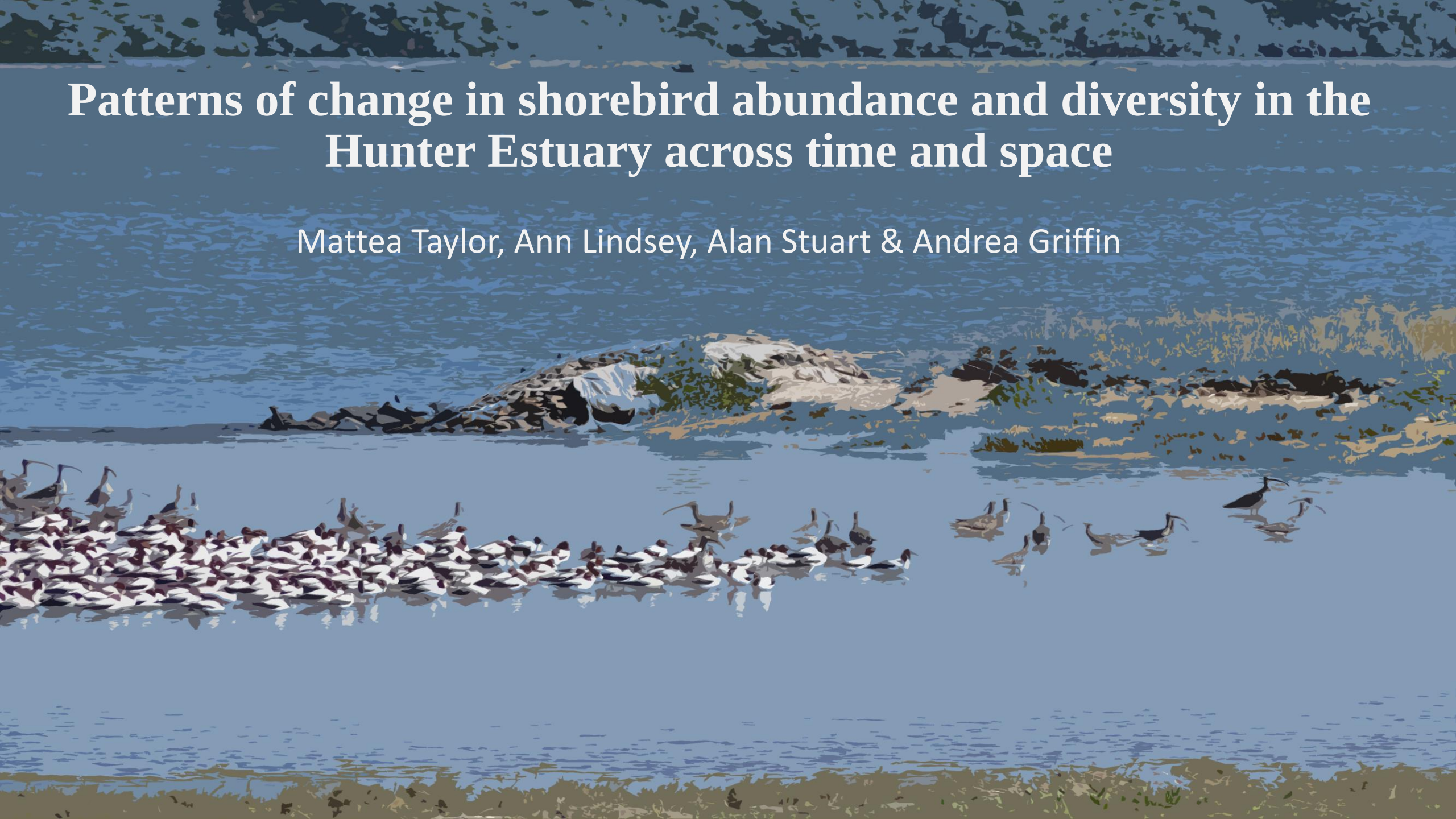
Patterns of change in shorebird abundance and diversity in the Hunter Estuary across time and space

Mattea Taylor, Ann Lindsey, Alan Stuart & Andrea Griffin



Shorebirds in the Hunter region

- Hunter Estuary Wetlands Ramsar site, NSW
  - Regularly 15 migratory & 8 resident shorebirds (Stuart & Lindsey 2021)
  - Critically Endangered Eastern Curlew
  - Vulnerable Bar-tailed Godwit (*baueri* ssp.)

- Declines
  - 1981-2007: 42% decline in mean numbers (Spencer et al. 2010)
  - International significance for migratory shorebirds
    - 1984: 4 species (Bamford et al. 2008; Brereton and Taylor-Wood 2010)
    - 2021: 1 species (Stuart & Lindsey 2021)
  - Amongst the sites with the greatest declines in Australia (Clemens et al. 2016)
    - 2nd worst migratory declines
    - Top 5 worst total declines
    - Local factors may contribute

Hunter Estuary and citizen science

- Historic degradation
  - Levees, floodgates & culverts restricted tidal flow (Streever 1998)
  - Decreased waterbird & shorebird abundances (Russell et al. 2012)
- Recent rehabilitation works (Glamore et al. 2021; Howe et al. 2010)
  - Removal of culverts
  - Installation of automated floodgates
  - Mangrove removal
- Monthly high tide shorebird surveys
  - Hunter Bird Observers Club members
  - Multiple publications site- or species-focused or pooled across the estuary (Clemens et al. 2016; Hansen et al. 2016; Lindsey 2021, Lindsey & McNaughton 2012; Reid 2019; Stuart 2019; Stuart et al. 2013; Stuart & Lindsey 2021)
- Diversity indices as a measure of restored wetland health (Daly et al. 2018; Rice 2003)

Swing Gates, Tomago

Questions & Methods

Questions

- How has shorebird diversity changed across time, space and habitat preference?
- What are the impacts of environmental variation, including wetland restoration?

- Dataset provided by Hunter Bird Observers Club
  - Pre-2018 data from digitised records
  - 2018-2022 data from Birdata records
- Initial trends – **by non-breeding season – November-March**
  - Species abundance by site -> max count & average count per site
  - Species abundance by area -> sum of site species abundance
  - Shannon Diversity Index (R Core Team 2022; Spellerberg and Fedor 2003)
    - Migratory/resident
    - Coastal/generalist

