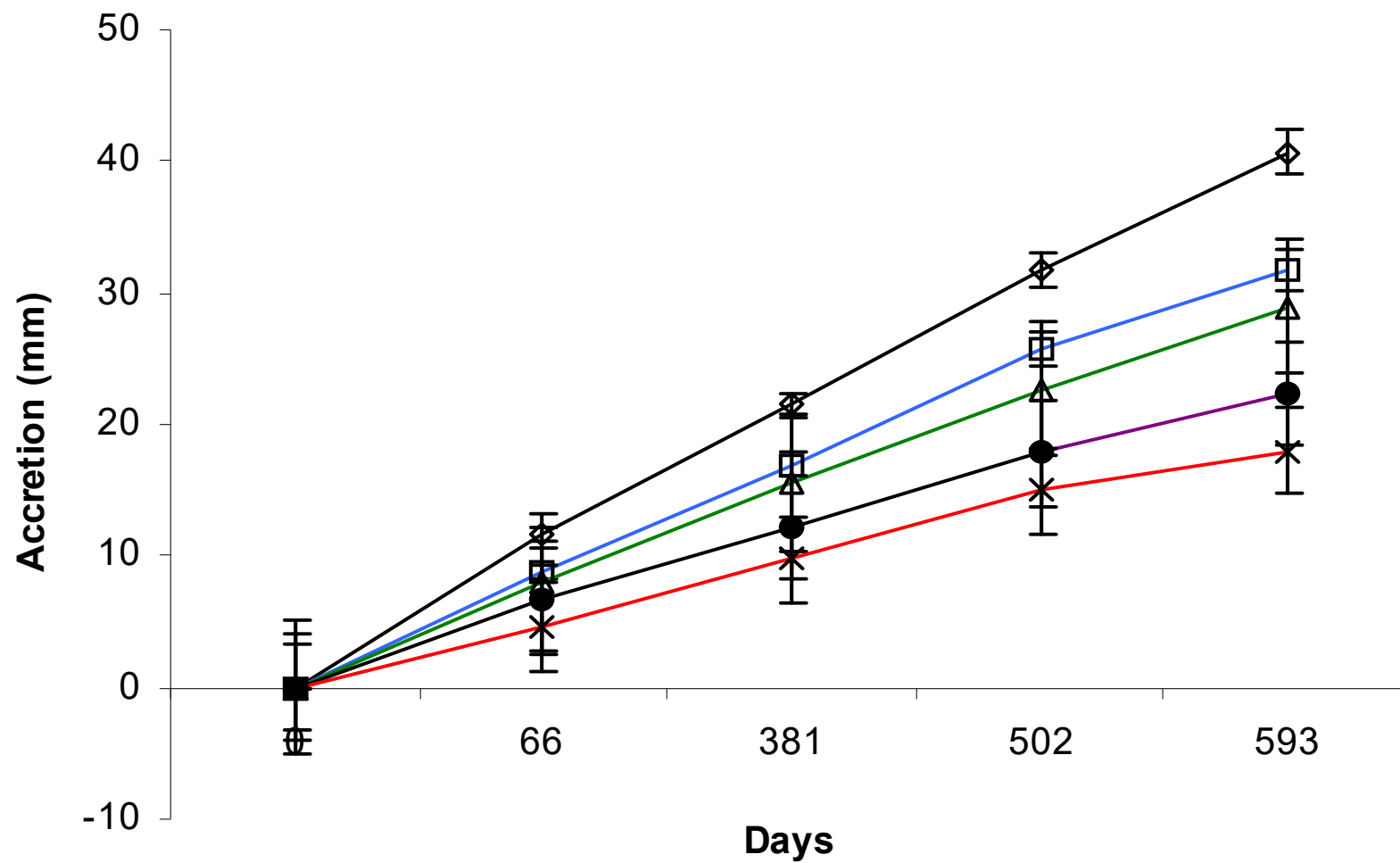
R3

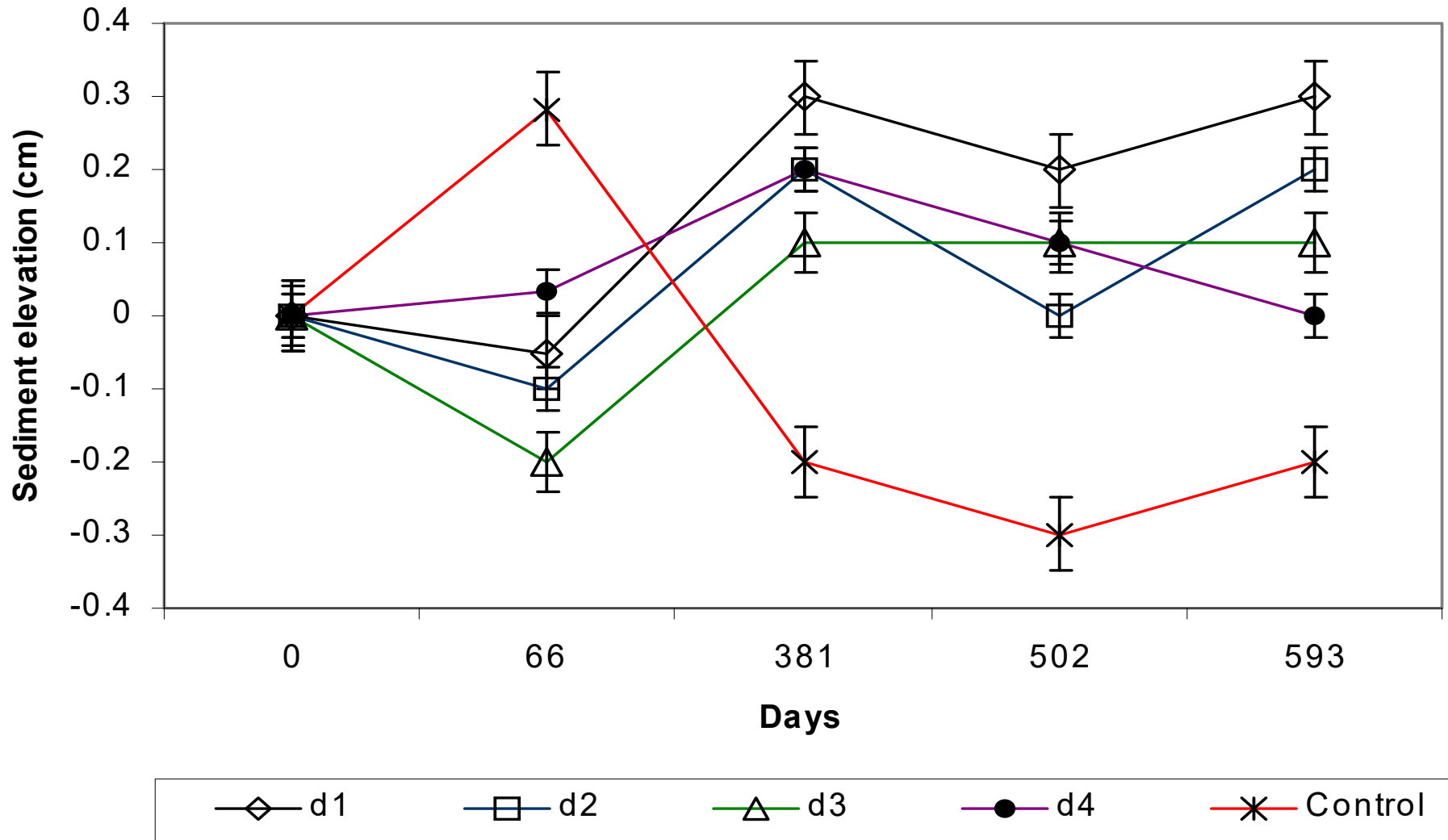




