Sea spurge (*Euphorbia paralias*) biocontrol in Australia with a fungal pathogen

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Gavin Hunter


Caroline Delaisse

Team Leader within the Weed Management Systems Group (CSIRO Health & Biosecurity)

I would like to begin by acknowledging the Jagera people and the Turrbal people as the Traditional Custodians of this region

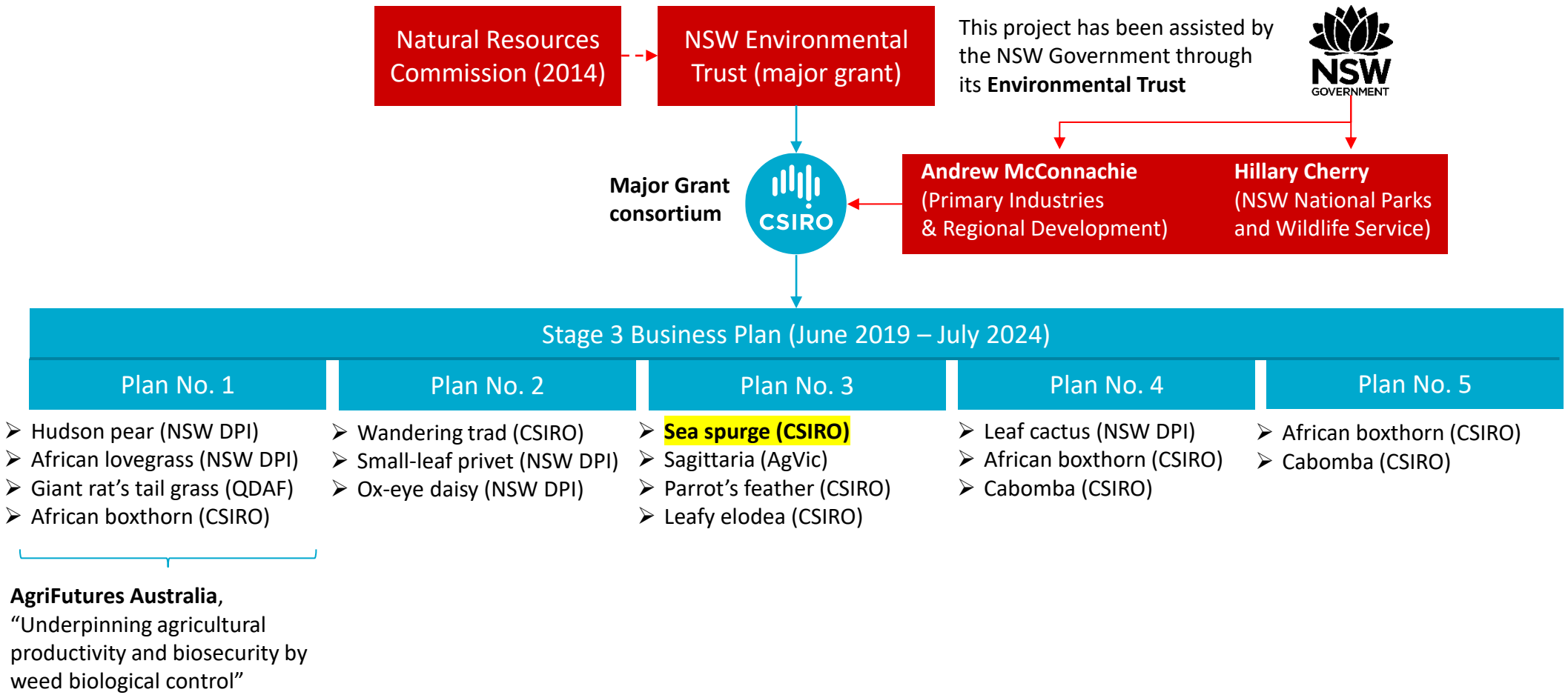
I pay my respects their Elders past and present

I extend that respect to Aboriginal and Torres Strait Islander peoples here today

2. **Progress report**: Sea spurge biocontrol in Australia

1. ✓ Community-led biocontrol agent releases
2. ✓ Monitoring and evaluation methods
   ✓ Preliminary results on biocontrol agent establishment, spread
3. ✓ Discussion of priority next steps

1. Investment context



3. Sea spurge, *Euphorbia paralias*

- Amongst Australia's most invasive coastal weeds, specialised to foredune habitats
- Native to northern Africa and southern Europe
- Populations detected in 1920s-1930s in Western Australia and South Australia, likely introduced by seeds in ship ballast
- Rapid spread by dispersal of seed floating on ocean currents, retaining viability for many years
- NSW incursions likely by seeds spread from Tasmanian and Victoria (genetic data)

4. Foliar blight fungal pathogen, *Venturia paralias*

- Isolated from diseased plants on Atlantic coastline of western France (**2009**)
- Demonstrated to be host-specific to sea spurge with no risk to native Australian plant species (**2019**)
- Conidia (asexual spore) readily disperse via wind or rain splash under cool, humid conditions
- Circular brown **leaf and stem lesions**, with girdling disrupting the vascular system