Hunter Estuary survey sites

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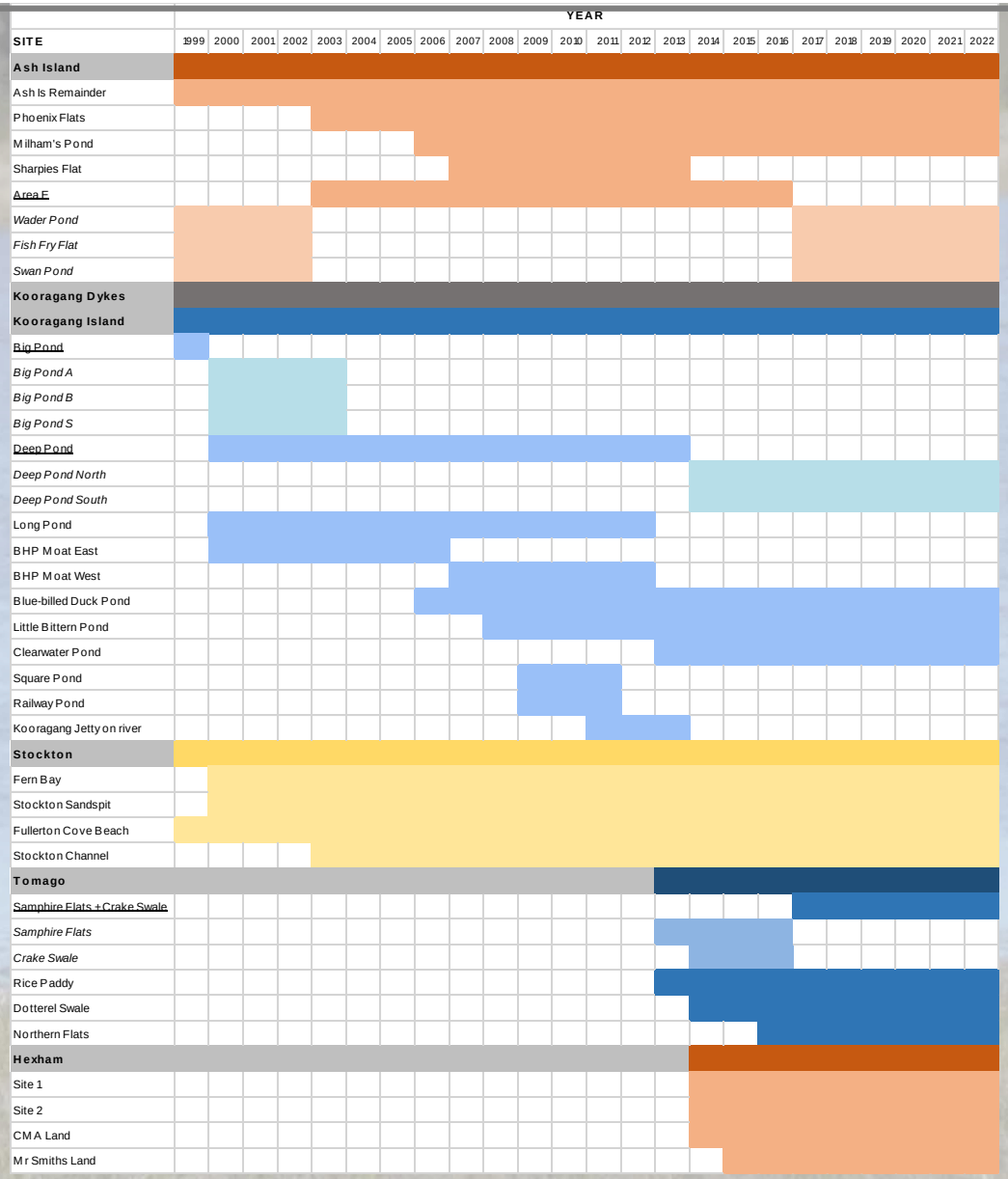
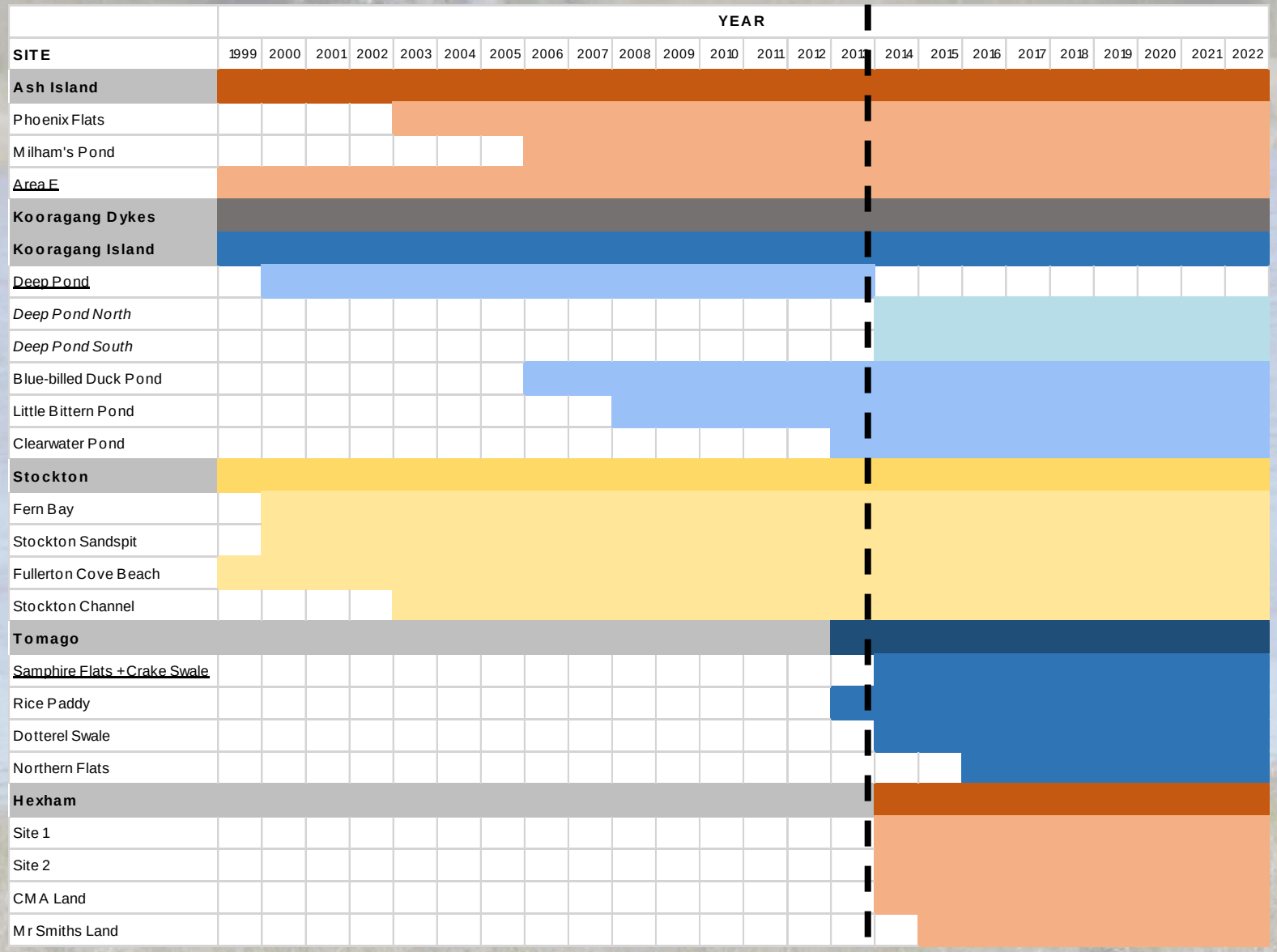
Survey timeline



Survey timeline



General summary of surveys

Non-breeding season:

- 1257 surveys
  - With shorebirds = 1184
  - No shorebirds = 73
- 37 species
  - 25 migratory
  - Up to 18 shorebird species in 1 survey
  - Average of 4.25 shorebird species per survey

