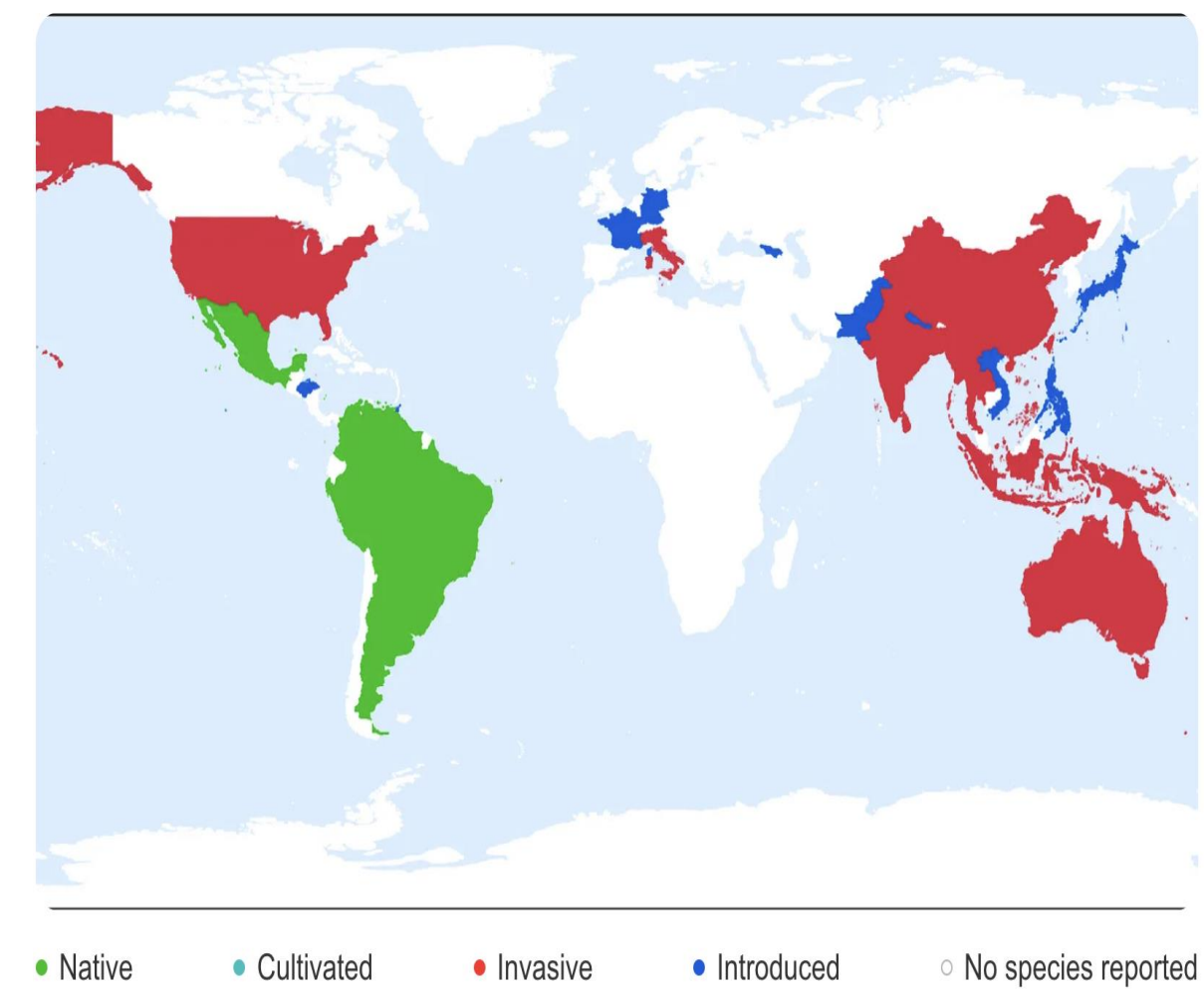


Genetic Variation in Alligator Weed Influences Herbicide Effectiveness Across Regions

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BACKGROUND

- *Alternanthera philoxeroides* (alligator weed) is an aggressive invasive species that spreads rapidly in aquatic and terrestrial environments [1].
- It outcompetes native vegetation, disrupts ecosystems, and creates economic challenges for land and water management since it can reproduce rapidly [1].
- Alligator weed is native to South America and has since spread as an invasive species throughout the world, notably the United States, China, Australia, and New Zealand [1].



