

# Biogeography of *Isolepis Fluitantes*

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# Affinities of the Cape flora

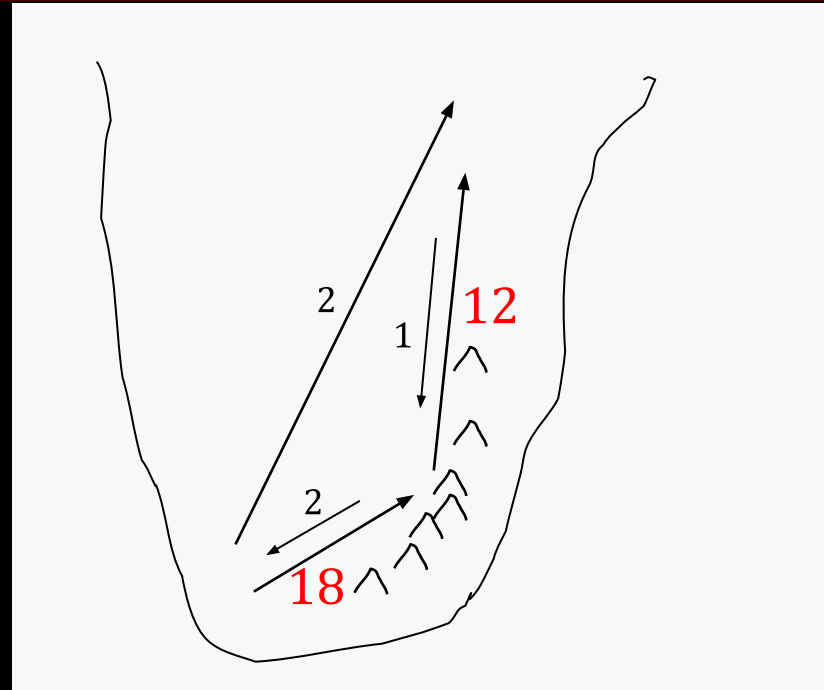
CFR and Tropical Africa:  
Northward migration over the  
Drakensberg

e.g. *Irideae*, *Pentaschistis*

(Galley et al., 2007)

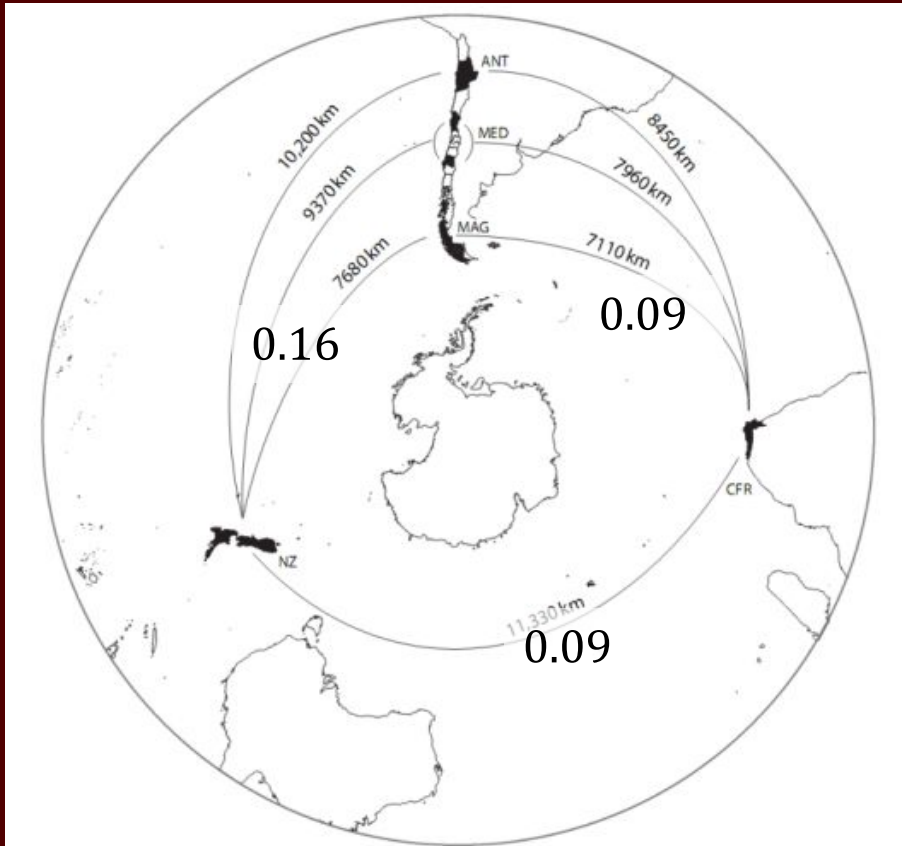
Some tropical taxa from Eurasia  
e.g. *Arabis*, *Carex*, *Ranunculus*