Survival after two years





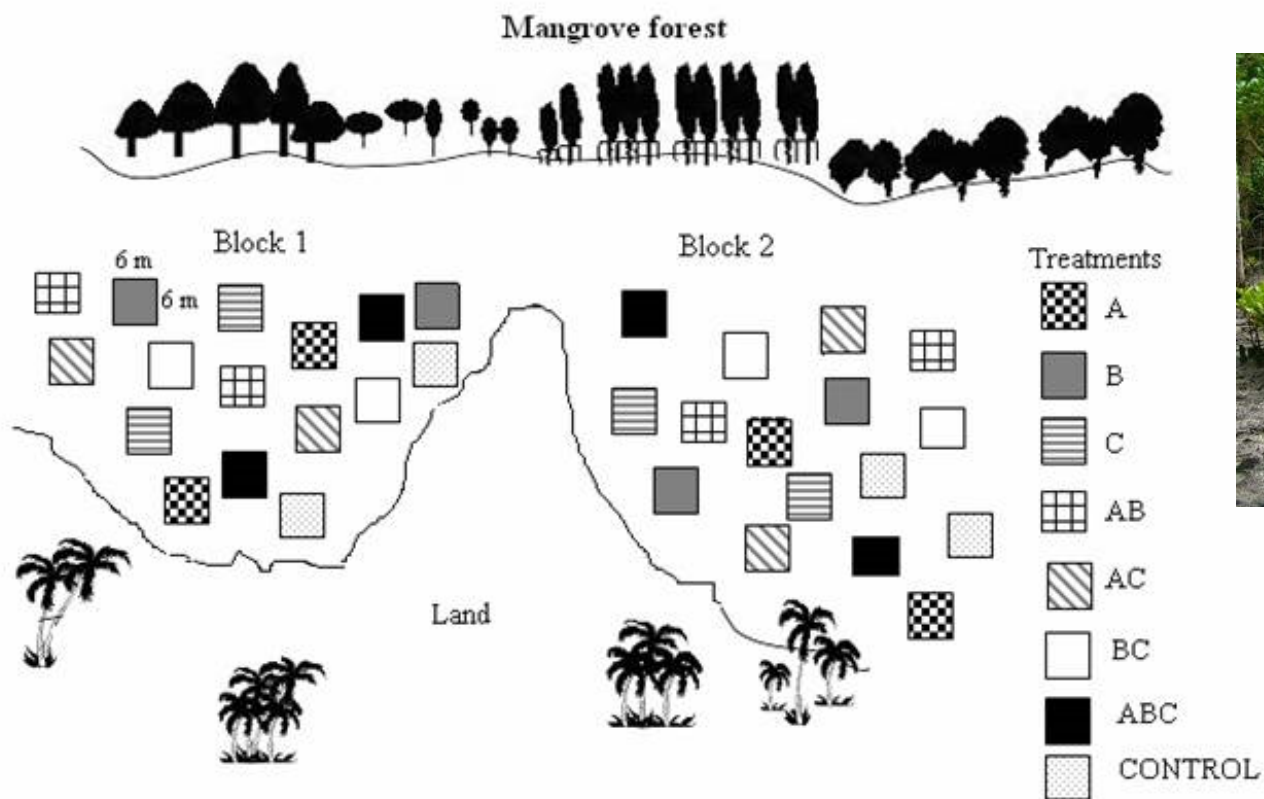


