



Landcare Research
Manaaki Whenua



DNA Diagnostics for plant species, what we can and can't do

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Molecular biology; why?



- Morphology often difficult, requires particular material (reproductive parts)
- Plasticity – things aren't always as they seem
- Sometimes only fragments / processed products
- We sometimes need to know more than “species”



Applications

- Species level diagnostics
- Intraspecific identification (eg Tradescantia, Pampas)

Limitations

- Available existing data (Genbank)
- Sample quality



Sample quality

- CSI is a television programme, so is Star Trek
- Tissue quality is the main limitation in what we can achieve
- Preserve / Package / Post!
 - Speed is essential

Some examples



- Vallisneria (Eelgrass)
 - *V. gigantea* a nationally banned species
 - Couldn't be determined accurately from morphology, and uncertainty about what some other material was.
 - Direct sequenced ITS (internal transcribed spacer of the ribosomal DNA), compared to published revision (Les et al 2008. Systematic Botany 33:49-65).

Vallisneria



- Formerly: *Vallisneria gigantea* (Eelgrass) = *V. americana*
- We found *V. australis*, *V. spiralis* and *V. natans*!
- Taxonomy has been confusing, and will result in changes to the Unwanted Organisms Register (*V. australis*)

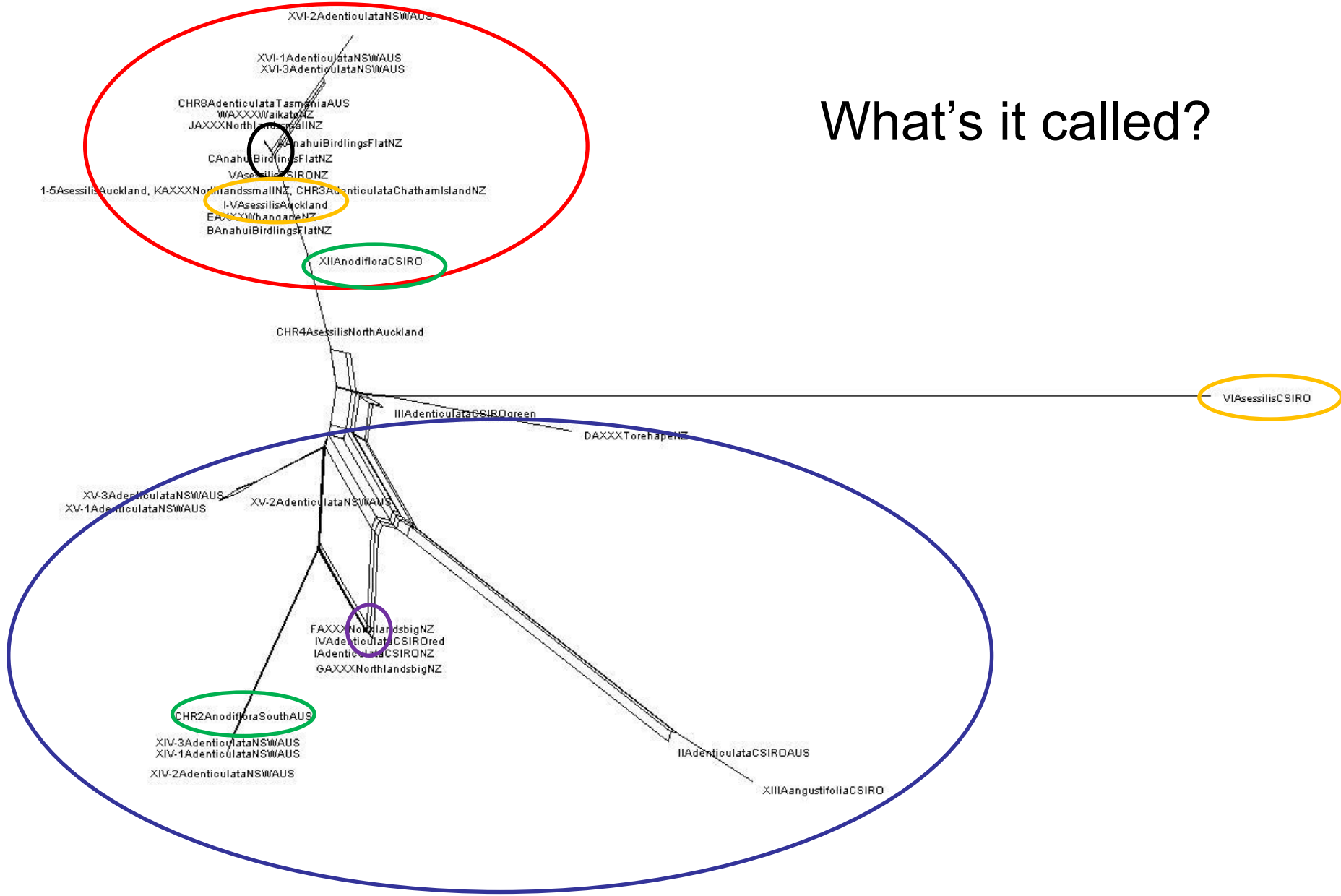


- Alternanthera (Alligator weed and relatives)
 - Difficult to tell apart morphologically (plasticity)
 - Uncertainty about origins of NZ material (endemic / native / introduced?)



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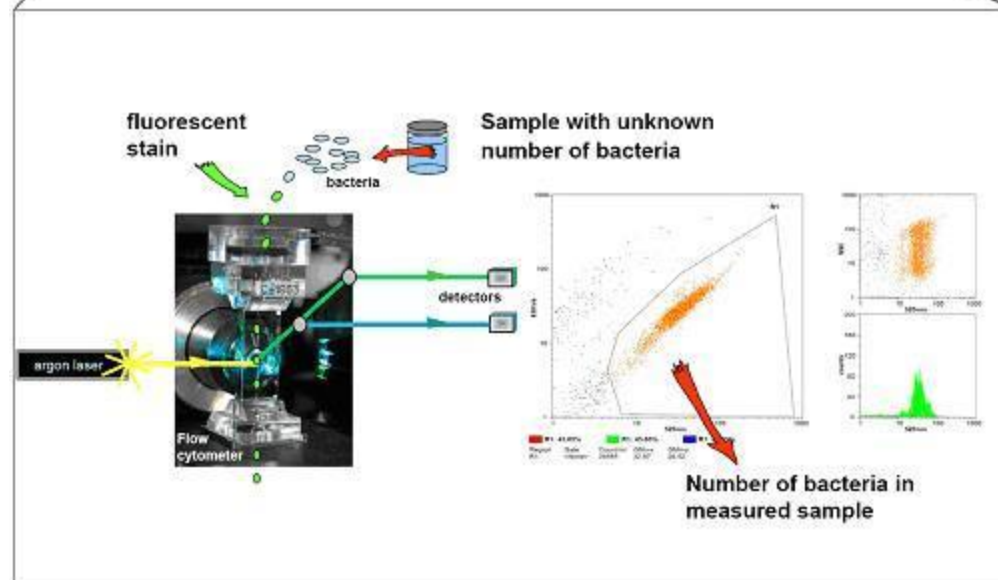
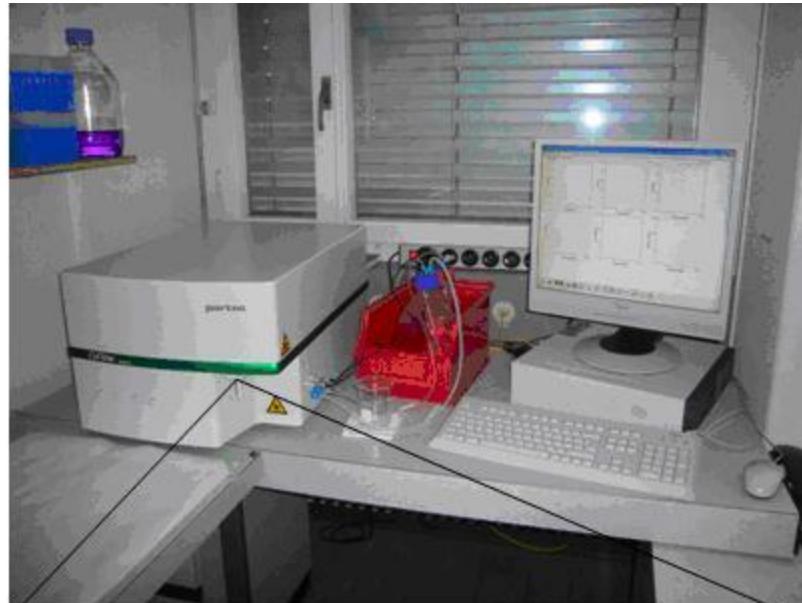
What's it called?