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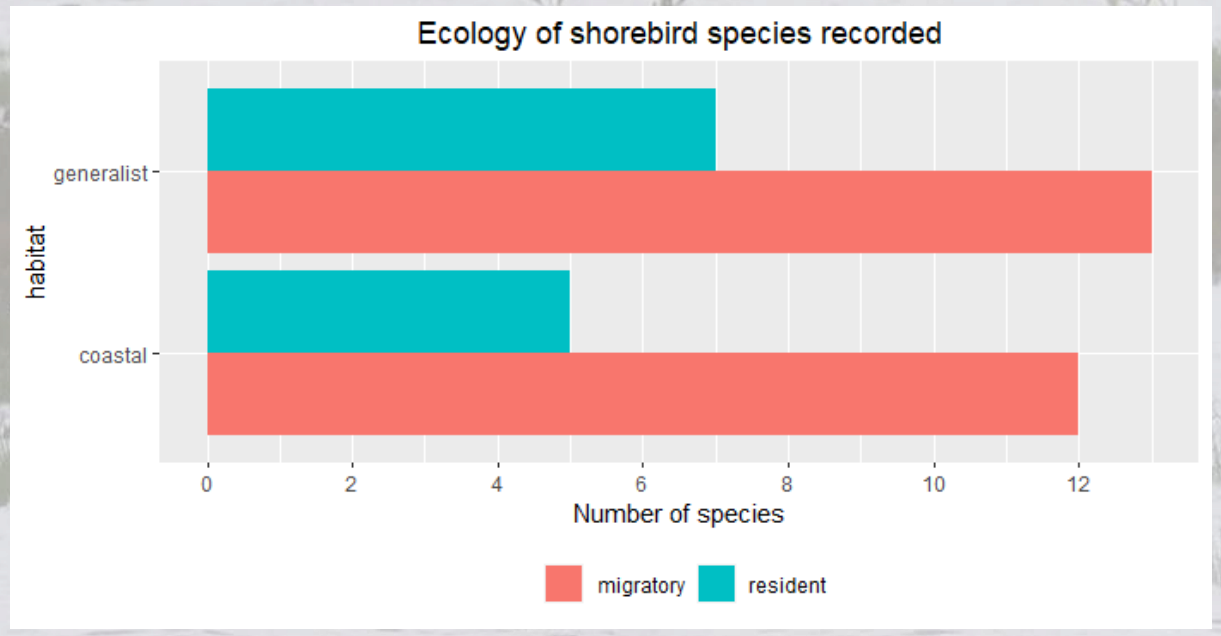
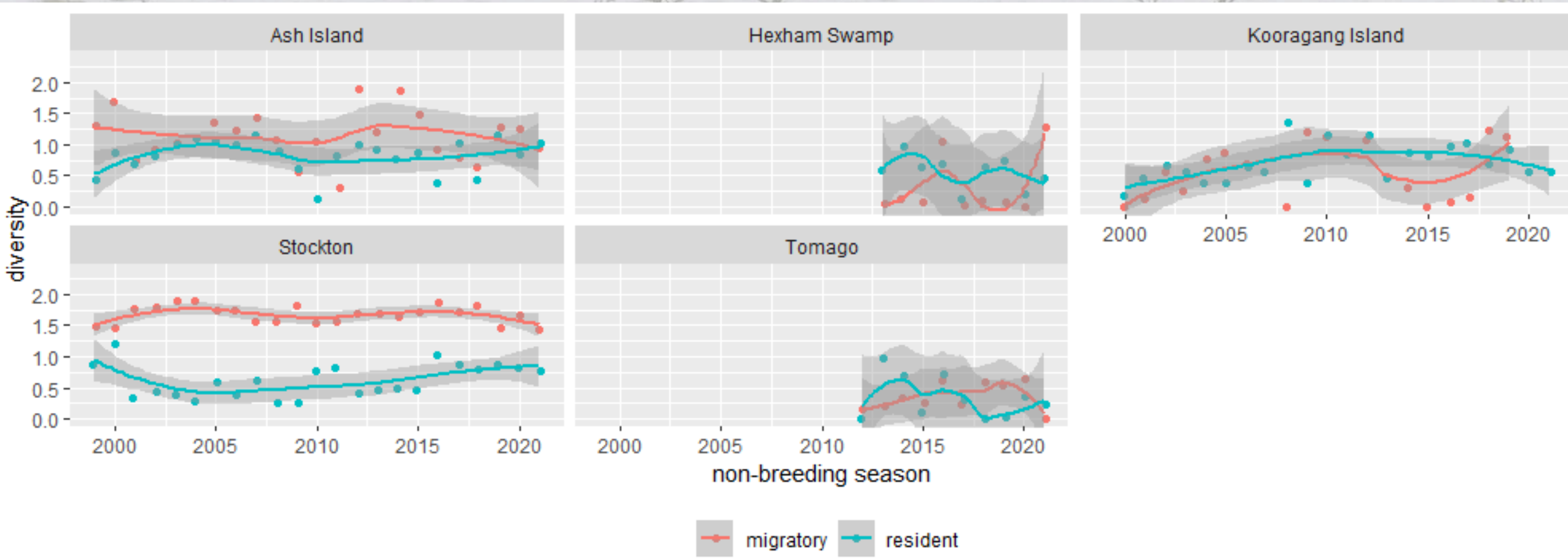
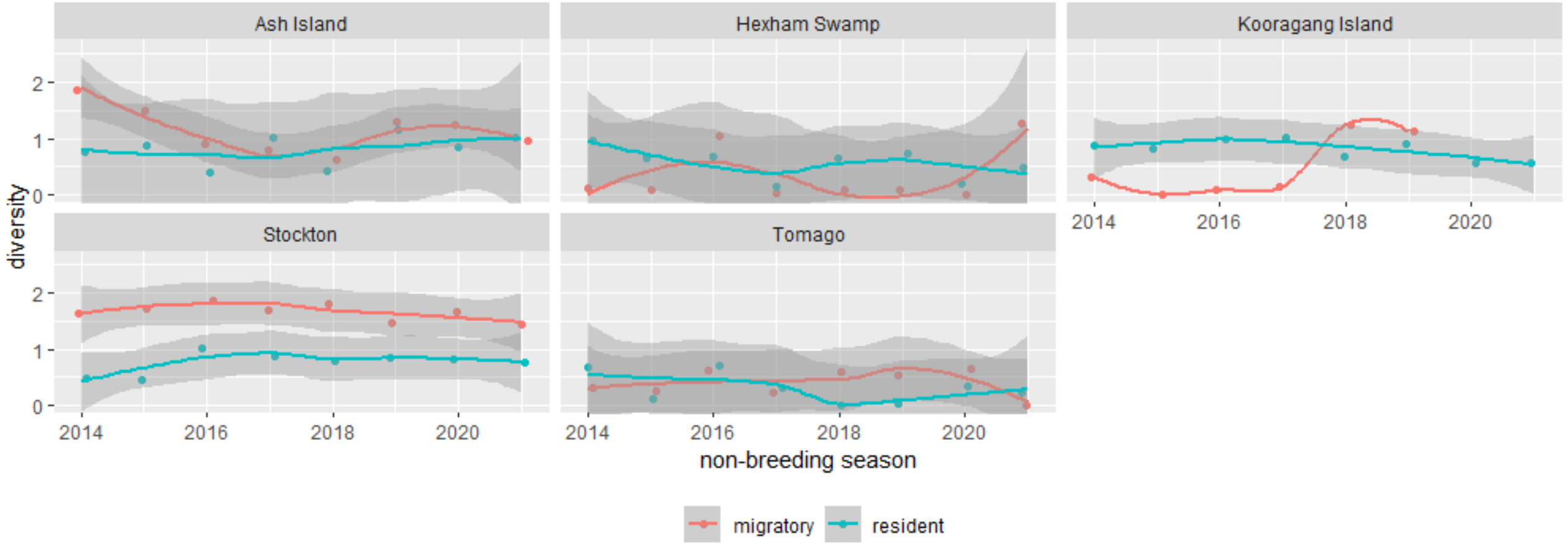