(Koch et al., 2006; Gehrke & Linder,  
2009)



data from Galley et al., 2007

# Affinities of the Cape flora



adapted from Moreira-Muñoz, 2007

Circum-antarctic:

Dispersal by

wind (Muñoz et al., 2004)

West Wind Drift (Waters & Roy, 2004)

water birds

Mostly not Gondwanan  
(Linder, 2005)

Africa to Australasia:

e.g. *Lepidium*, Gnaphalieae

Australasia to Africa:

e.g. Ehrharteae, *Tetraria*

(Bergh & Linder, 2009)



# *Fluitantes*

*Fluitantes*: CFR,  
African mountains,  
Europe, S–SE Asia,  
Australasia

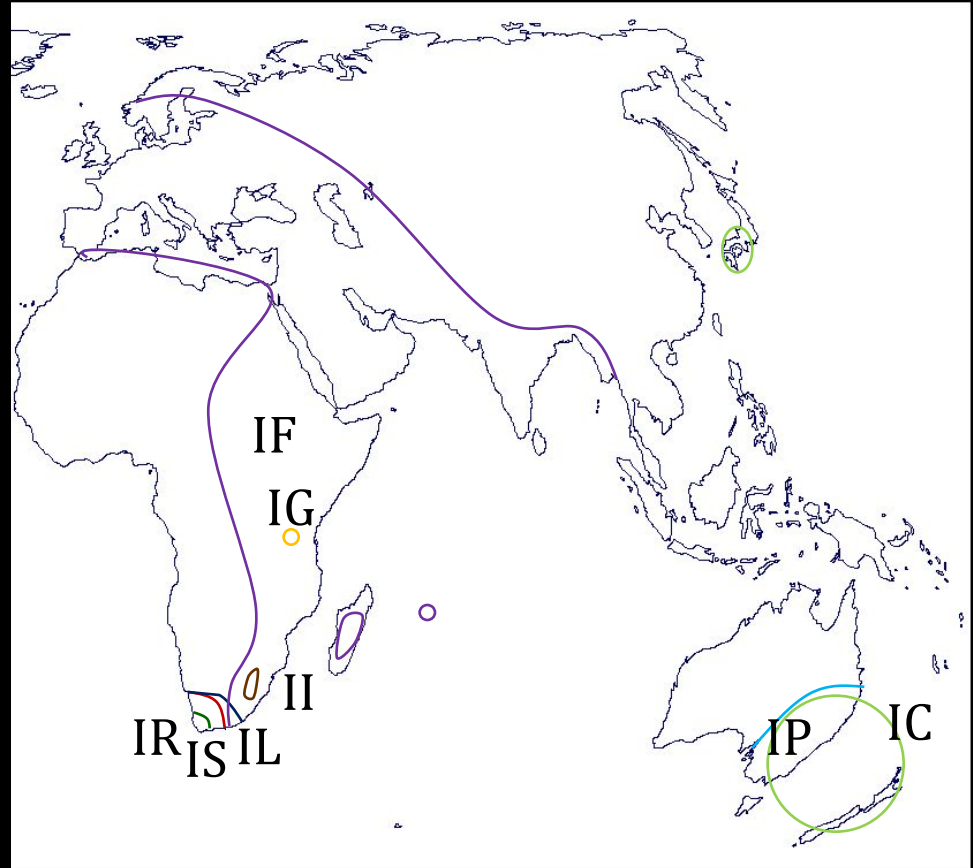
*fluitans striata*

*graminoides rubicunda*

*inyangensis producta*

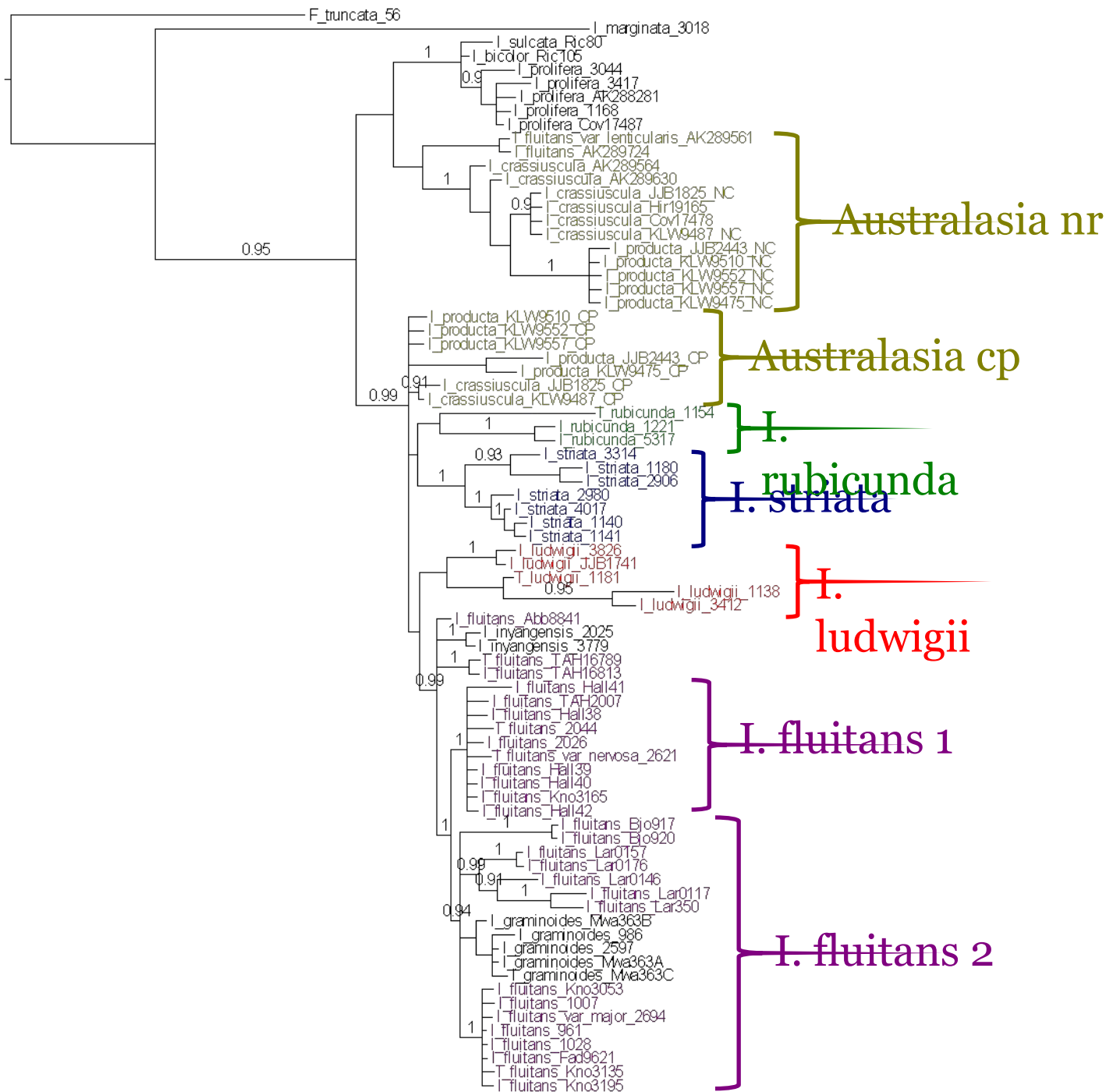
*ludwigii crassiuscula*

(Muasya & Simpson, 2002)