What if there is no data / all have the same sequence?



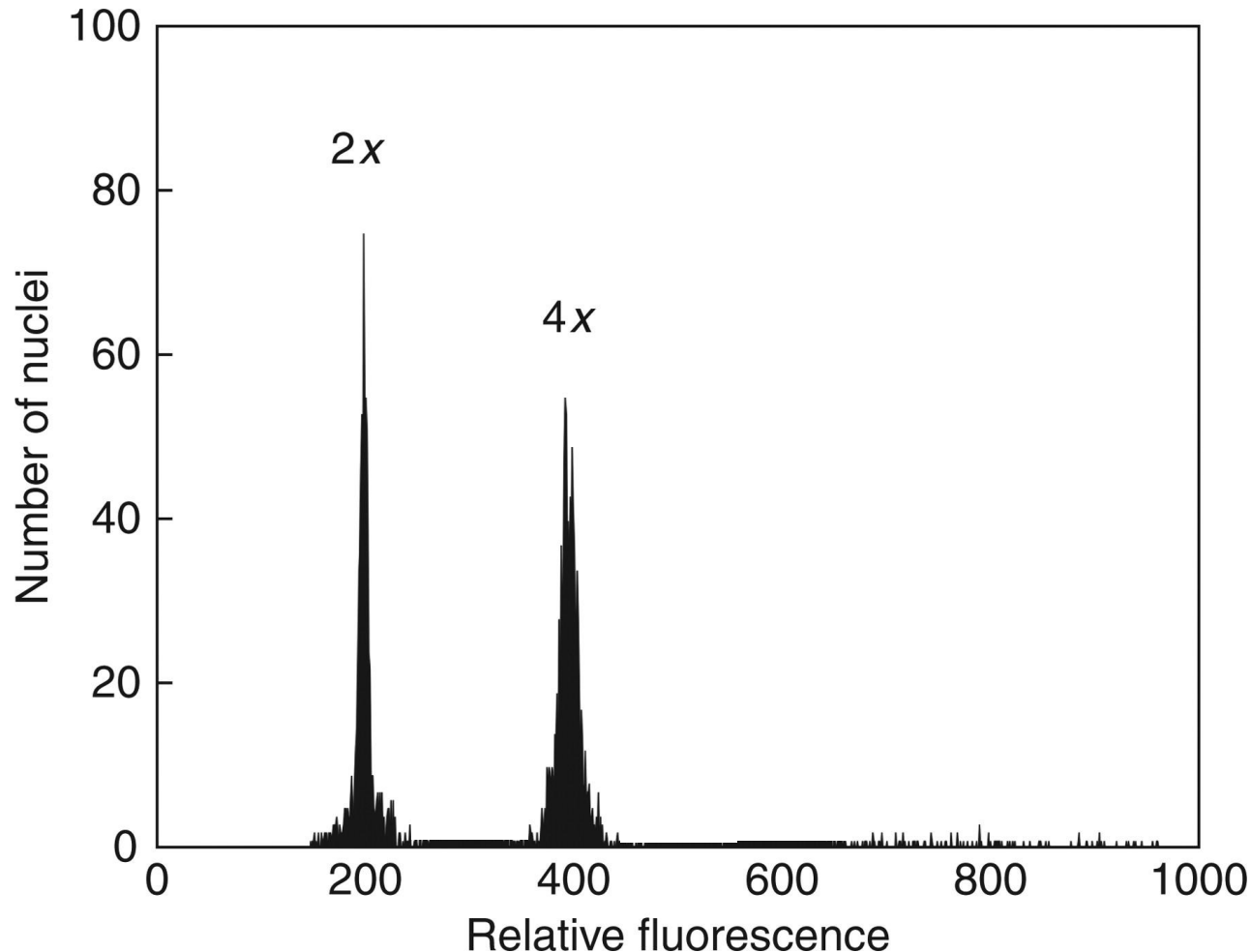
- *Sorghum halpense* is a nationally banned plant
- Morphological id of a sample from the wild came back as *S. halpense*, but wasn't ideal material / some missing characters
- All sequences for *Sorghum* spp. on Genbank were identical