Leaf lesions

Stem lesions

4. Foliar blight fungal pathogen, *Venturia paralias*

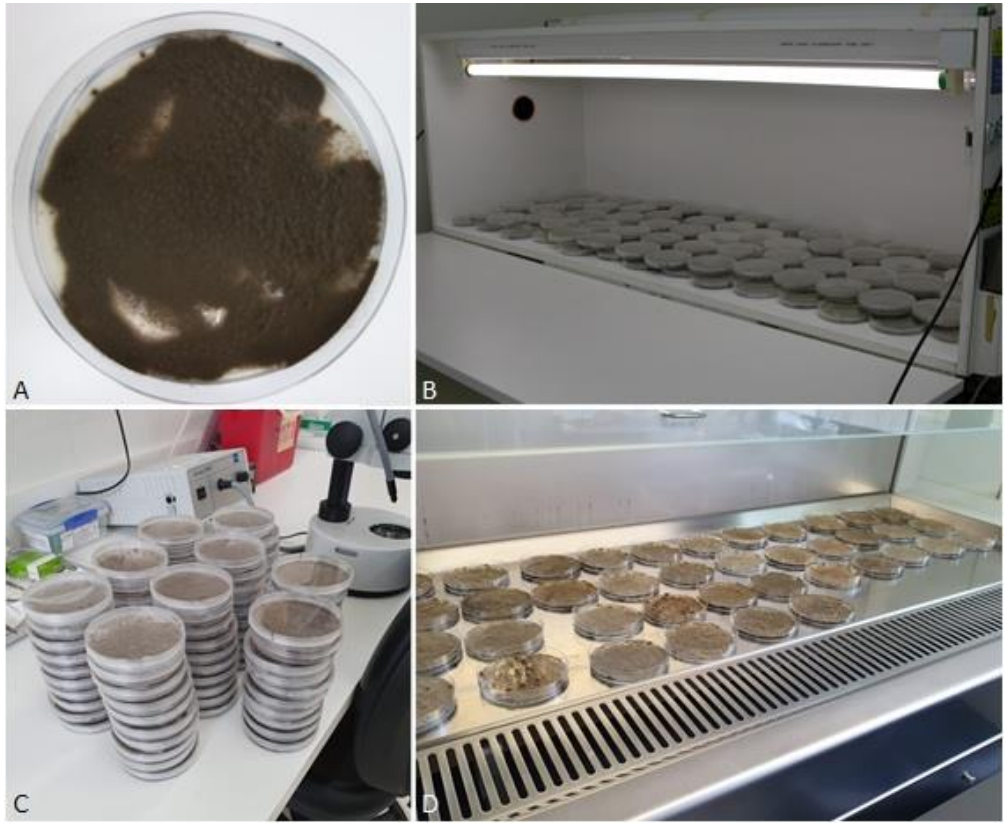
- Lab-based experiments have revealed significant negative effects of infection on sea spurge plant growth

- Until now, no knowledge of effects on sea spurge growth under field conditions

5. Biocontrol agent mass-rearing and release through community partnerships

- Mass-rearing and delivery pipeline.

- 8 participating community groups and land management agencies between December 2021 – May 2024
  - **Victoria**: 128 sites
  - **Tasmania**: 103 sites



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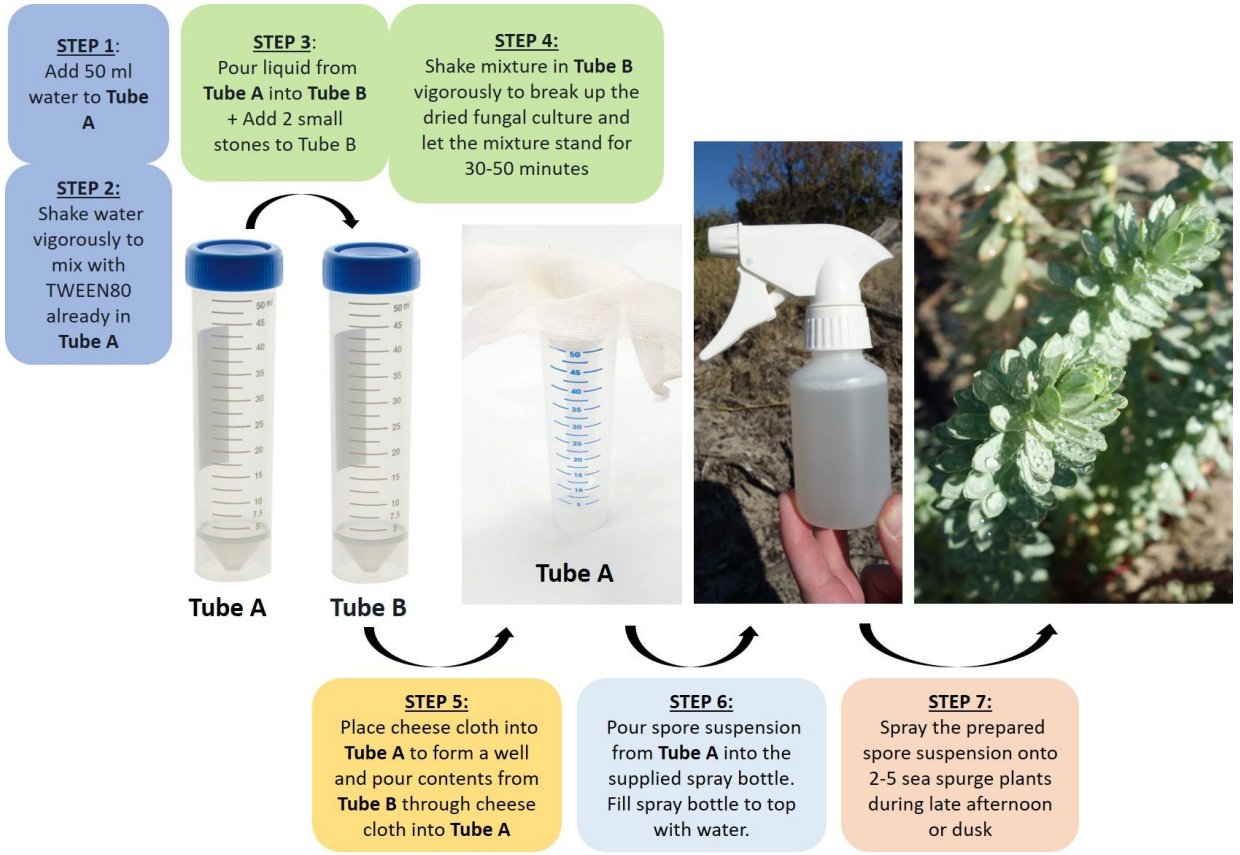