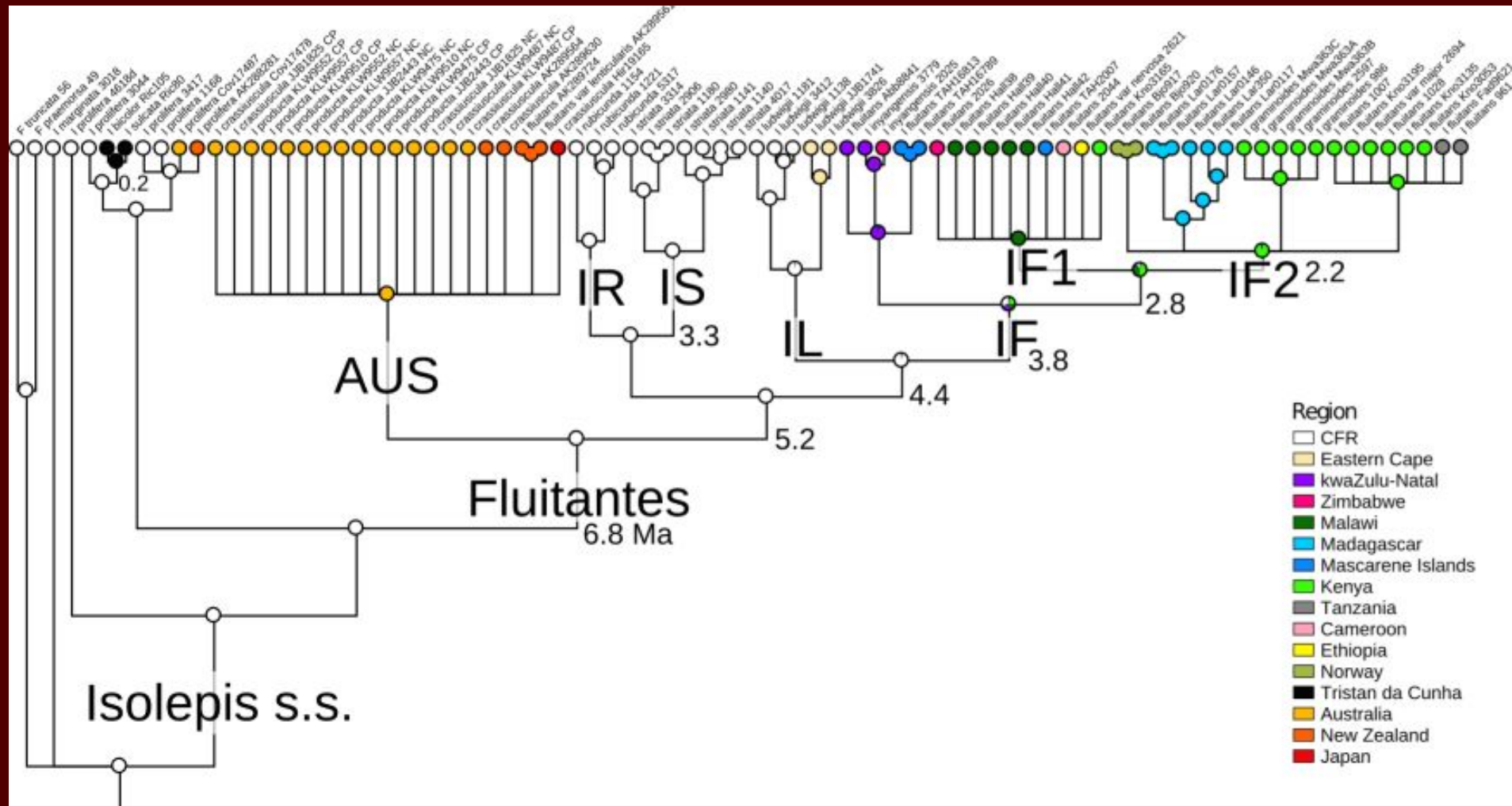


# Methods

- Sequencing
  - ITS, *atpI–H*
  - 3+ populations per species
- Phylogeny: MrBayes
- Dating: BEAST
- Ancestral area reconstruction: Mesquite



# Ancestral areas





# Dispersal to Australasia

- Long-distance dispersal event
- Hybridization with *Proliferae*?
- Subsequent speciation in situ?