Sorghum – flow cytometry



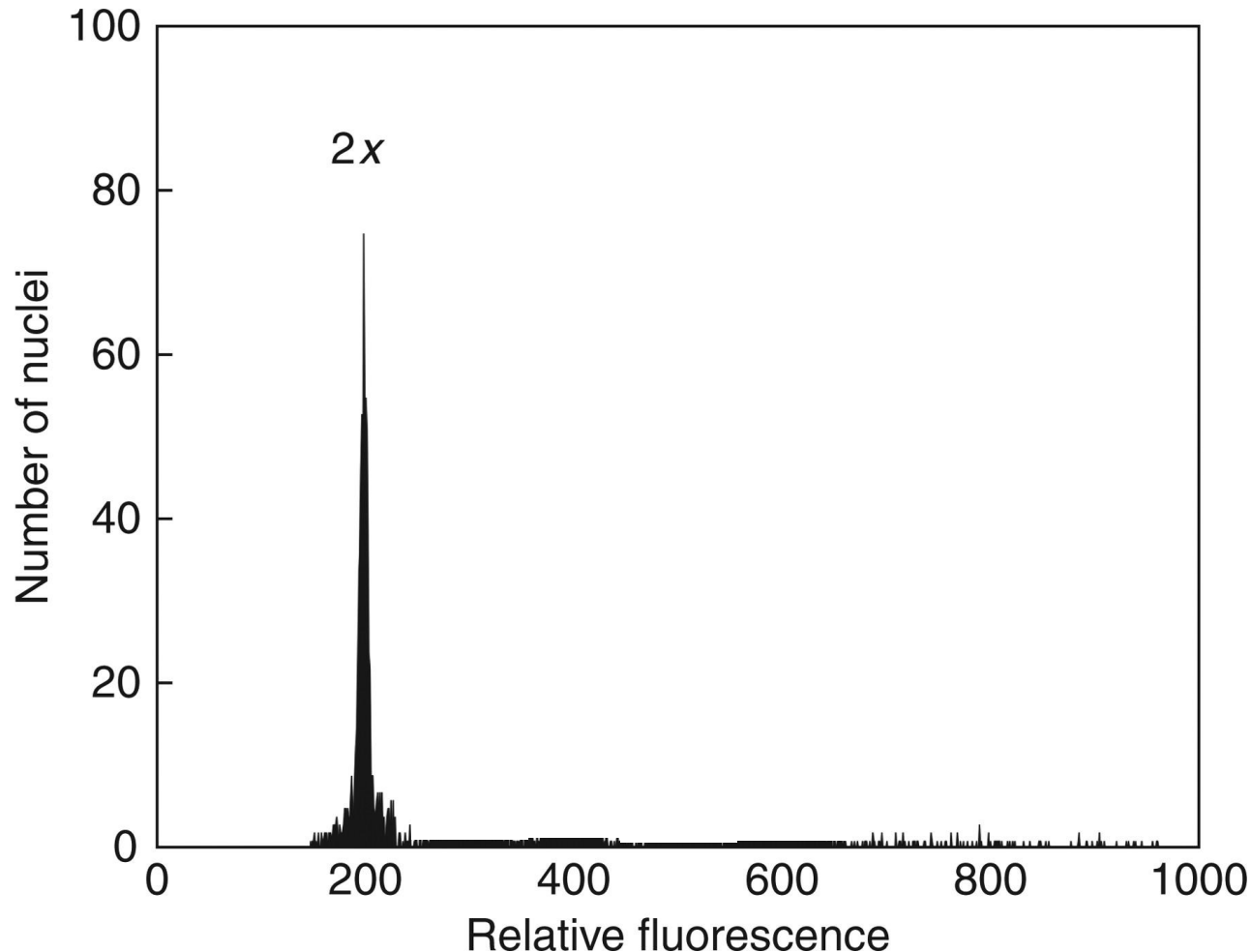
- *Sorghum halpense* is tetraploid; other species (*S. bicolor*, *S. xsudan*) are diploid