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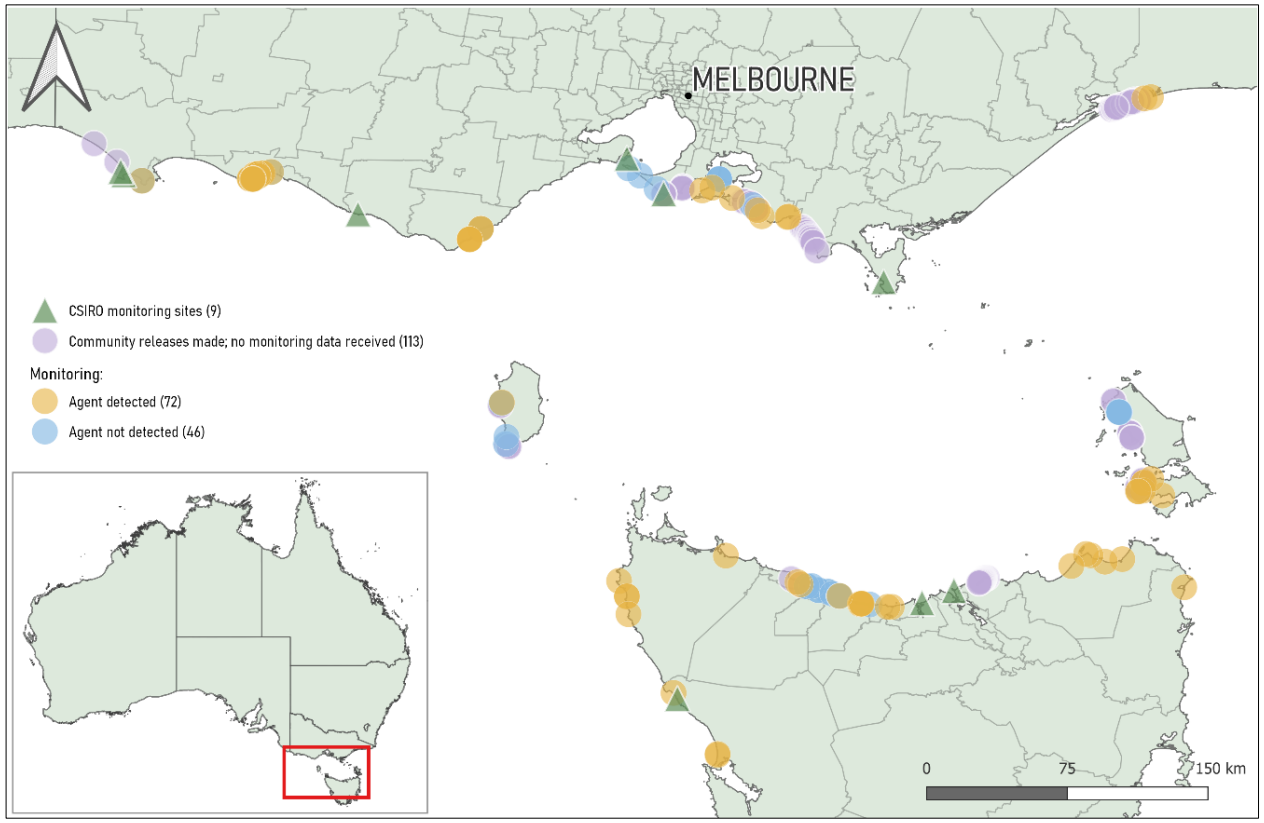
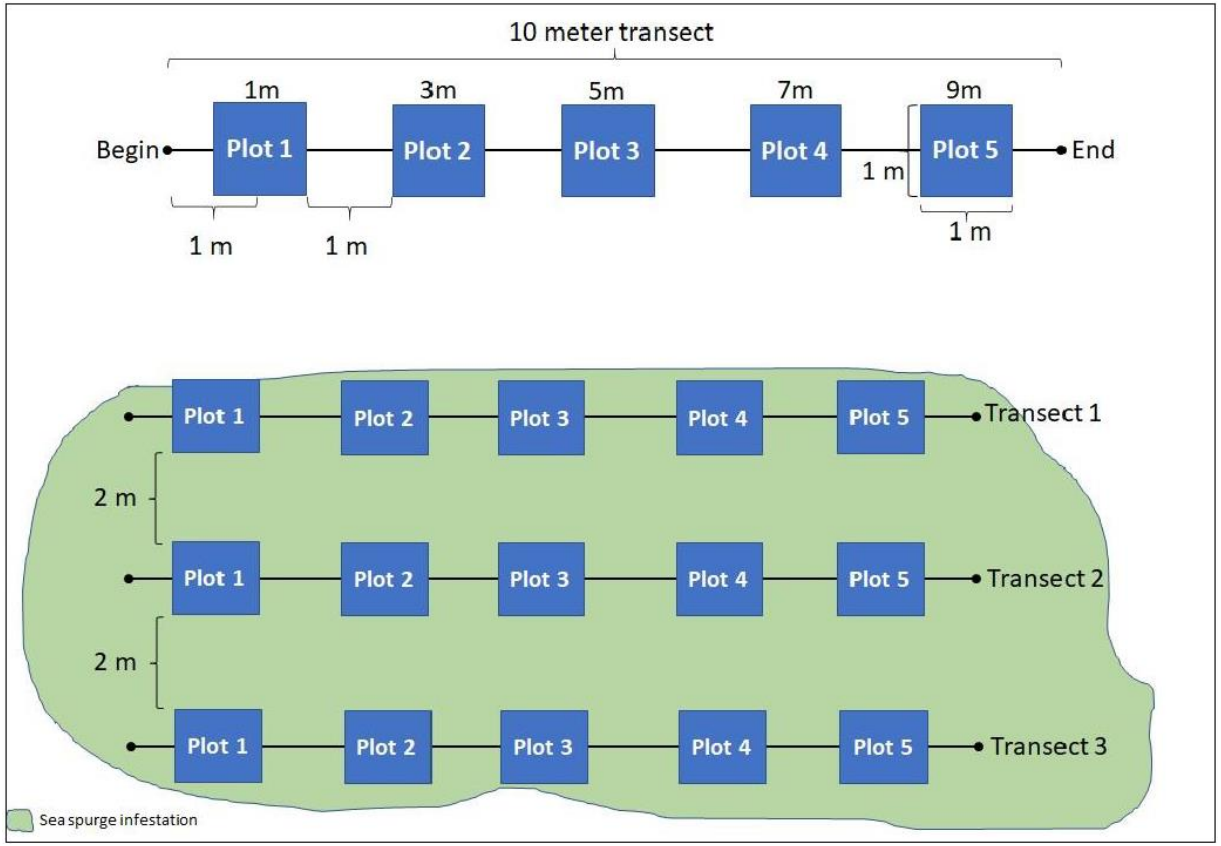
Post-release monitoring revealed the fungus had **established at 61 %** of release sites



6. Release, monitoring and evaluation at fixed plots

- Passive monitoring post release with no experimental control
- 9 sites (3 Tas, 6 Vic)
- 3 x transects per sites, and 5 x 1m^2 plots per transects



6. Release, monitoring and evaluation at fixed plots

- Passive monitoring post release with no experimental control
- 9 sites (3 Tas, 6 Vic)
- 3 x transects per sites, and 5 x 1m^2 plots per transects
- Measures:
  - Disease incidence
  - Sea spurge foliage health-disease severity metric
  - Sea spurge foliage cover
  - Sea spurge reproductive output