# Dispersal through Africa

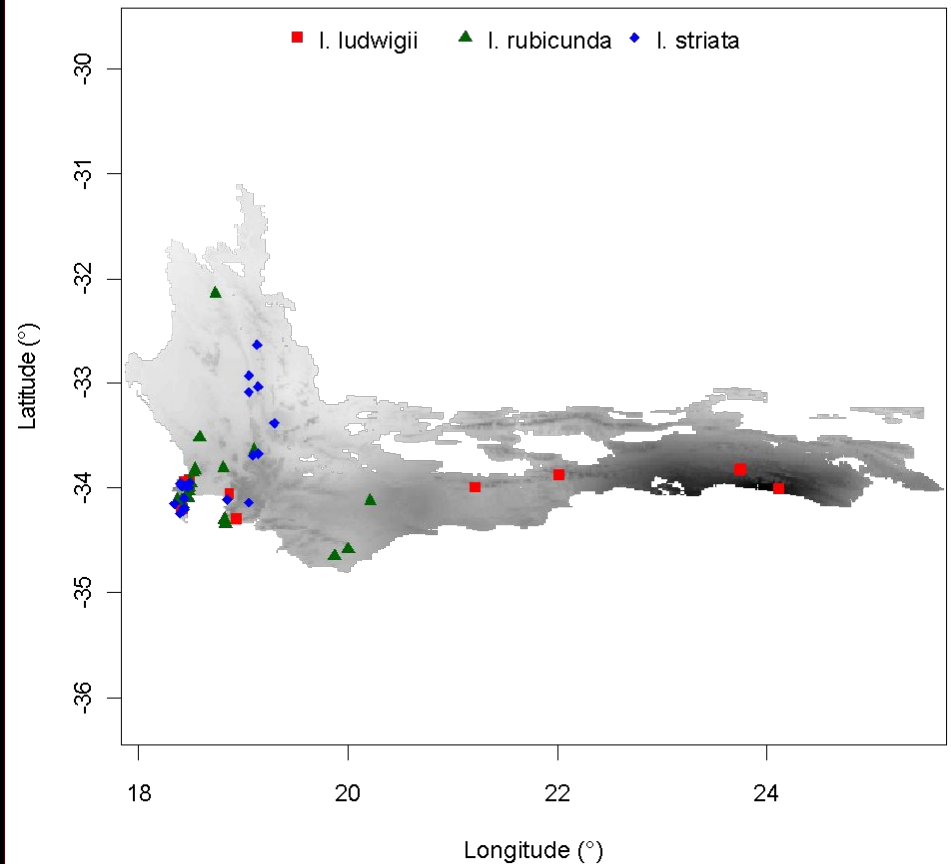
- Congruent with other CFR elements  
(Galley et al., 2007)
- Broad-scale niche conservatism  
(Wiens & Graham, 2005)
- Island colonization

# Diversification in the CFR

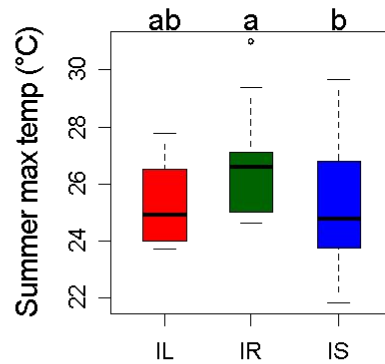
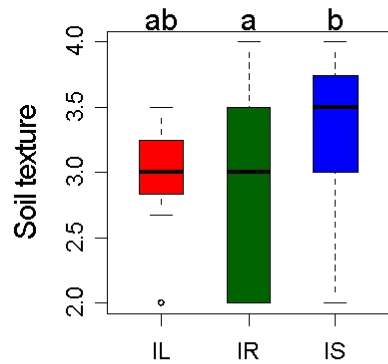
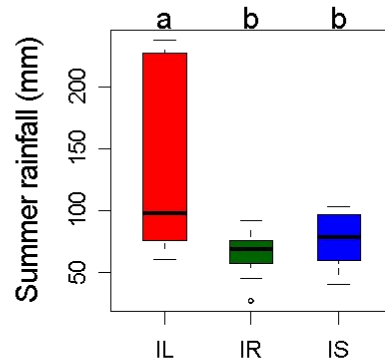
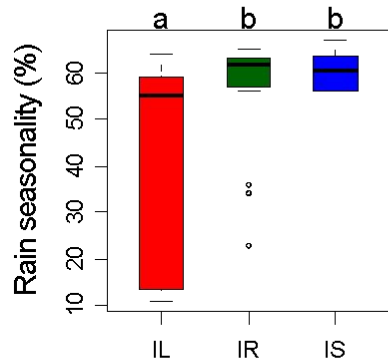
- Topographical complexity (Cowling et al., 2008) and tectonic stability
- Soil, pollinator specificity (Linder, 2003, 2005; van der Niet & Johnson, 2009)

# Habitat inference

- Georeferences from Bolus specimens
- Habitat data from GIS layers:
  - climate (Hijmans et al., 2005)
  - radiation (Slingsby unpub.)
  - soil (Gelfand et al., 2003)
- ANOVA
- DFA