Sorghum – flow cytometry



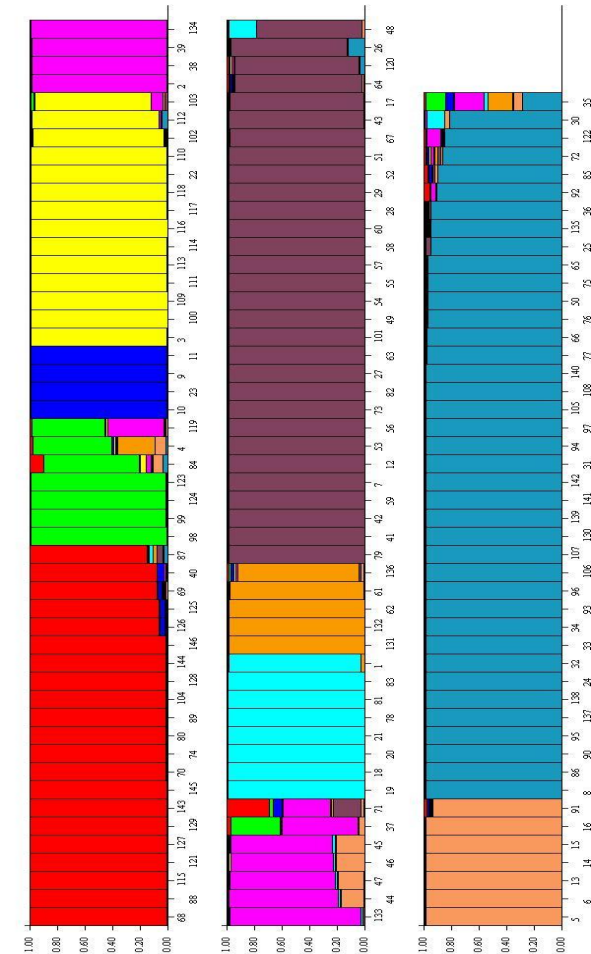
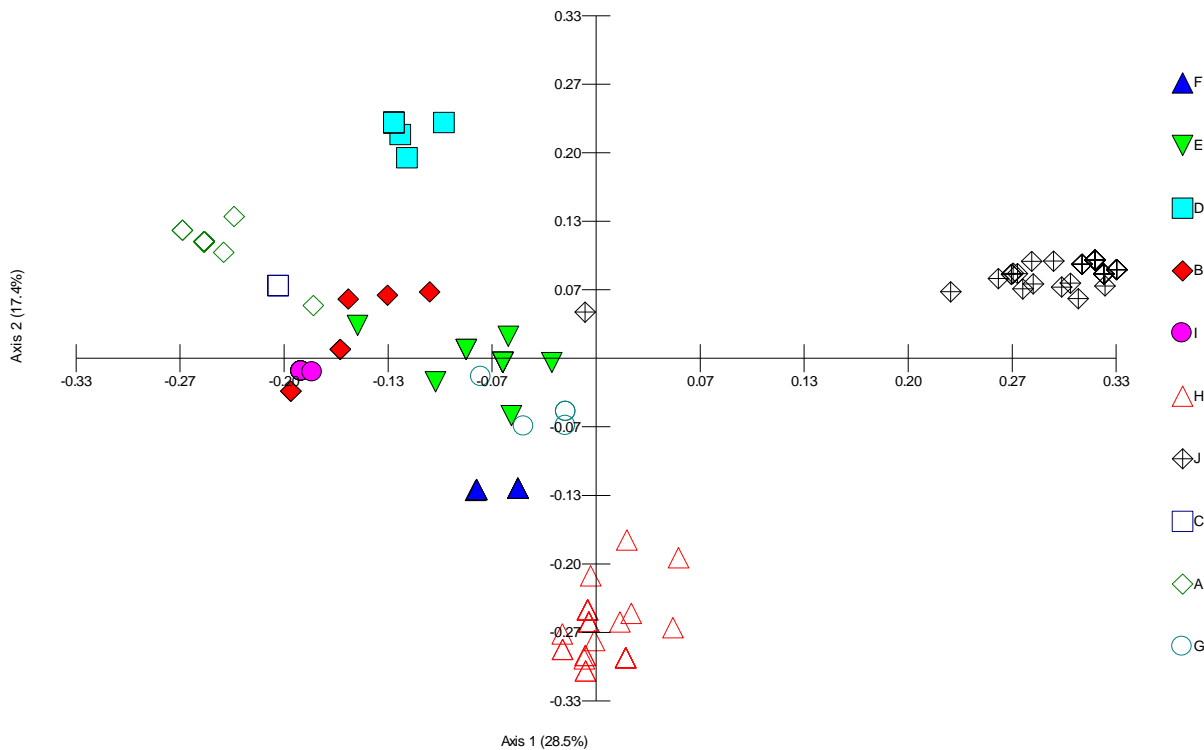
- *Sorghum halpense* is tetraploid; other species (*S. bicolor*, *S. xsudan*) are diploid