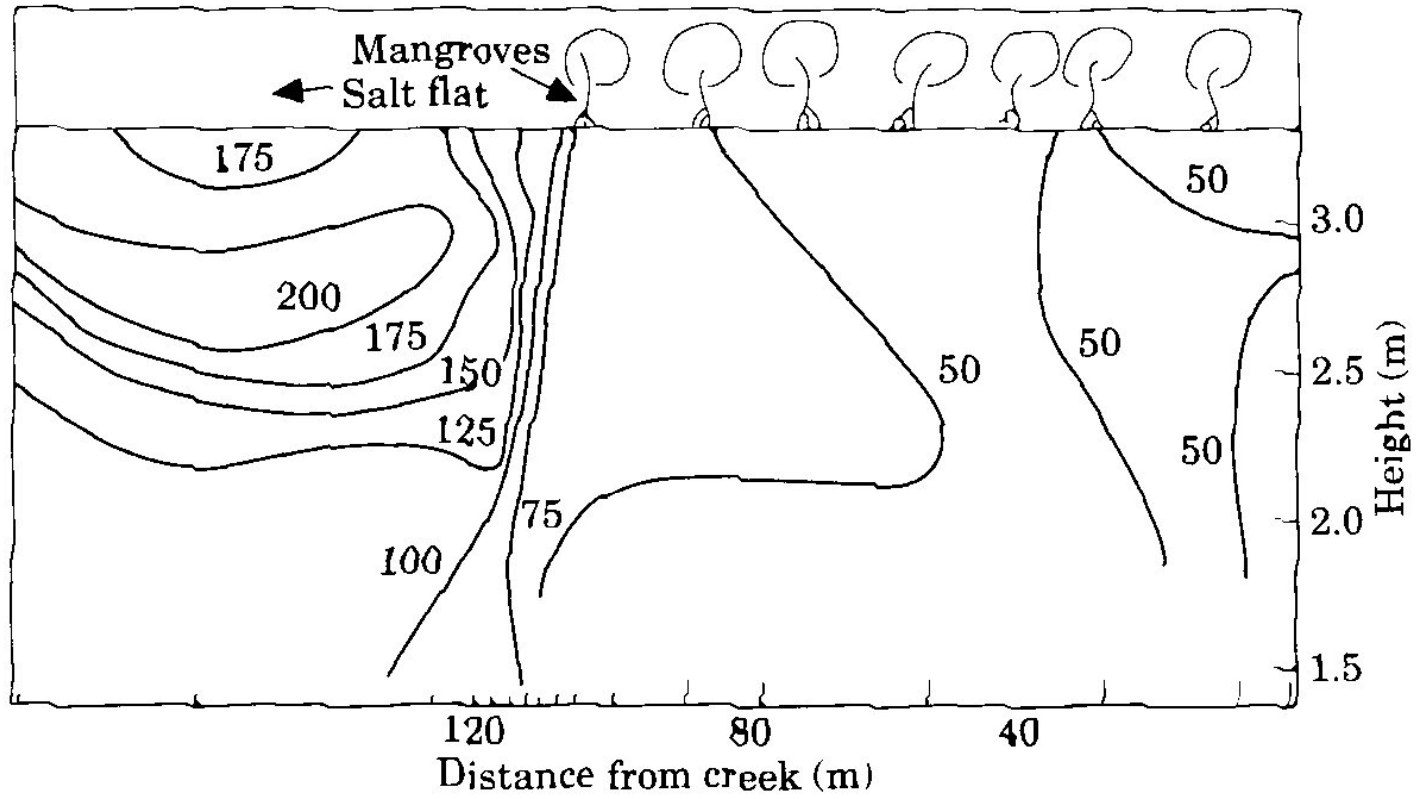
1) Can grossly degraded mangrove sites be restored?