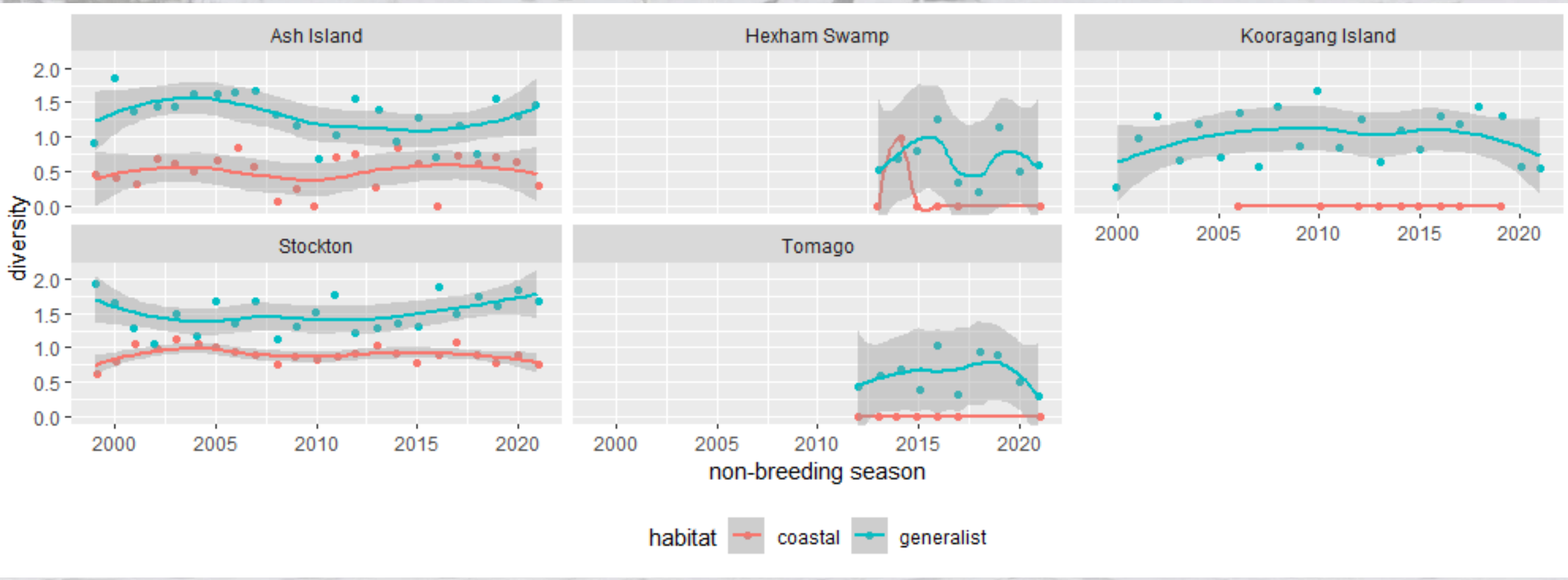
Diversity: migratory versus resident



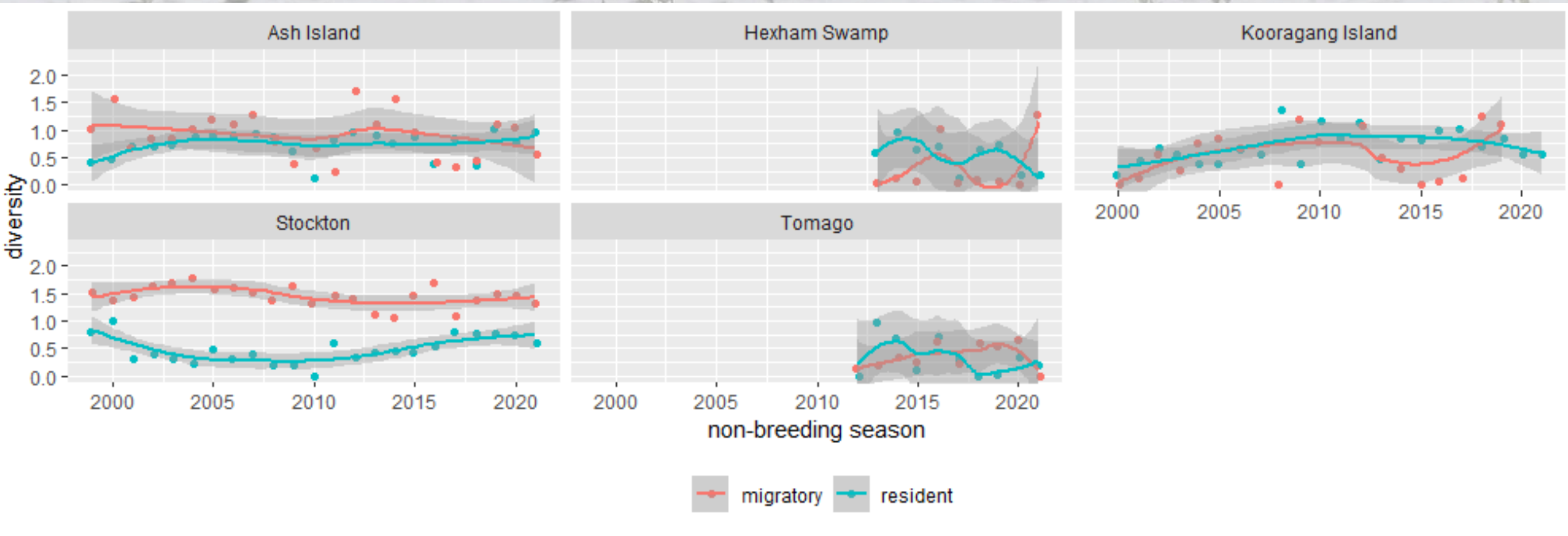
Diversity: migratory versus resident 2014-2022



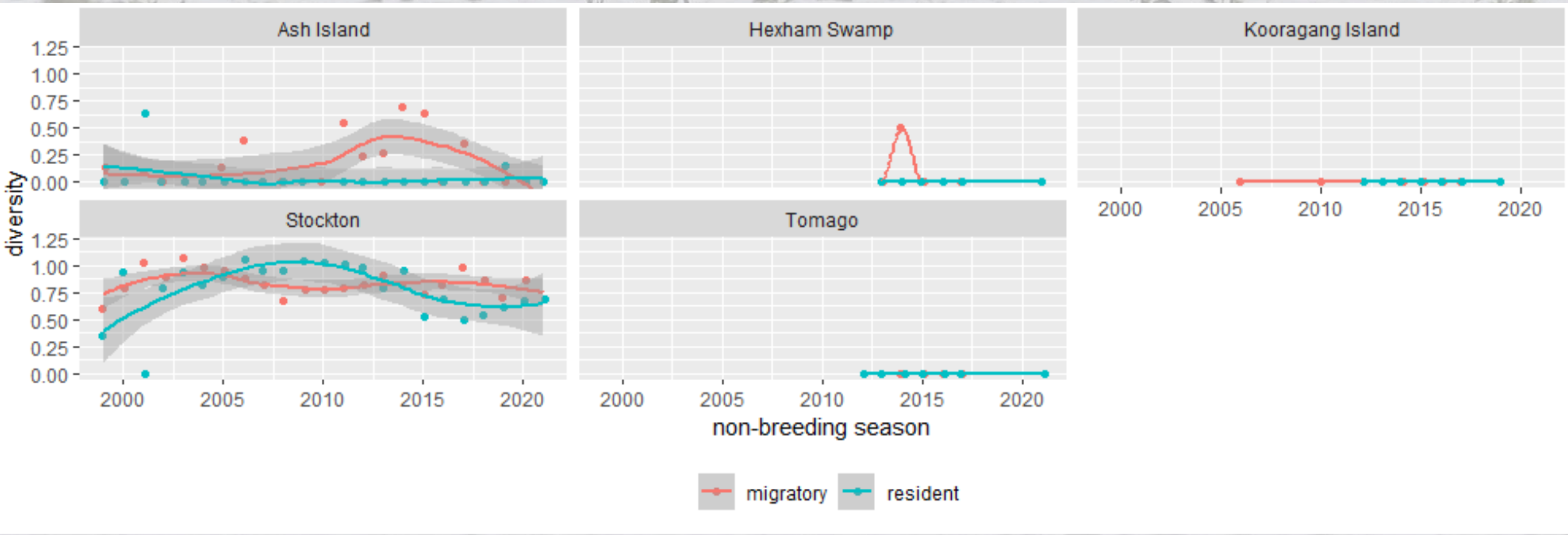
Coastal versus generalist



Diversity: generalist by movement ecology



Coastal obligate by movement ecology



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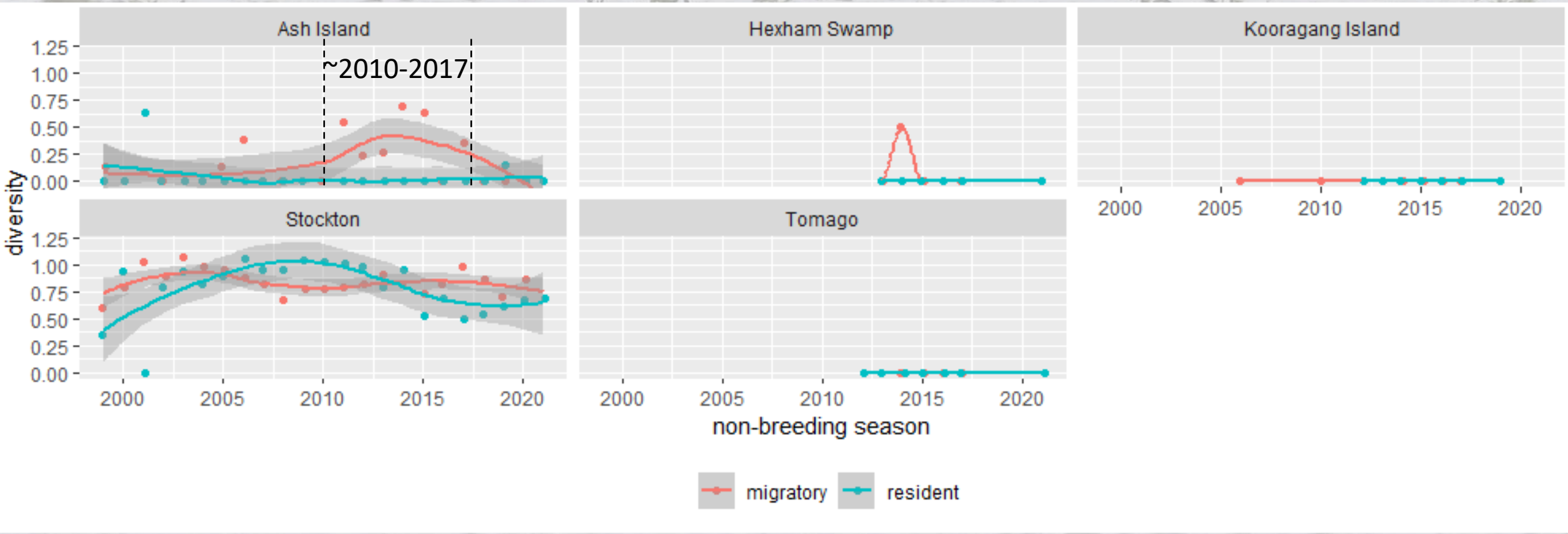