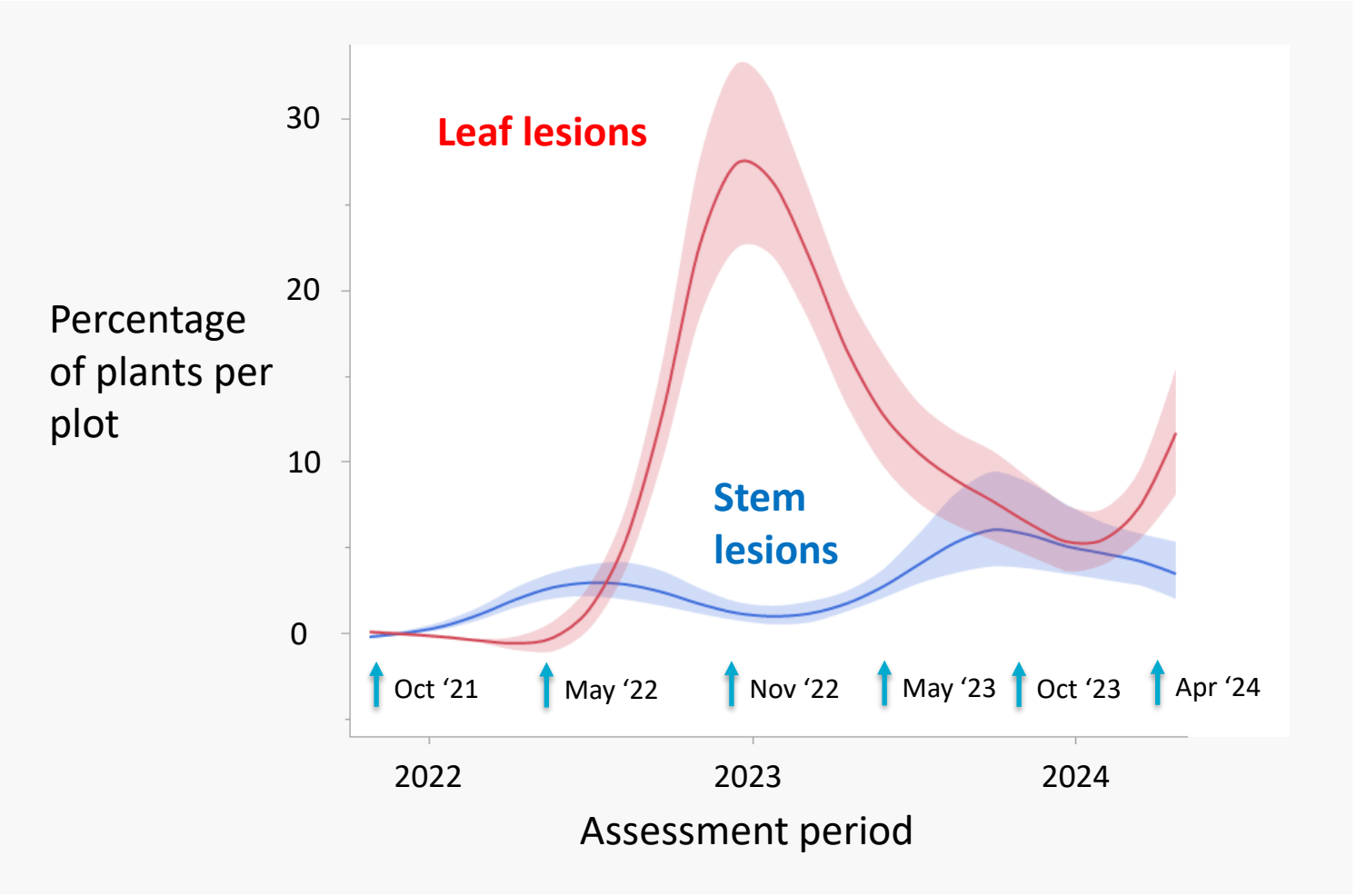
CSIRO, Bushrangers Bay VIC, 2021

CSIRO, London Bridge VIC, 2021

7. Disease incidence

- **Incidence**:
  - % sea spurge plants per plot with leaf and stem lesions
  - Not a measure of severity of infection or plant health
- **Leaf lesions**: Strong temporal variation post-release
- **Stem lesions**: Steady increase over time

Fungal pathogen detected at all 9 sites during all monitoring event and now deemed **established**



8. Disease severity metric

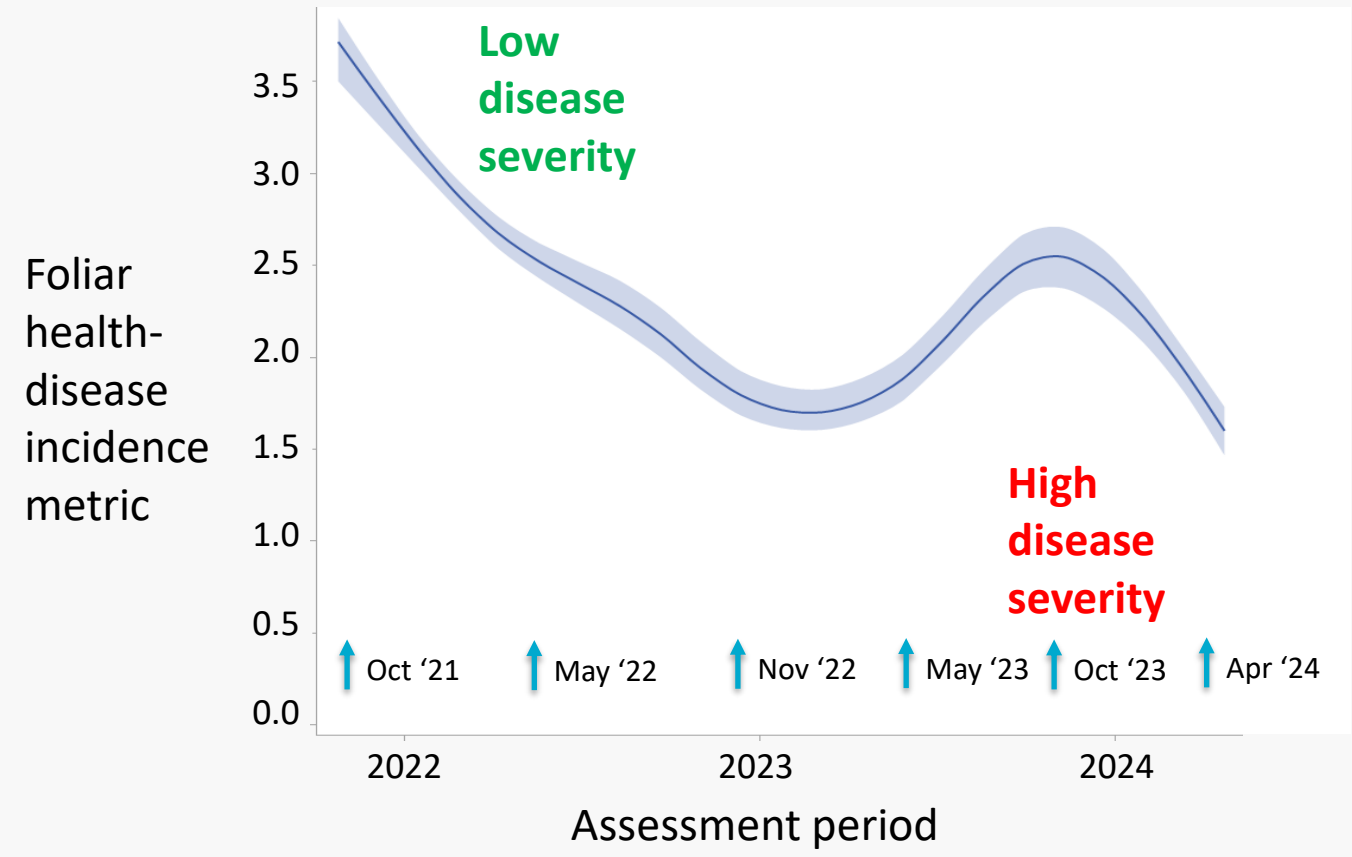
- **Severity**: combined measure of foliage health and disease incidence (4-point score)