Management Challenges in Australia and New Zealand

New Zealand

Management strategies from the United States seemed to be ineffective for controlling alligator weed species in aquatic and terrestrial ecosystems.

Australia

Management strategies from the United States were ineffective for controlling alligator weed species in aquatic and terrestrial ecosystems.

Objectives

- Determine the haplotypes of the alligator weed in New Zealand, Australia, and Mississippi through genetic analysis.
- Assess genetic differences among populations to determine whether haplotype variation explains the inconsistent effectiveness of current management strategies.

METHODS

Regions in study

- **Mississippi**
 - Terrestrial and Waterways (n= 74)
- **New Zealand**
 - Terrestrial and Waterways (n= 76)
- **Australia**
 - Terrestrial and Waterways (n= 49)

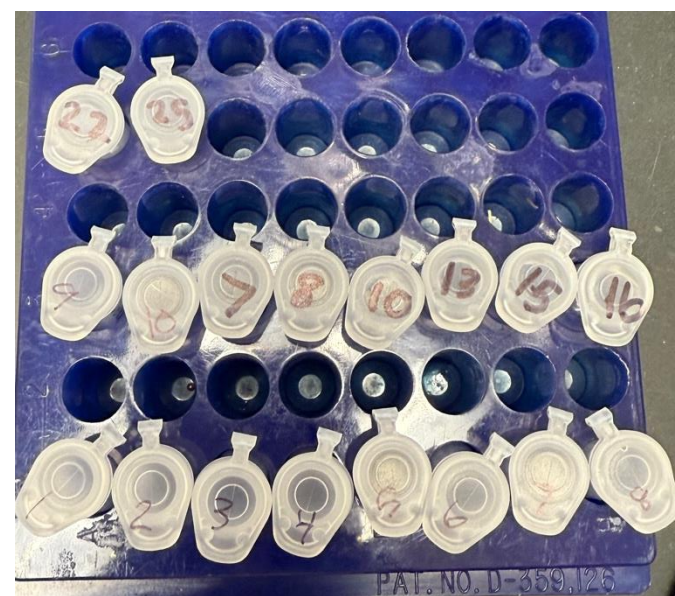
cpDNA repeat regions (for primers)

Samples were genotyped at these three repeat chloroplast regions.