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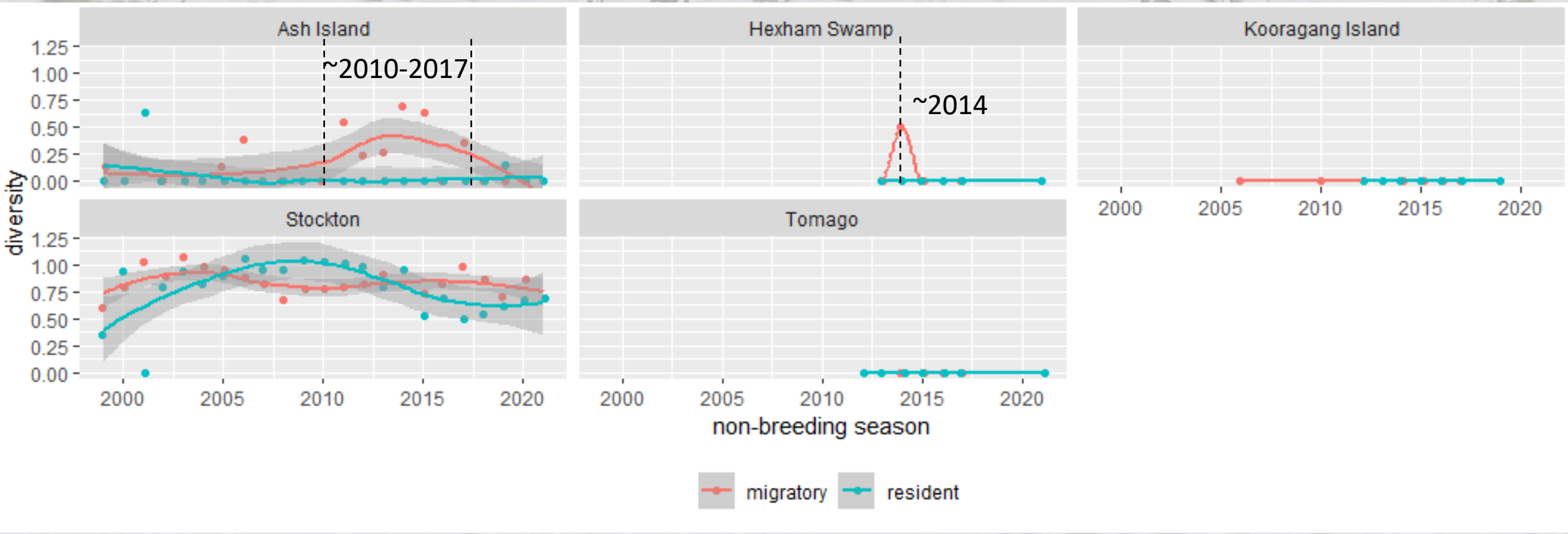
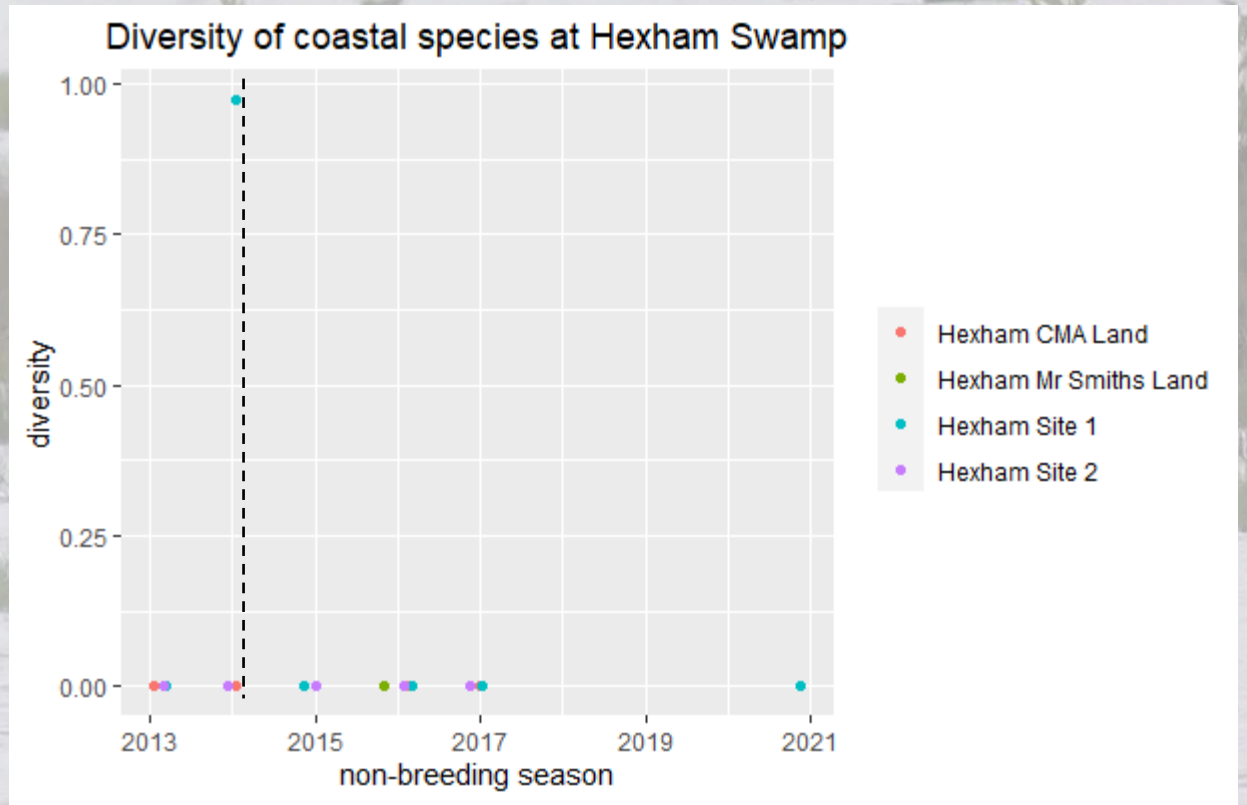