4. No signs of infection, **foliage healthy**

3. Lesions present but no decline in foliar and stem health

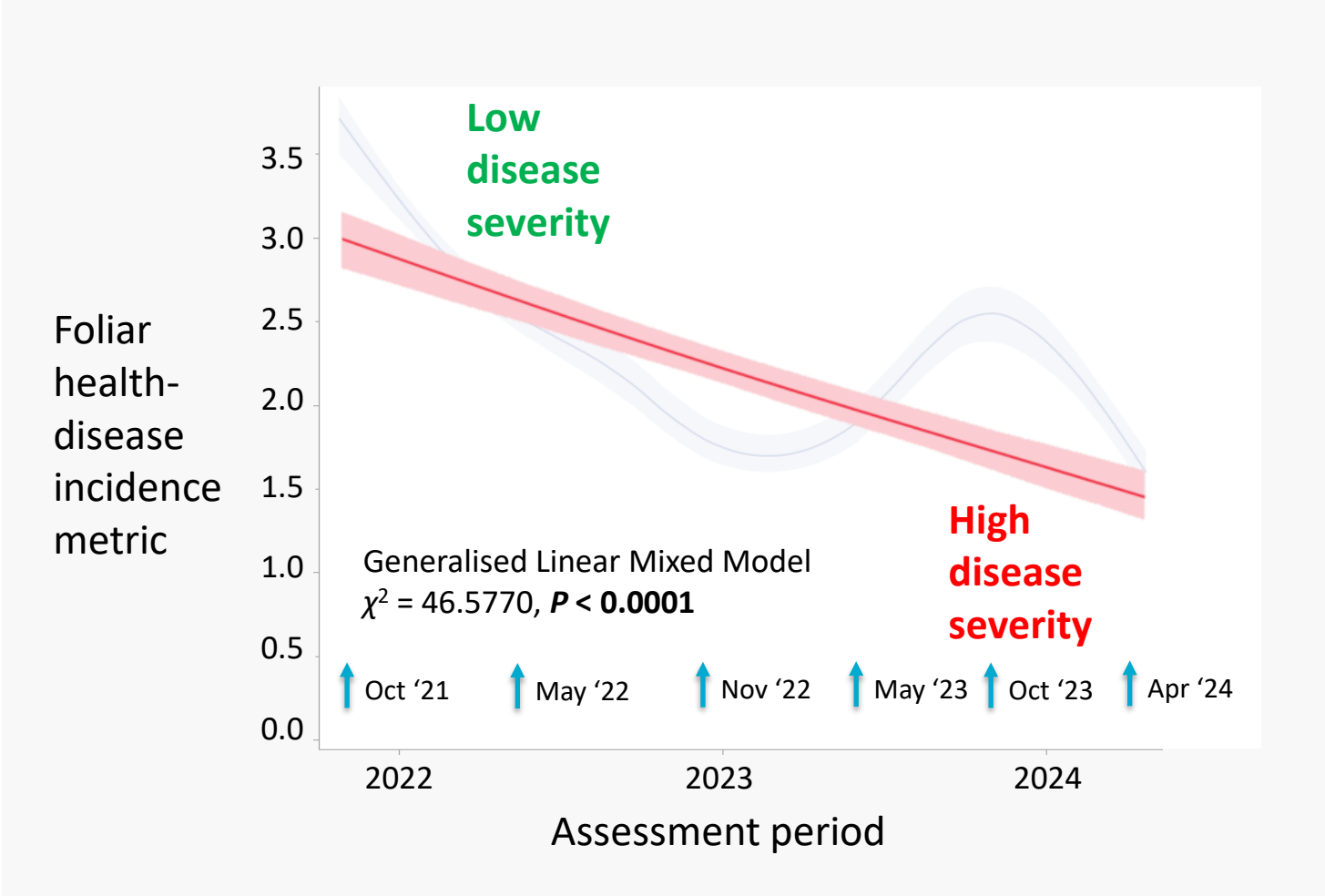
2. Lesions present and decline in foliar and stem health