rpl16
trnS-G
trnFc-Ff

Haplotype Identification

1. DNA Extraction of Alligator Weed

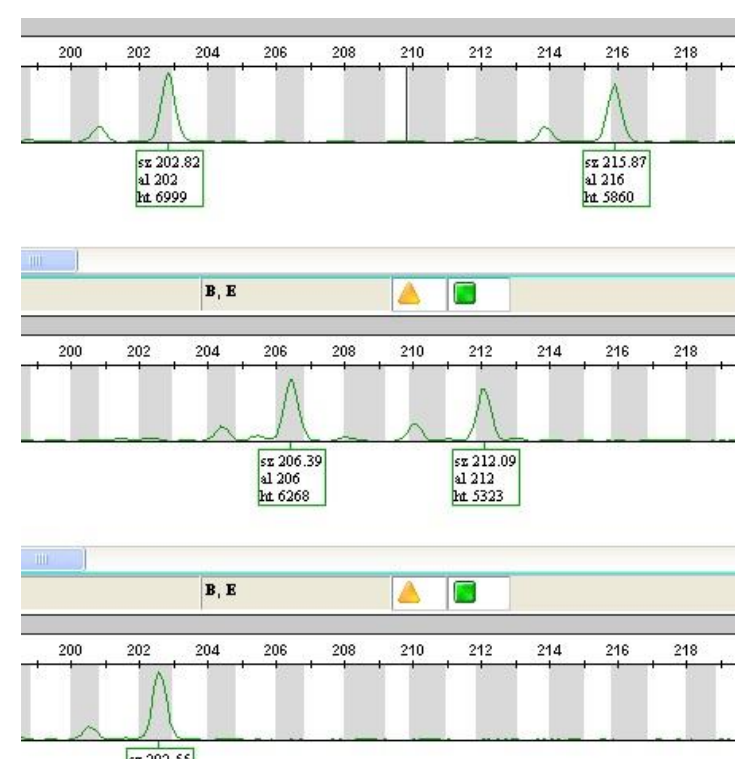


2. Genotyping using genetic analyzer



Genetic Analyzer for sequencing chloroplast DNA regions

3b. Haplotype identification



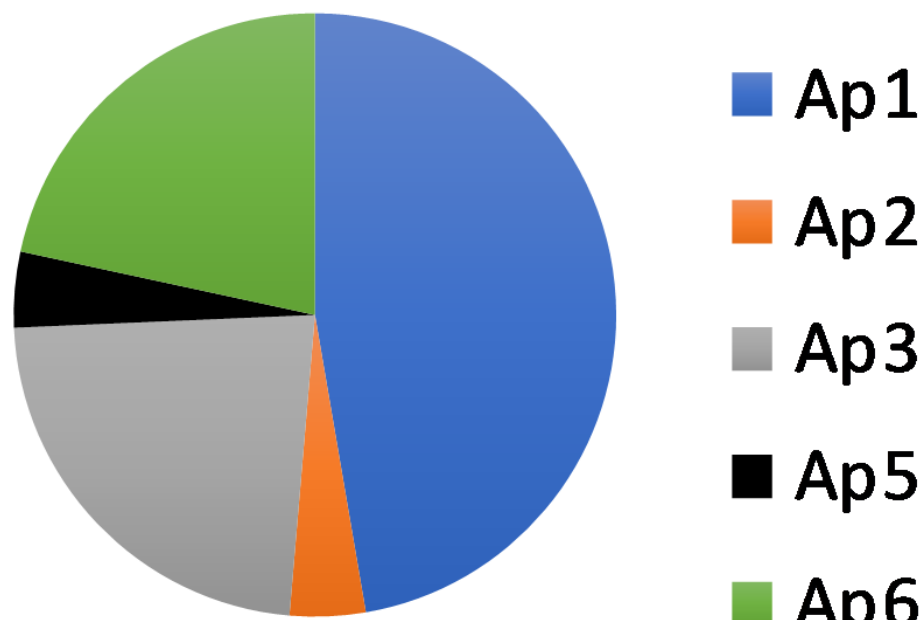
GeneMapper Software

RESULTS

Are there distinct haplotype variations in alligator weed populations across Mississippi, Australia, and New Zealand?

Yes, there is a distinct difference in the distribution of haplotypes found in all three regions