Hexham Swamp diversity & abundance



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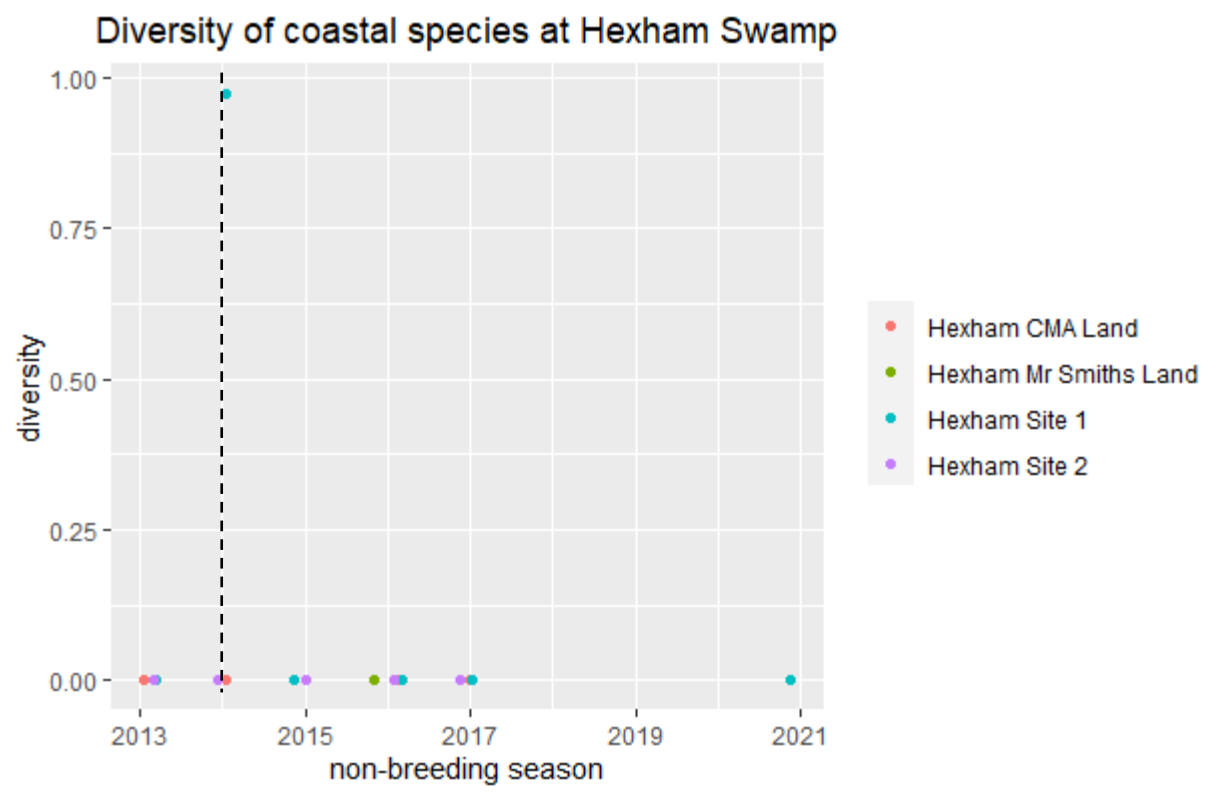
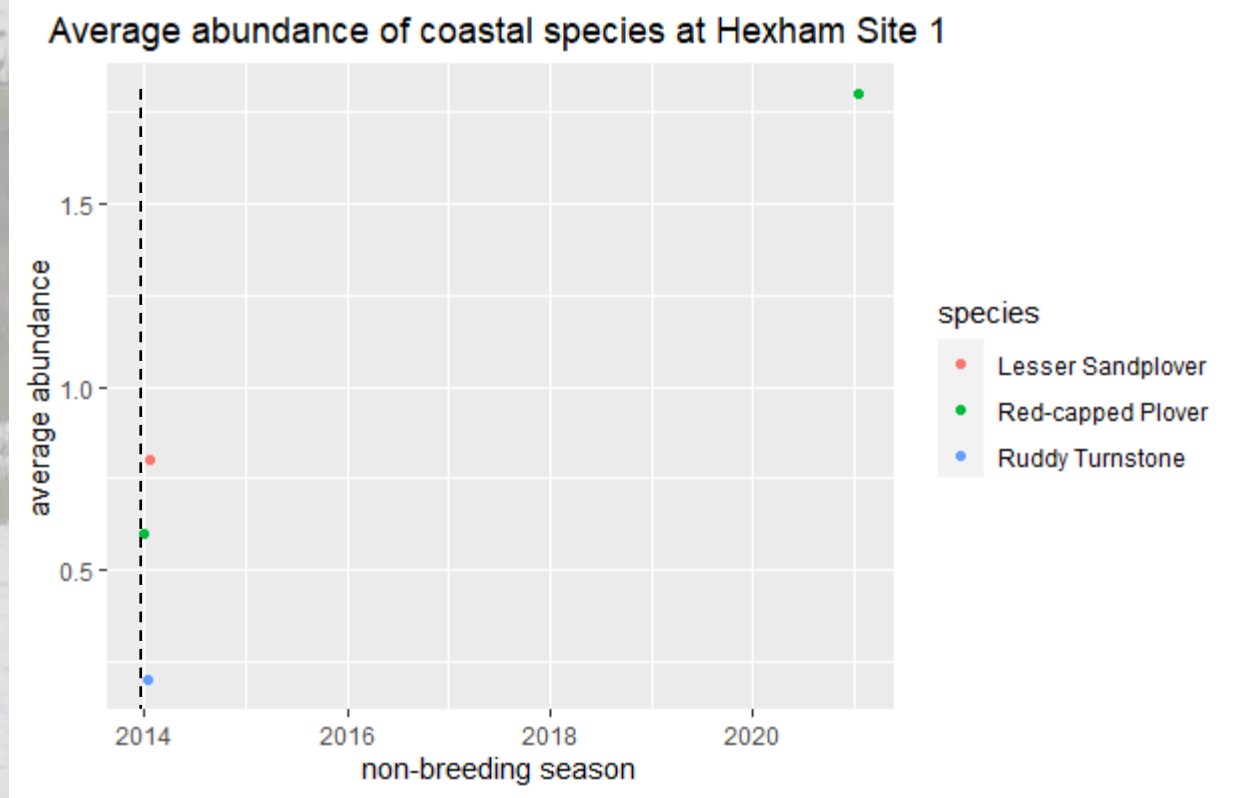
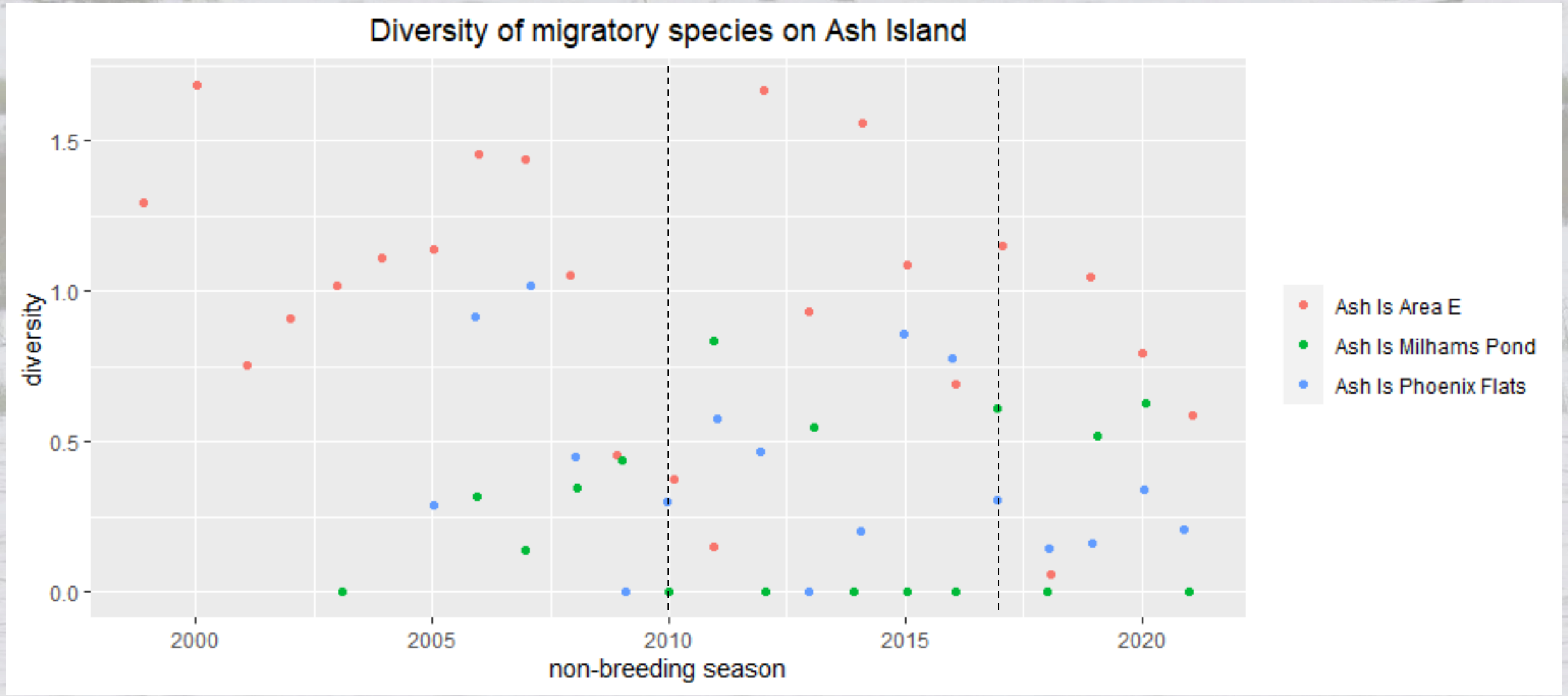