2) If so, what species mix performs best, and does more mean better?

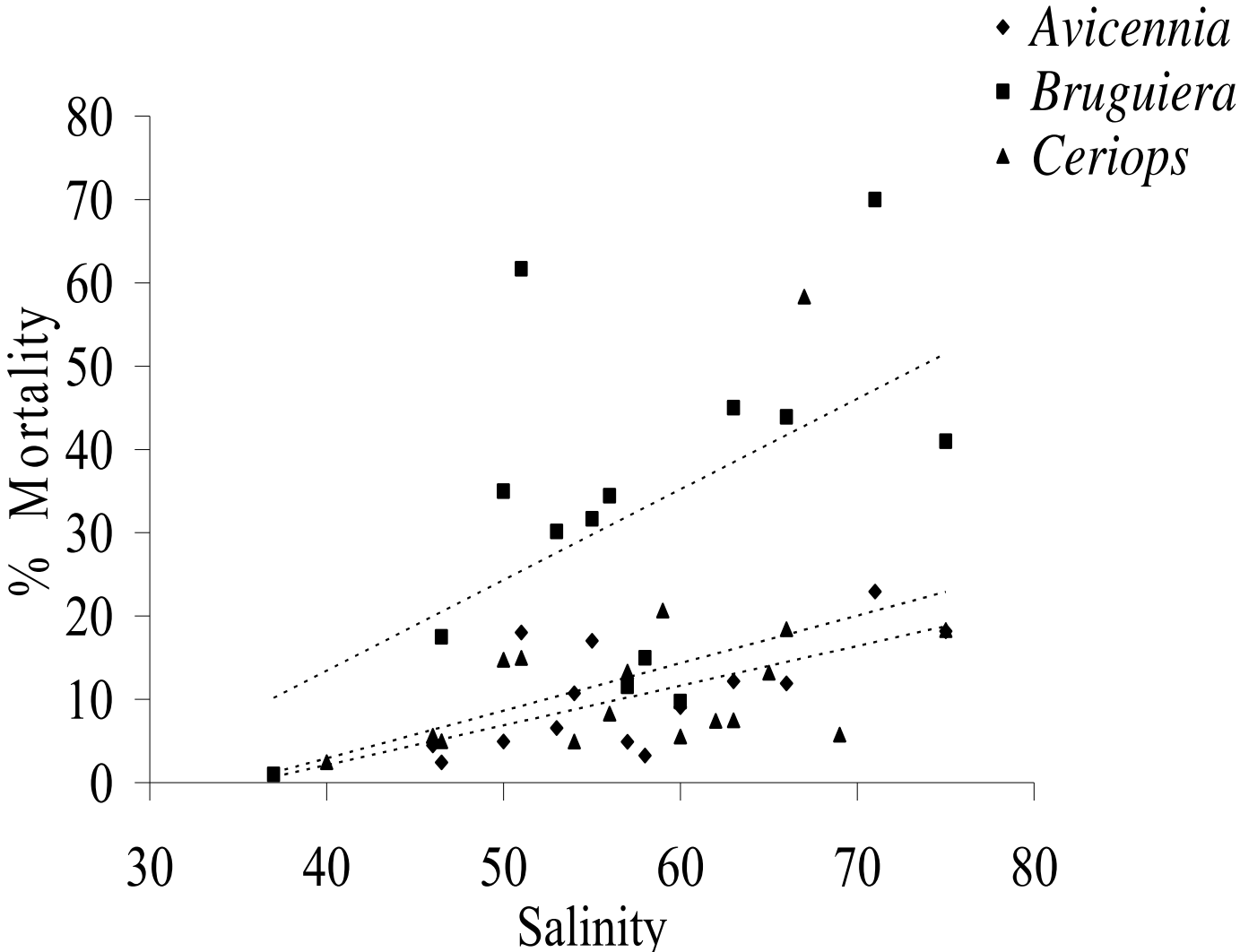
An experimental test of the effects of species richness on ecosystem functions in mangroves