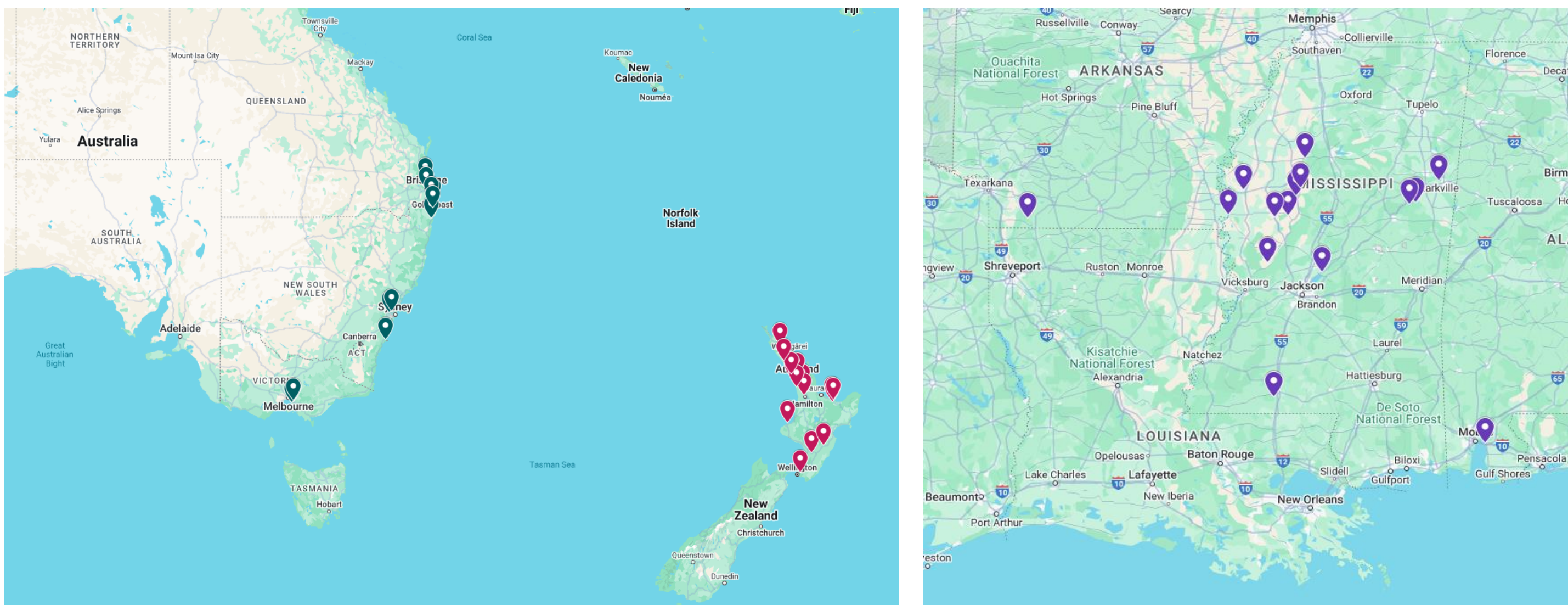
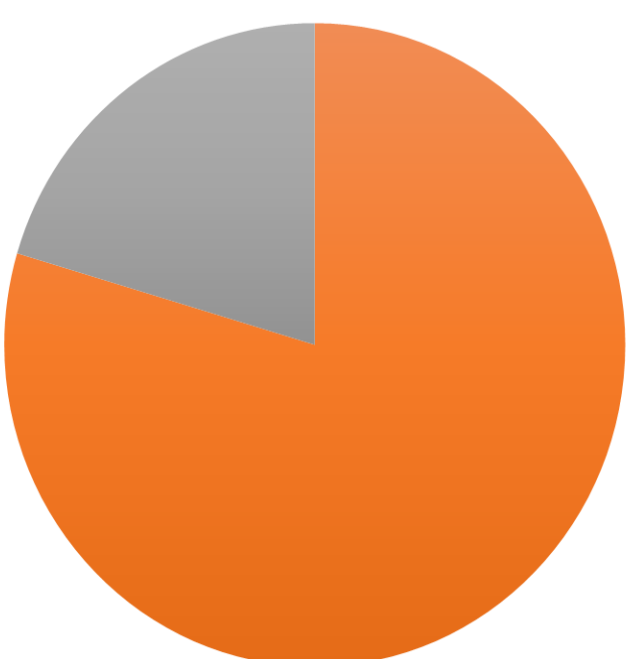
Mississippi



New Zealand



Australia



Reference: [1] Williams, D et. al. (2020) High genetic diversity in the clonal aquatic weed *Alternanthera philoxeroides* in the United States. *Invasive Plant Sci. Manag.* doi: 10.1017/imp.2020.32

DISCUSSION

Why did the management strategies not work in New Zealand and Australia?

Haplotypes found in New Zealand and Australia did not directly match those found in Mississippi, thus explaining why herbicides that worked in Mississippi were not effective in Australia and New Zealand.