Ash Island diversity



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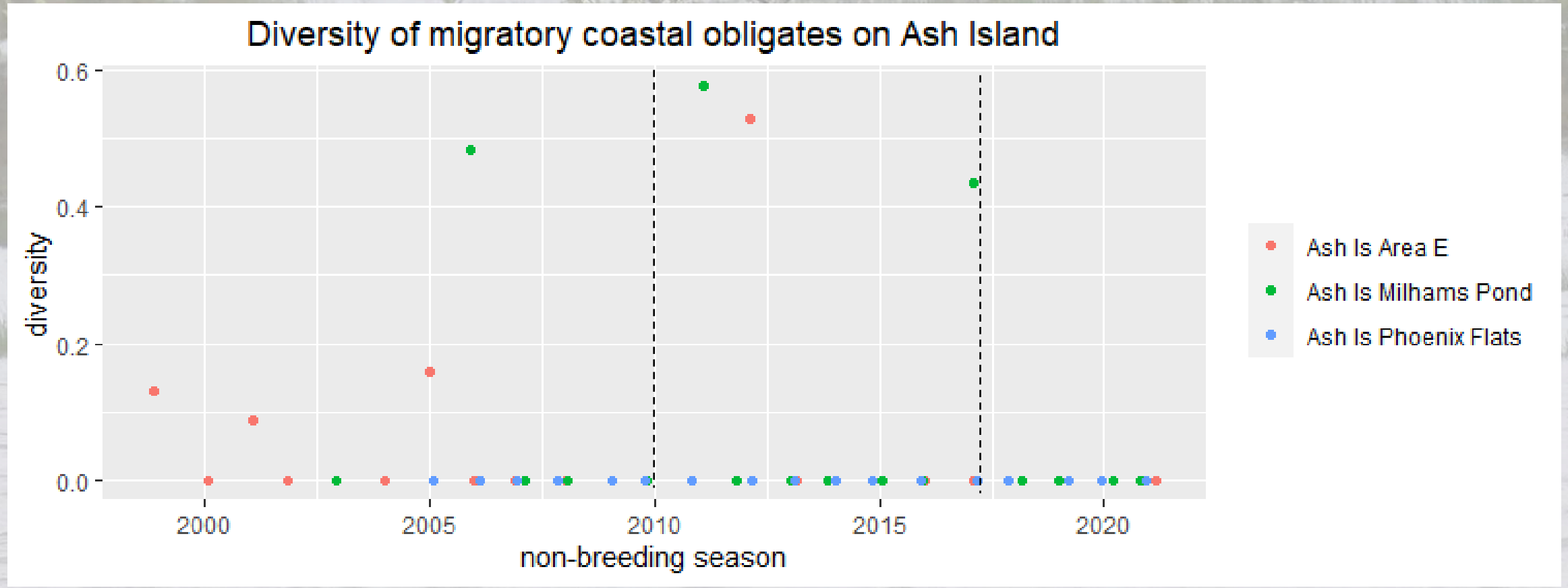
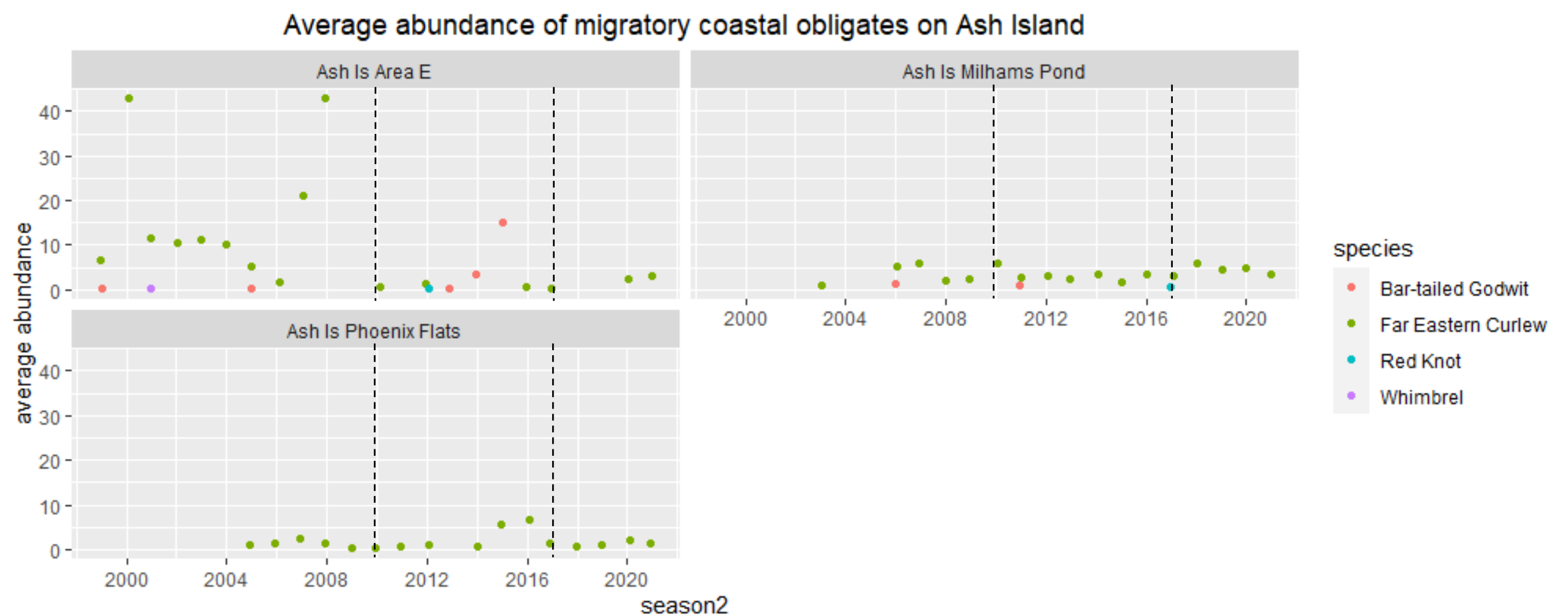
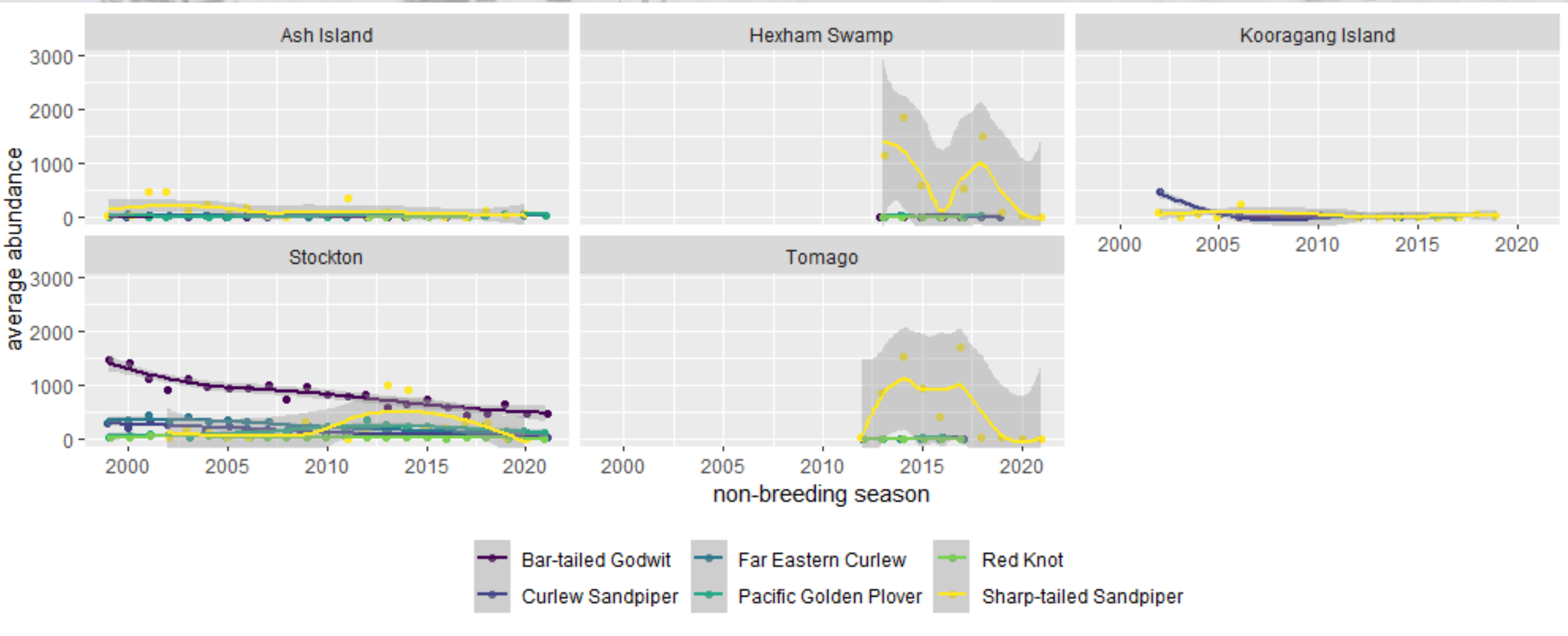