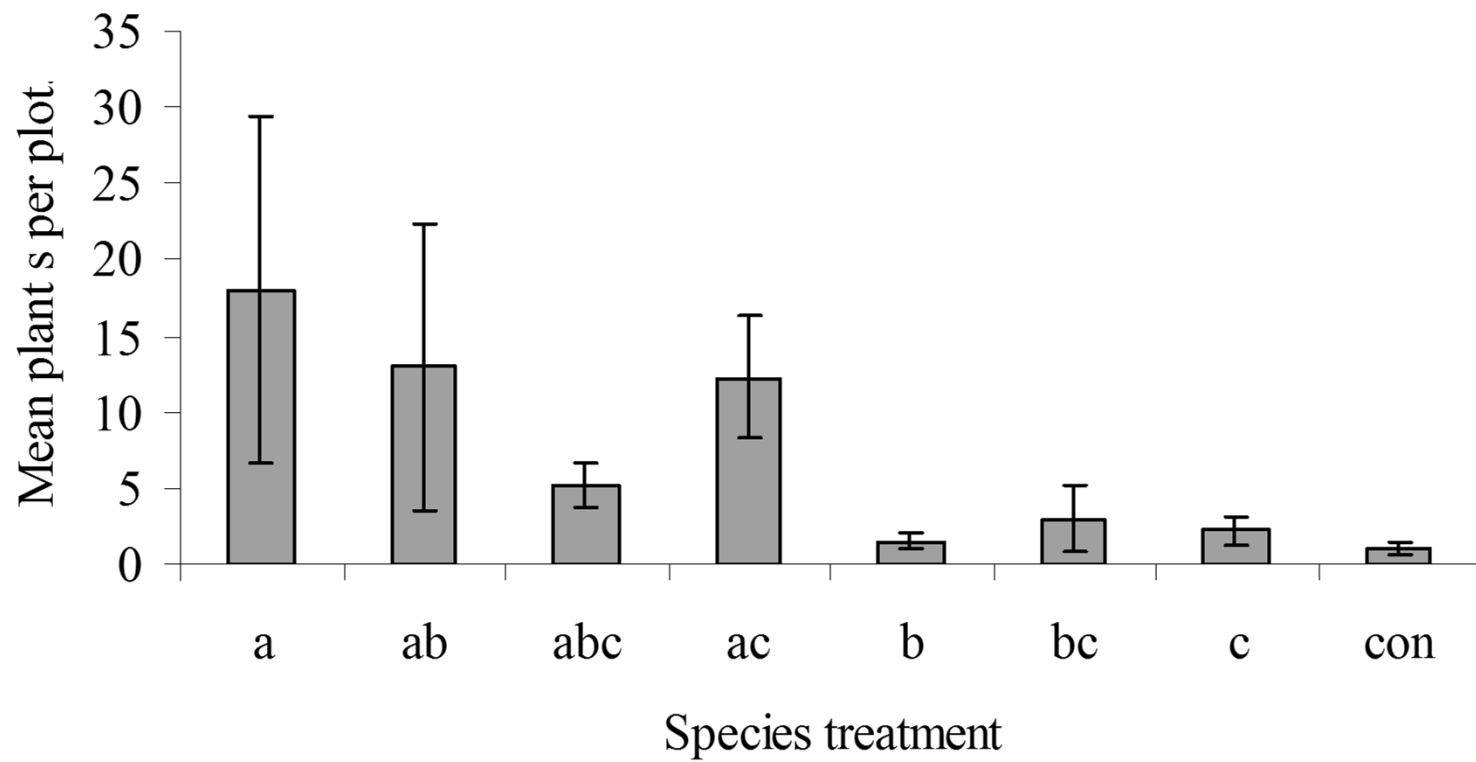


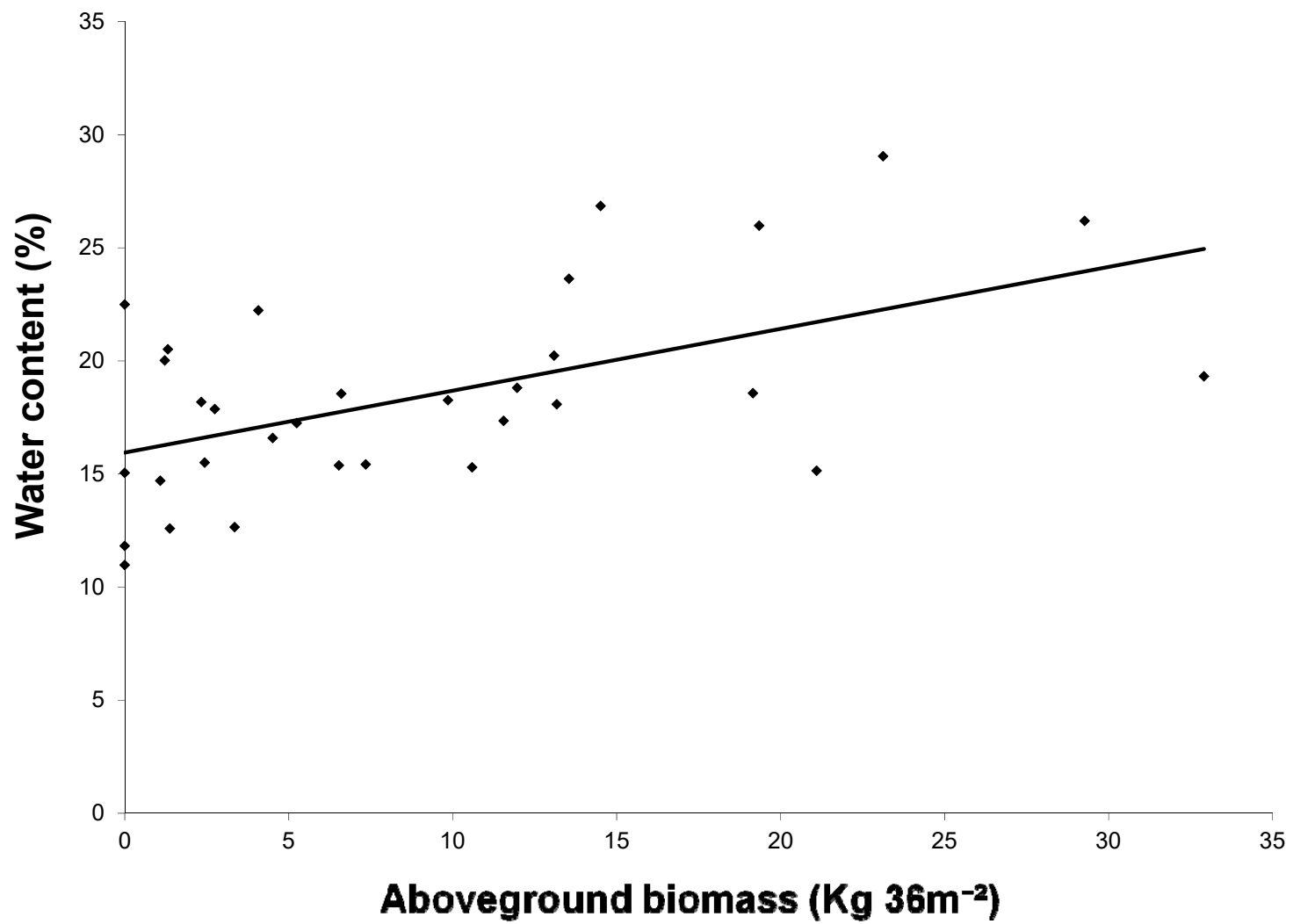


From Ridd and Sam (1996)

Kirui et al. (2008). *Hydrobiologia*, 603, 171-181.