Mississippi

- Populations consisted of Ap1 at 47% and Ap2 and Ap3 at around 22-23%.

New Zealand

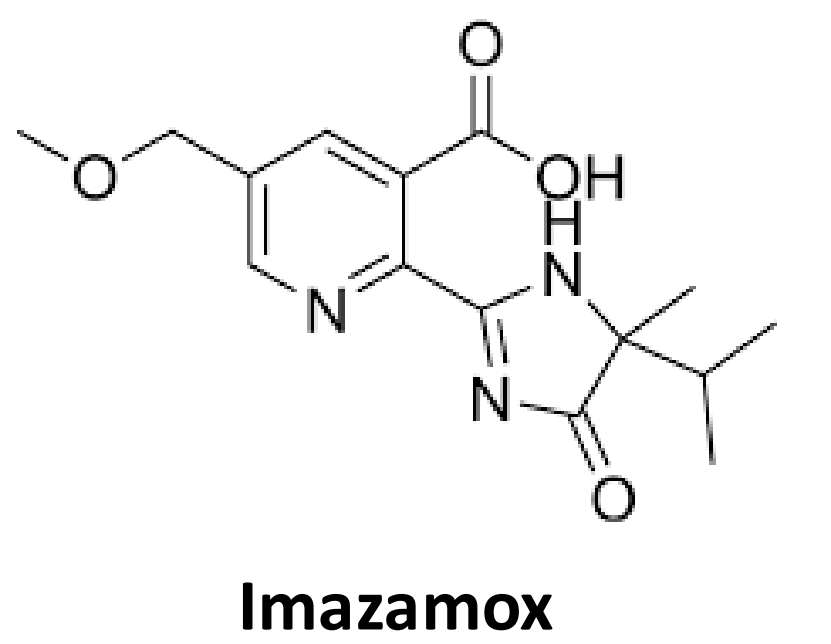
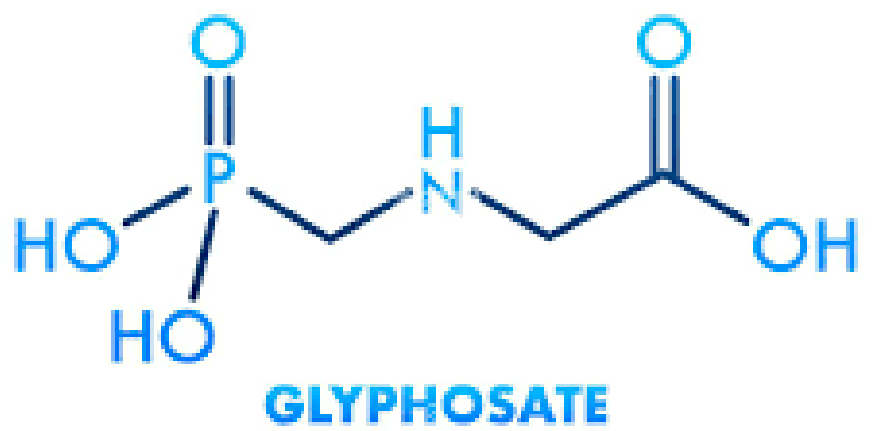
- Populations consisted of Ap5 and Ap3 at 46% each.

Australia

- Populations consisted of Ap2 at 80% and Ap3 at 20%

Future Implications for Management

- Herbicide failures in Australia and New Zealand are linked to genetic differences in alligator weed populations. Mississippi trials may not have tested the dominant haplotypes found in Australia and New Zealand.
- Some shared haplotypes like Ap3 exist, but past trials may have included too few or different variants.
- Future herbicide trials must include **genotyping** to match haplotypes with effective treatments. Improved genetic understanding will lead to **more targeted and effective** management strategies since alligator weed is highly resilient and each haplotype may require different control methods.



ACKNOWLEDGEMENTS

I want to thank my advisor for supporting me during this project. I want to thank the natural resource managers who collected the samples we tested, and I also want to thank my undergraduate student cohort for their moral support. This project was funded in part by the SERC Grant (TCU).

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