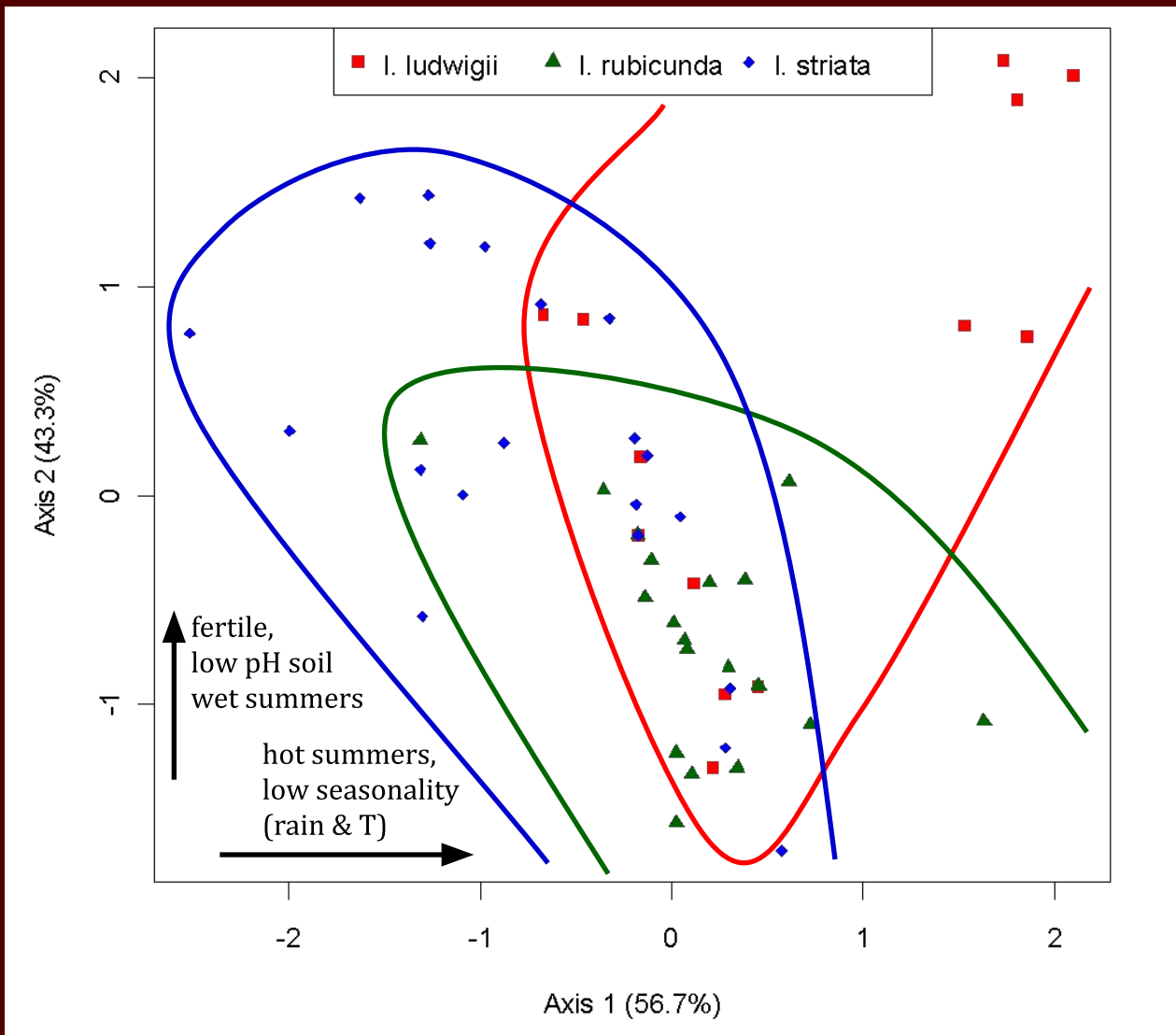


# Habitat divergence



| Variable              | <i>F</i> | <i>P</i> |
|-----------------------|----------|----------|
| Soil fertility        | 1.51     | ns       |
| Soil texture          | 2.99     | 0.06     |
| Soil pH               | 2.33     | ns       |
| Solar radiation (Jan) | 0.53     | ns       |
| Temp seasonality      | 1.68     | ns       |
| Summer max temp       | 3.13     | 0.05     |
| Rainfall seasonality  | 13.37    | <0.001   |
| Summer rainfall       | 11.46    | <0.001   |

# Habitat divergence



# Diversification in the CFR

- Cannot test for mode of speciation
- Little habitat differentiation at  $\sim 1 \text{ km}^2$
- Microhabitat differentiation
  - Relevant plant characteristics still unknown
- Other isolating mechanisms?