1. Lesions present and **death of leaves and stem**



8. Disease severity metric

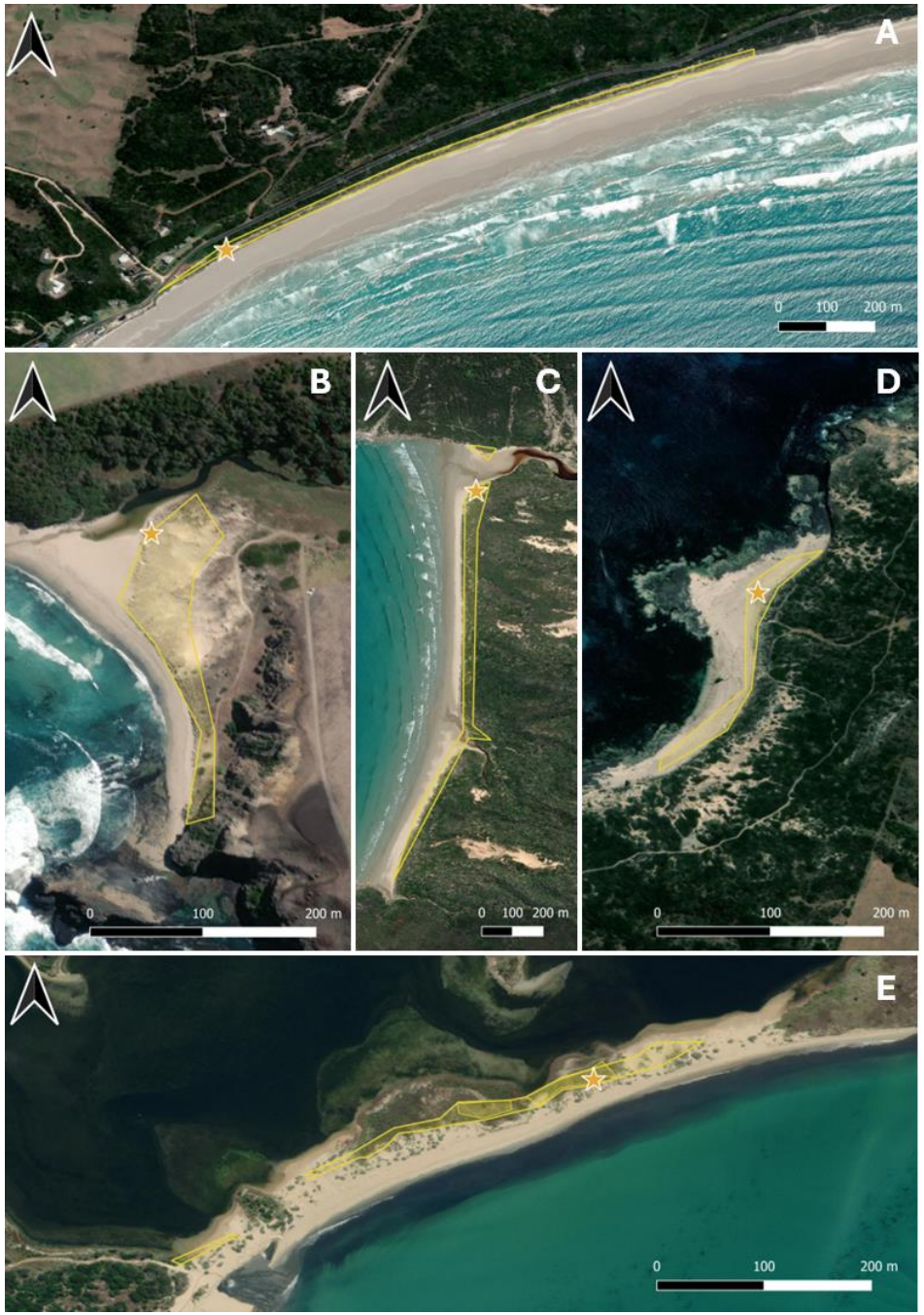
53 % decline in foliar health over time



9. Spread of the fungus

Victoria

(A) Shelly Beach,
(B) Bushrangers Bay,
(C) Oberon Bay,
(D) Whites Beach,
(E) Sand Island



9. Spread of the fungus

Tasmania
(A) Bakers beach
(B) Low Head

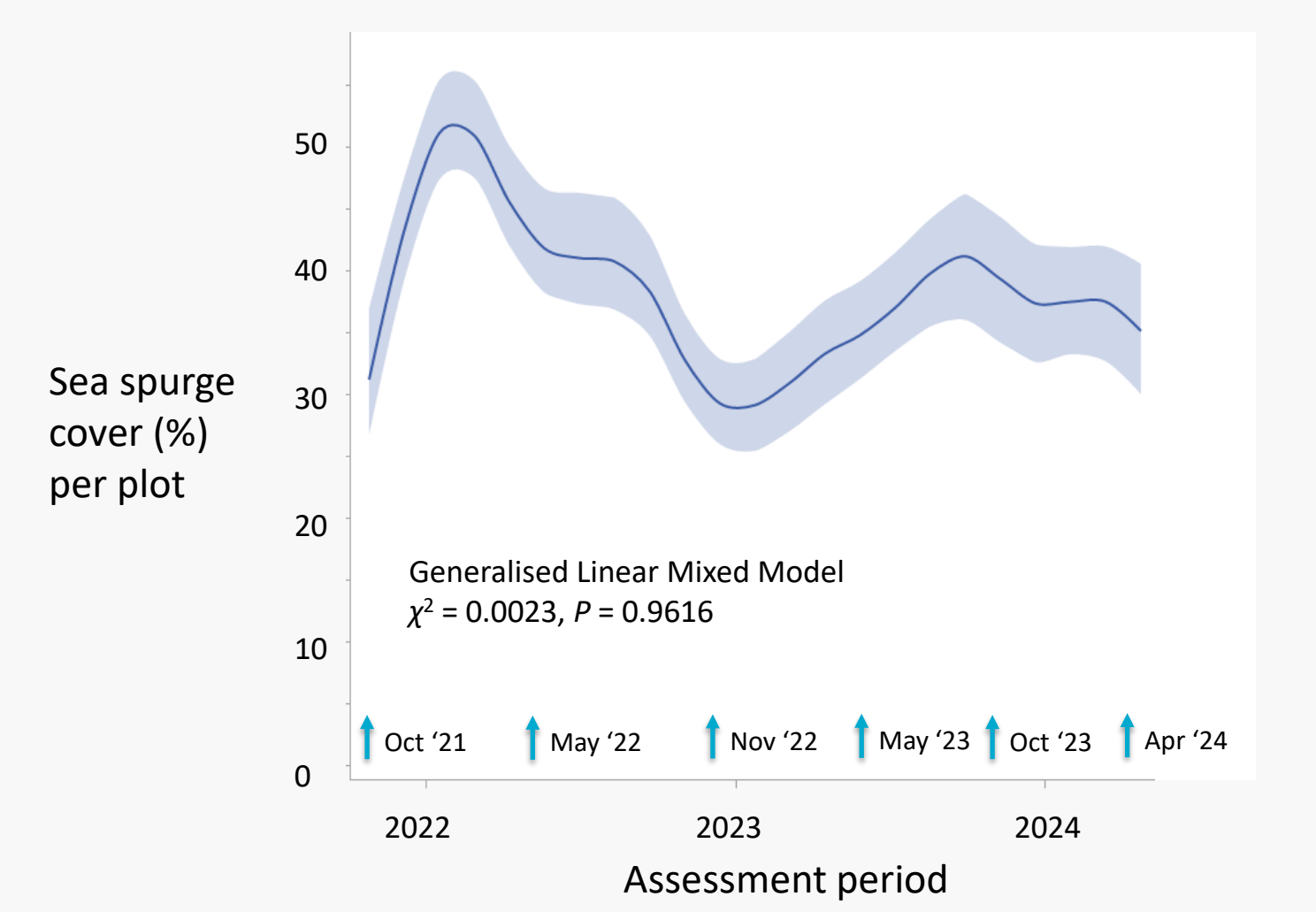
Images prepared by Dr. Jon Marsden-Smedley (SPRATS)