What if we need to know more than species?



- Often the case in weed biocontrol (species complexes)





- **Microsatellites**

- Excellent for whole species / genera
- Co-dominant
- Not always available for plants

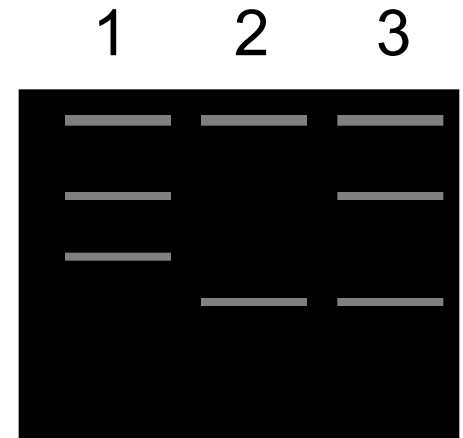
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1) AT AT AT AT AT AT = 10 + 12

2) AT AT AT AT = 8 + 8

3) AT AT AT AT

3) AT AT AT AT AT AT = 8 + 12



Take home messages:



- It isn't expensive, and is usually fast
- ID is only as good as existing data, but this applies to any method – current state of the art
- If in doubt, preserve something as soon as you can! **Mould = Mould!**

Who to talk to: (shameless advertisement)



- Dr Gary Houlston, Plant Science Advisor, EcoGene
- Dr Frank Molinia, Manager, EcoGene
- Dr Ines Schonberger, Manager, Allan Herbarium, Landcare Research