2005



2007



2009

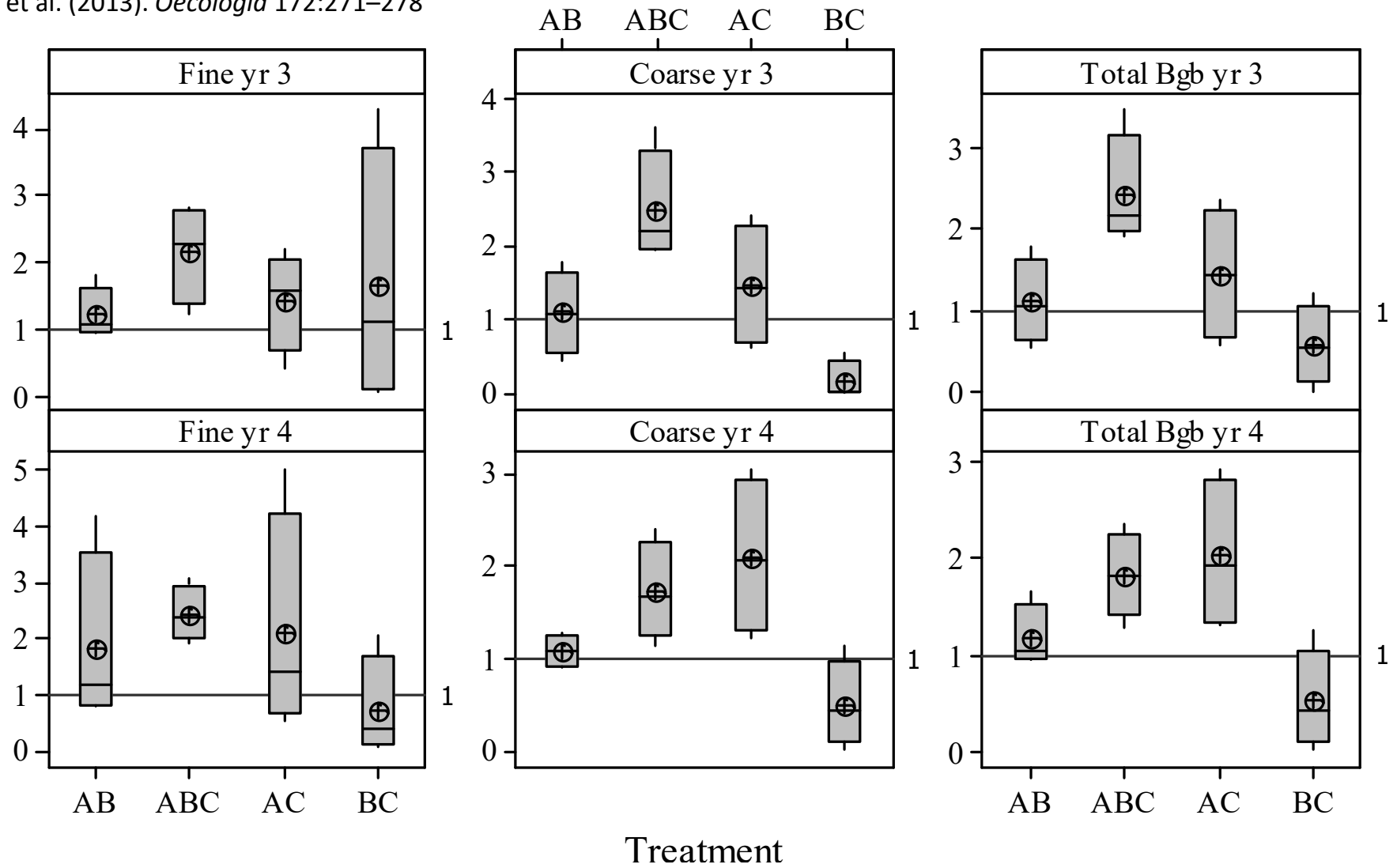


2010



Species mixing boosts the below-ground productivity of mangrove roots

Lang'at et al. (2013). *Oecologia* 172:271–278

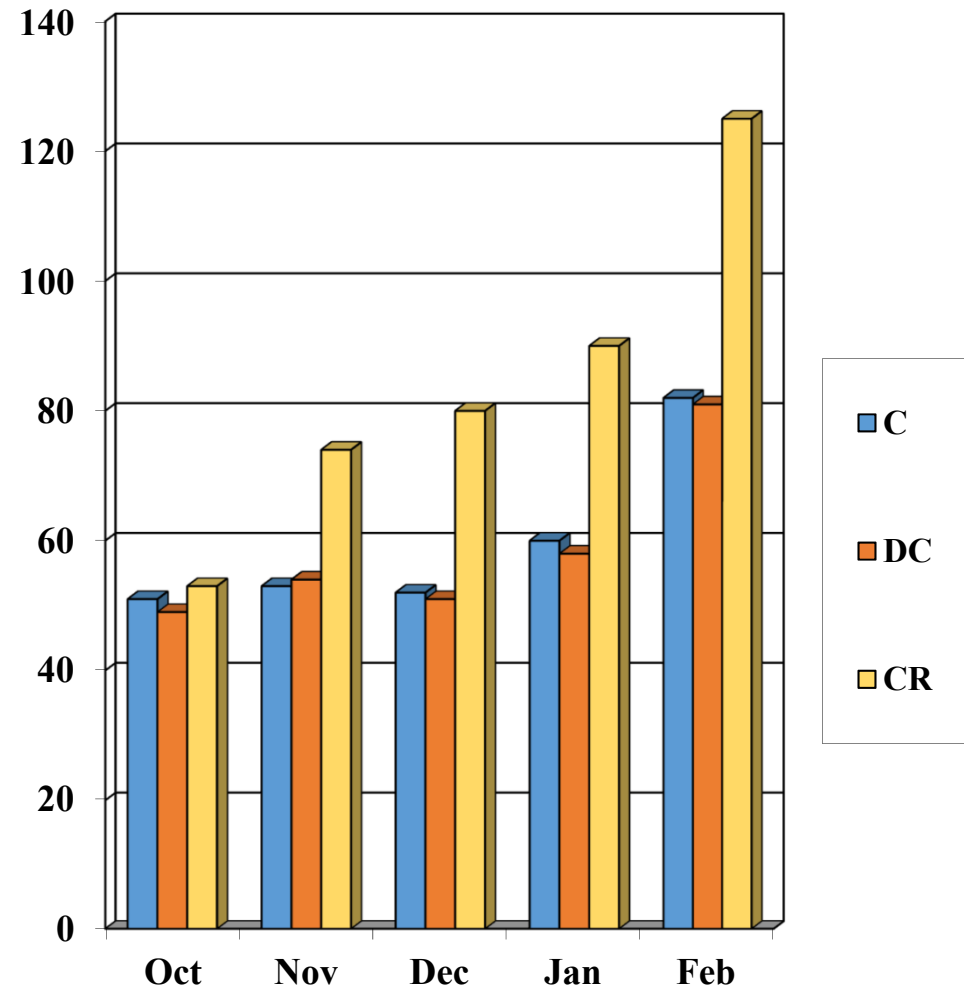


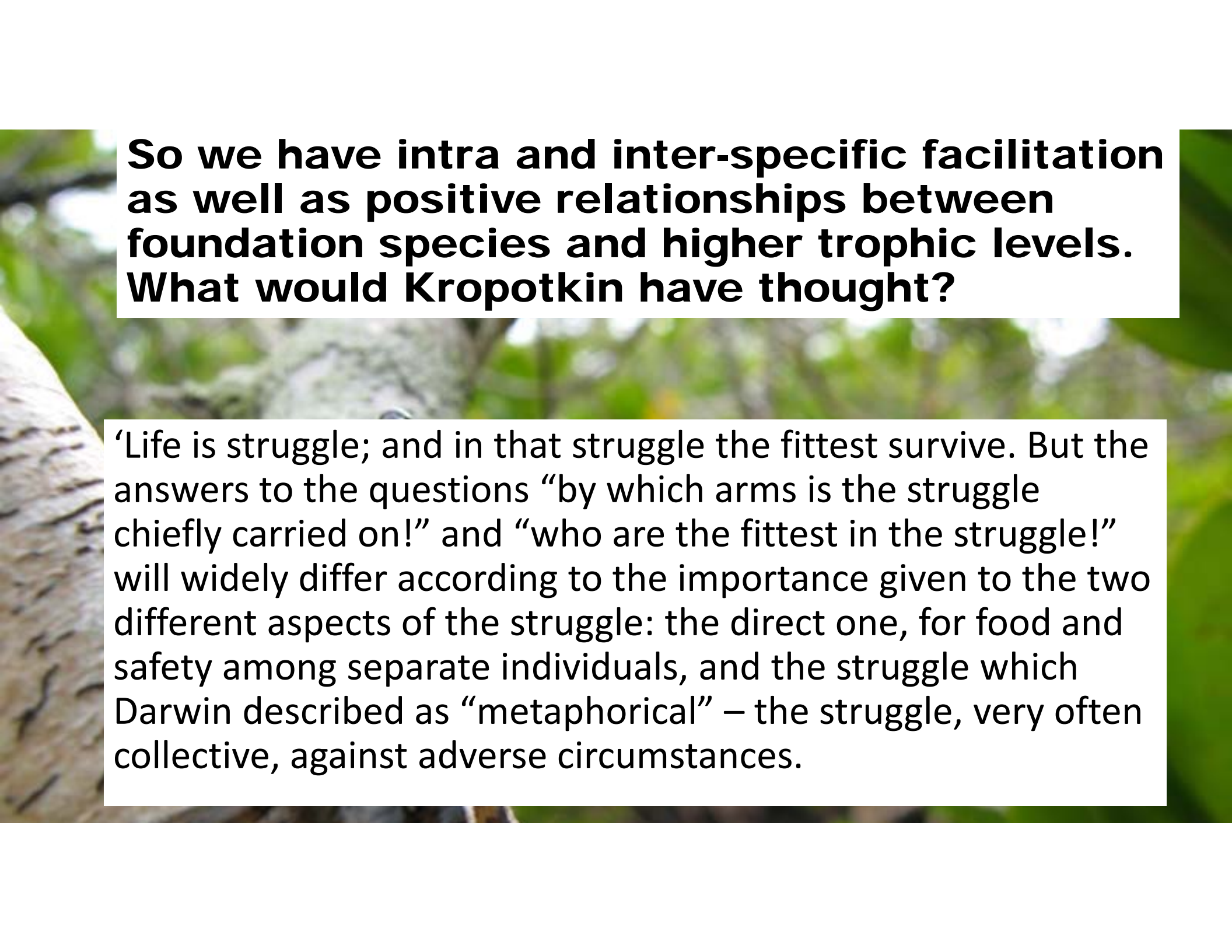
Ecosystem effects of crabs

Smith et al., 1991 Est. Coast. Shelf Sci., 33:419-432



- Stipule fall rates ($\text{g m}^{-2} \text{ day}$): 0.34, 0.34, 0.30 (control, disturbance control and removal, respectively)
- Significantly fewer mature propagules produced in crab removal areas
- Porewater sulphide increased in removal areas





So we have intra and inter-specific facilitation as well as positive relationships between foundation species and higher trophic levels. What would Kropotkin have thought?

‘Life is struggle; and in that struggle the fittest survive. But the answers to the questions “by which arms is the struggle chiefly carried on!” and “who are the fittest in the struggle!” will widely differ according to the importance given to the two different aspects of the struggle: the direct one, for food and safety among separate individuals, and the struggle which Darwin described as “metaphorical” – the struggle, very often collective, against adverse circumstances.