Data not yet analysed

10. Sea spurge foliage cover

- High degree of spatial and temporal variability in sea spurge foliage cover

No significant reduction in sea spurge foliage cover over time when averaged across sites

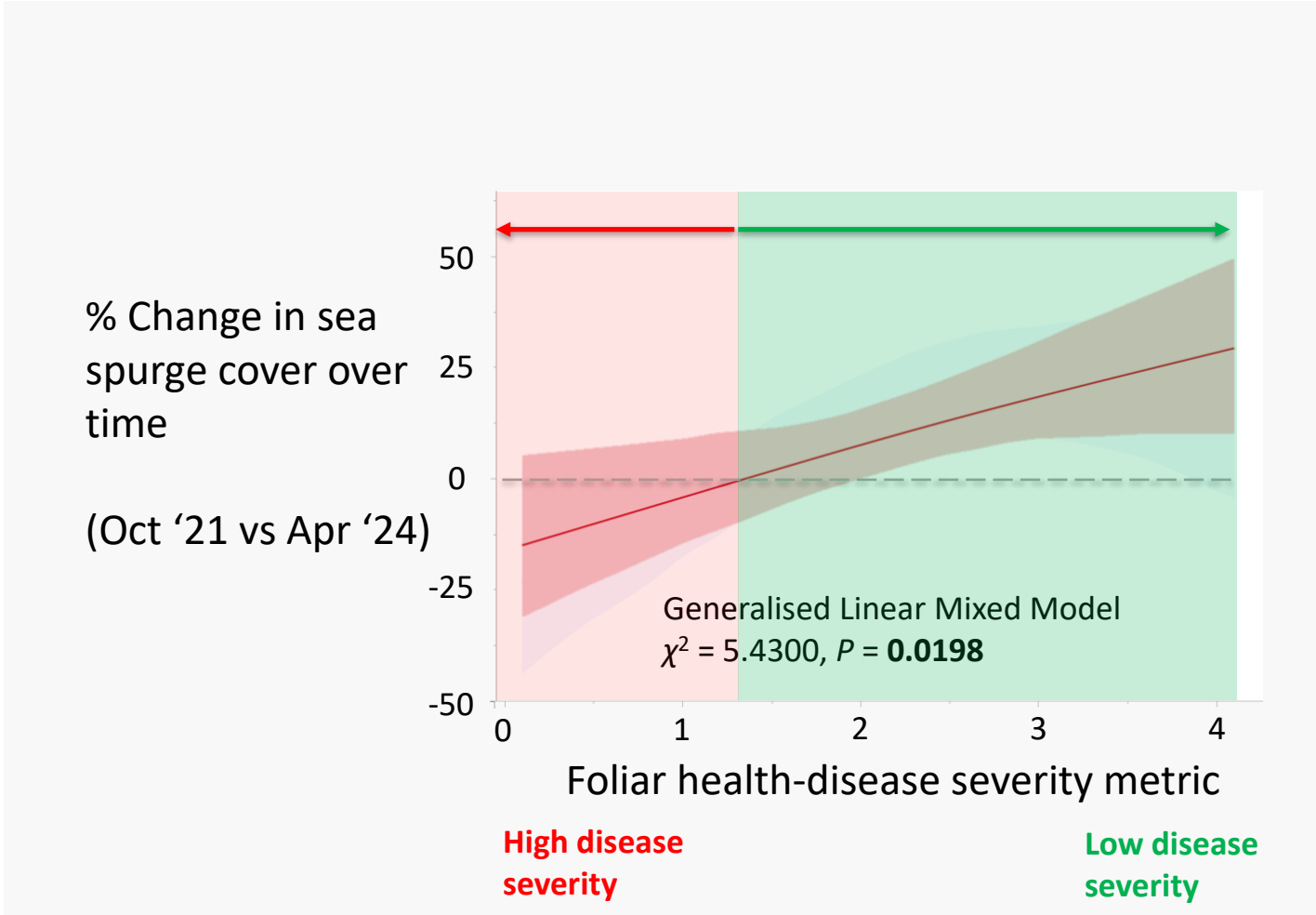


10. Sea spurge foliage cover

- Two key elements to understanding variability:
  - % **change** in sea spurge cover over time (final compared with baseline cover)
  - Associations with maximum disease severity