Ash Island abundance

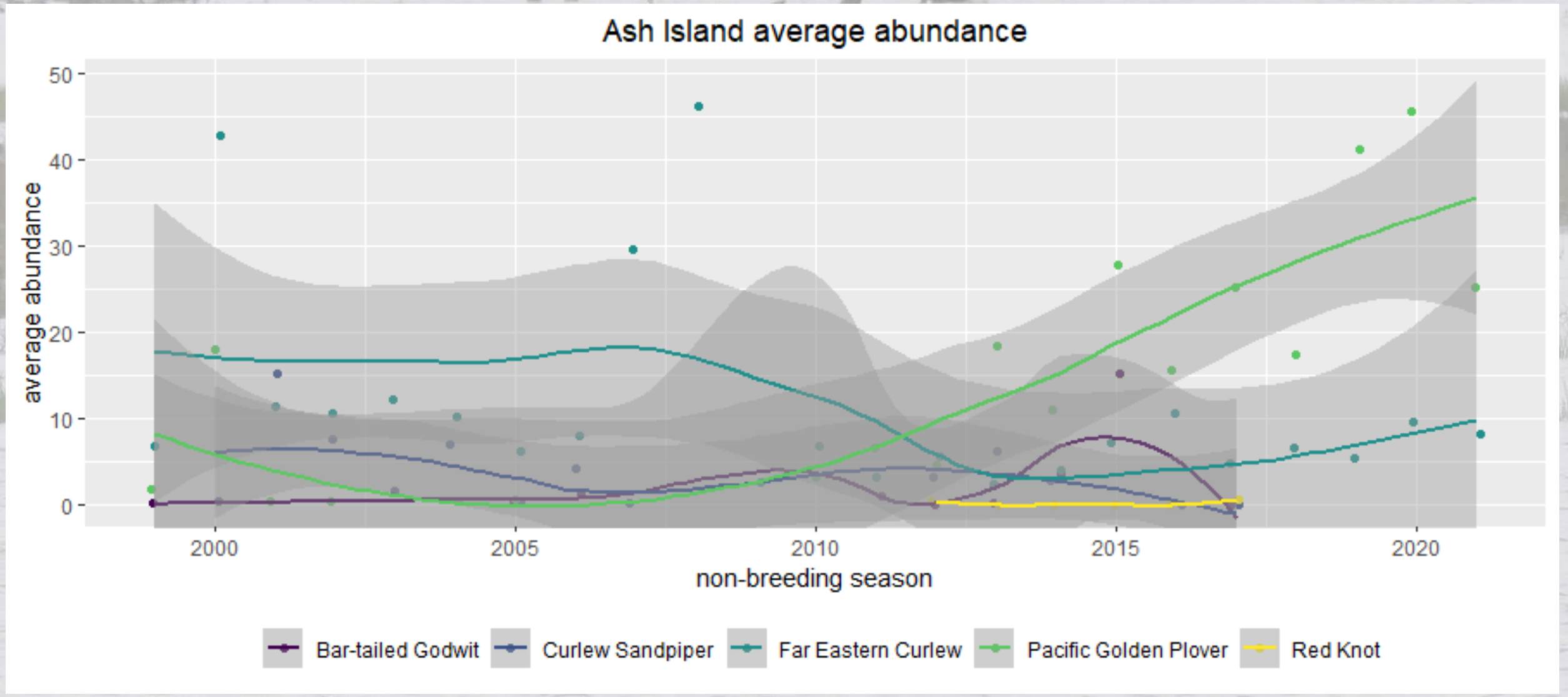


Changes in internationally significant species



(Brereton and Taylor-Wood 2010; Stuart & Lindsey 2021)

Changes in internationally significant species



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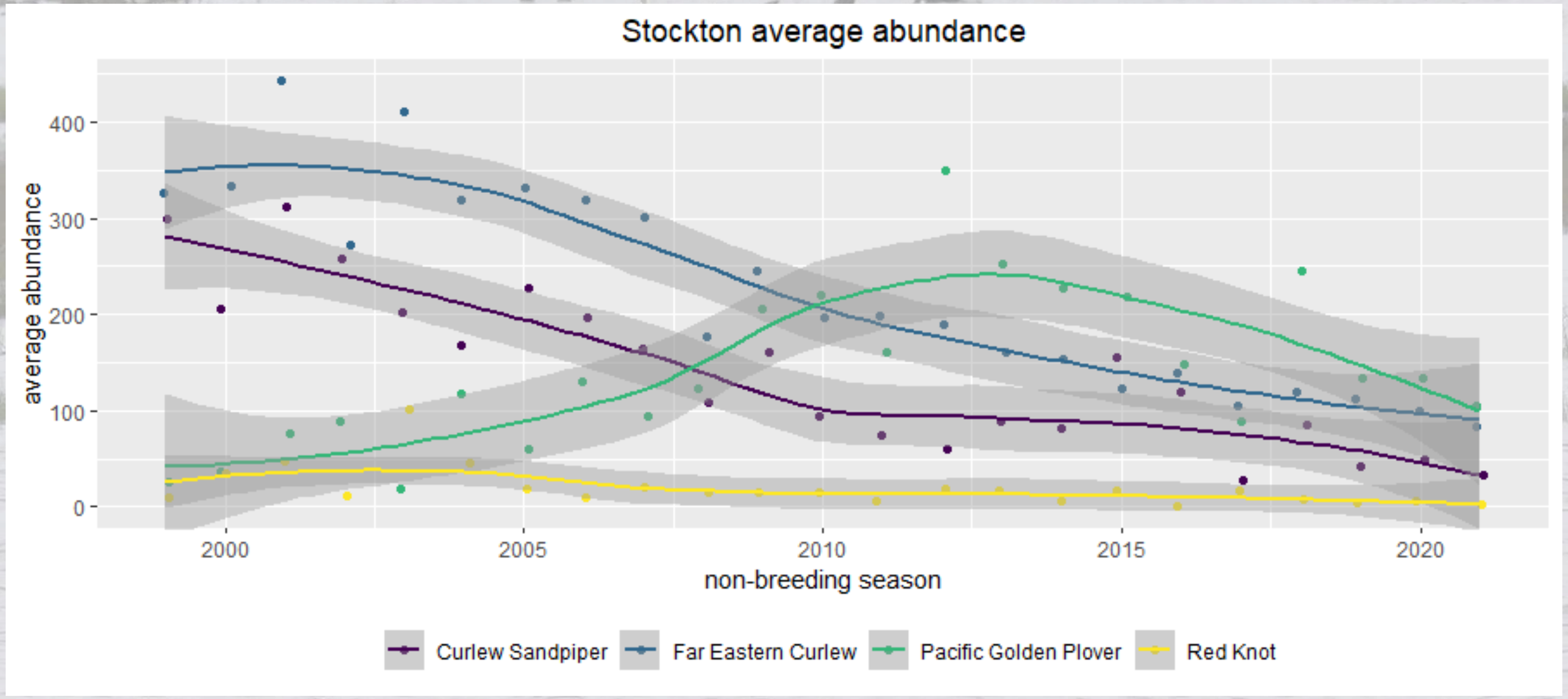

Conclusion & Next Steps

- Ash Island and Stockton are the only sites used by coastal migrants
  - Consideration of habitat factors and use of site as high tide roosting or low tide foraging grounds
- Potential declines in diversity at Ash Island
  - Statistical modelling of diversity over time at each area and site level
- Tomago and Hexham, despite the restoration works, are highly variable
  - Likely influenced by inconsistent tidal flushing
  - Requires understanding the tidal flow and how it links to these sites and shorebird responses

Acknowledgments

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Newcastle Coal INFRASTRUCTURE GROUP

birdlife AUSTRALIA

PORT WARATAH COAL SERVICES

NATIONAL PARKS & WILDLIFE SERVICE N·S·W

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Questions?