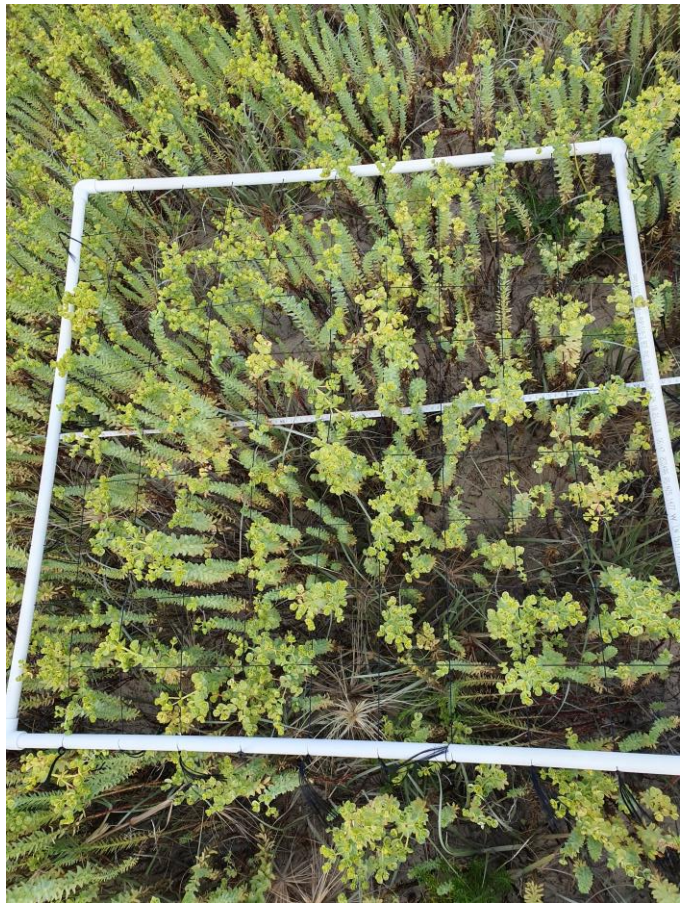
- Sea spurge cover tended to **decline** over time at sites with **high disease** severity (values < 0) – but note overlap of CIs with zero.

- Areas with **low disease** severity continued to experience significant growth in sea spurge cover over time (values > 0)



11. Summary of key outcomes

- ✓ Detection of the fungus at > 50 % of community release sites
- ✓ Fungus established at all and spreading at most CSIRO fixed monitoring sites
- ✓ Foliar health and cover of sea spurge decreased significantly over 2.5 years in relation to disease severity
- ✓ Impacts are expected to accumulate over several years with sustained spread of the fungus



Oberon Bay VIC, October 2021

April 2024

11. Priority next steps

- ✓ Evaluate rates of spread and continued monitoring of sea spurge populations
- ✓ Explore opportunities for integration of biocontrol with other control methods and management strategies
- ✓ Investigate drivers of spatial and temporal variation in disease incidence/severity and sea spurge populations
- ✓ Explore opportunities to support release of the fungus in Sth Australia and Western Australia

Thank you from Gavin, Caroline et al., and participating community volunteers

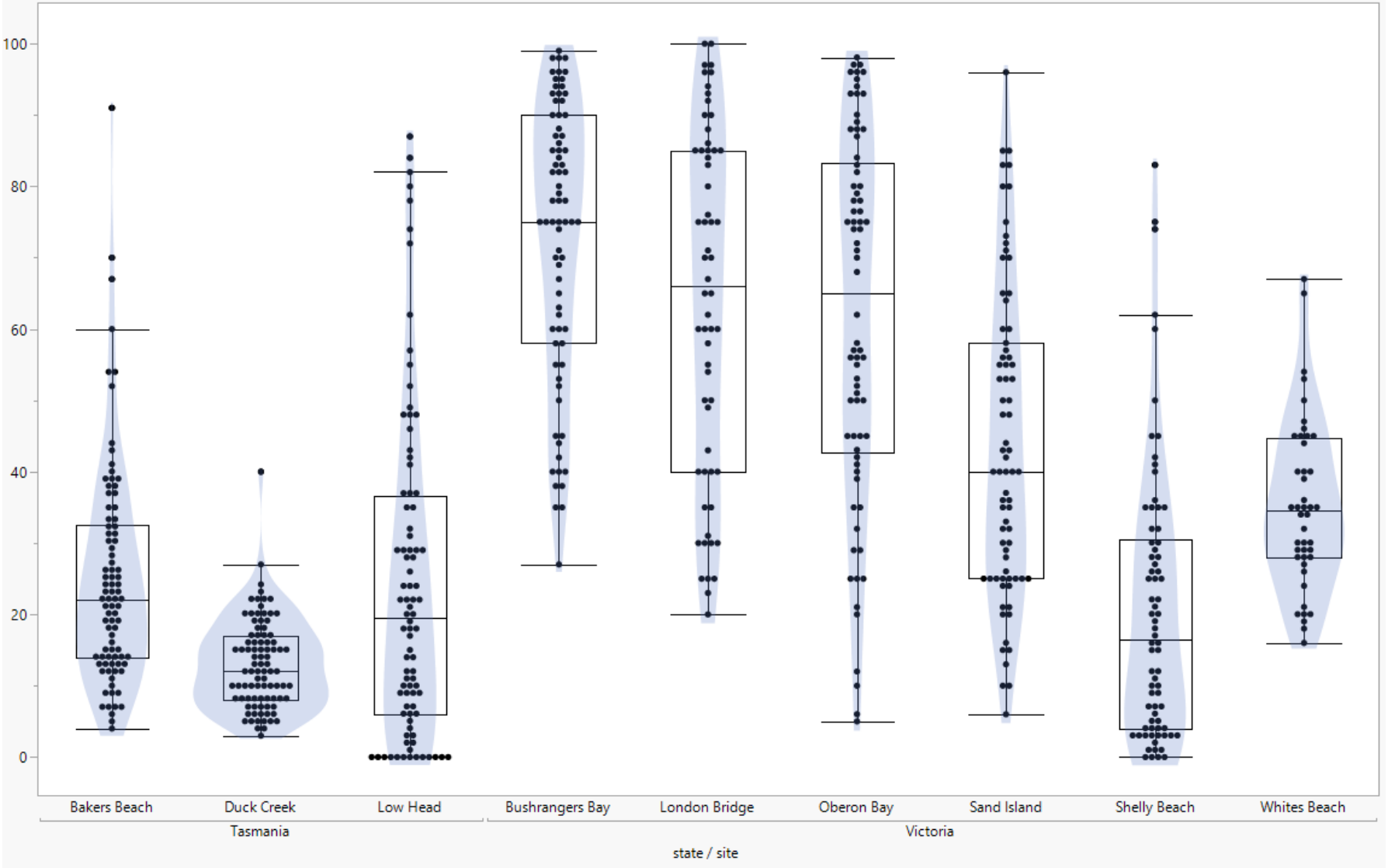

Gavin Hunter


Caroline Delaisse

Other interesting preliminary results

5. Modelling next steps

Sea spurge cover (%) per plot



10. Sea spurge reproductive output

- Metric of reproductive output that combines flower/fruit phenology x % sea spurge cover)
- High degree of spatial and temporal variability in reproductive output
- No significant reduction in sea spurge reproductive outcome when averaged across sites.