THE SPATIAL OCCURRENCE OF FORMAL POLITICAL REPRESENTATION AND THREATENED SPECIES

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ABSTRACT

INTRODUCTION

The present day has been defined as within the Anthropocene Epoch, representing a sixth "mass extinction" induced by humans (**lewisDefiningAnthropocene2015**). Even under extremely conservative assumptions, this century's average rate of vertebrate species loss is up to 100 times higher than the background rate (**ceballosAcceleratedModernHuman2015**). This loss of the world's biodiversity is due to human-led modifications to the environment. Over-exploitation and agriculture have the greatest impact on biodiversity on a global scale (**maxwellBiodiversityRavagesGuns2016**), with the proportion of threats remaining roughly consistent among IPBES regions (**w.w.f.LivingPlanetReport2020**).

Heightened impact from invasive species and system modifications make Australia's threat profile significantly different when compared to the global aggregate (**kearneyThreatsAustraliaImperilled2019**). Australia's concoction of threats has led to the rate of species going extinct being the highest in the world with the decline of many endangered species continuing to occur across the continent (**simmondsVulnerableSpeciesEcosystems2020**). In the past decade, three Australian species have gone extinct that were predictable and likely preventable (**woinarskiContributionPolicyLaw2017**).

Unlike other places, to save Australian threatened species we need active management. This means funding, coordination, effort. In the Australian context, **leggeMonitoringThreatenedSpecies2018** concluded the five major constraints on improved monitoring, which can roughly be translated into improved management of biodiversity are methodological challenges, cross institutional blockages, within-institutional impediments, policy/legislative deficiencies, and funding shortfalls. Four of these problems represent a significant opportunity for leadership. These significant challenges facing conservation of biodiversity could either be completely or partially improved by institutional changes. These challenges have been explored and explained by scientists over decades, with myriad analyses alerting policy makers, and recommending the necessary reforms. However, the implementation of institutional or system reform at the scale needed has not occurred. As such, a critical step in addressing the species extinction crisis is approaching it as a political and social problem.

The continent of Australia, the island of Tasmania, and numerous smaller islands represent the sovereign country of Australia. The country is divided up into 151 federal electorates, based

on population data that are redrawn every 4 years. The electorates are used to elect the members of the house of representatives.

No one has ever really explored the relationship between species conservation and leadership. We explore using listed species and federal members. Why? Because federal members have responsibility (CBD, EPBC). Our aim to showcase potential for new models of conservation that fill the gaps identified by Legge.

METHODS

3.1 Australian threatened species

We used public grids of Species of National Environmental Significance (SNES), listed by the Australian Department of the Environment and Energys Threatened Species Scientific Committee and Minister under the Environment Protection and Biodiversity Conservation Act 1999 (**commonwealthofaustraliaThreatenedSpeciesEPBC2021**) (retrieved 1st July 2021). There were 1,961[?] threatened species listed at the time of analysis (**commonwealthofaustraliaThreatenedSpeciesEPBC**
We used species or species habitat is likely to occur within area distributions as this is the more definitive (than may occur). These grids reflect the area within the outermost limits of a species distribution (**gastonSizesSpeciesGeographic2009**). As electorates in North East Australia comprise marine regions, we have included non-terrestrial threatened species.

3.2 Australian federal electorate and land boundary data

Federal electoral boundaries and their demographic classification are maintained and released by the Australian Electoral Commission. Australian land boundary spatial data was acquired from the Australian Statistical Geography Standard (ASGS) Edition 3.

3.3 Mapping the distribution of electorates and threatened species

RESULTS

Our analysis examines the spatial relationship between federal electoral boundaries and the distribution of federally listed threatened species under the EPBC Act 1999. Our analysis includes all **** threatened species currently listed on the EPBC Act, comprising flora, frogs, birds, mammals, fishes, reptiles, and other animals.

4.1 The occurence of threatened species and

The intersection between threatened species and federal electoral boundaries reveal a disparity, with larger electorates representing more threatened species than their smaller counterparts (Figure 1). The largest electorate is Durack, which is over 50,000 times the size of the smallest, the inner metropolitan electorate of Grayndler. The larger electorates of Durack (WA), O'Connor (WA), and Kennedy (QLD) contain the most threatened species. The electorate of Adelaide contains the least with 29 threatened species and on an electorate size basis is the 31st smallest.

The disparity can primarily be explained by federal electoral boundaries being drawn on the population distribution of humans and the varied occurrence of threatened species. Despite this, the area difference of inner metropolitan electorates compared to the larger rural electorates is not equivalent to threatened species proportion. For example, the electorate of Sydney (NSW) has the highest concentration of threatened species, whilst Lingiari (NT) has the lowest. Lingiari is 30,000 times the size of Sydney yet contains less than double the number of threatened species. Australian urban areas are known to support substantially more threatened species than non-urban areas (**ivesCitiesAreHotspots2016**; **soanesConservationOpportunitiesThreatened2020**). Another possible explanation is urban electorates are closer together and therefore share the same species. Another contribution is rural areas may house more species that are undiscovered when compared to built-up urban areas. These explanations need further investigation.

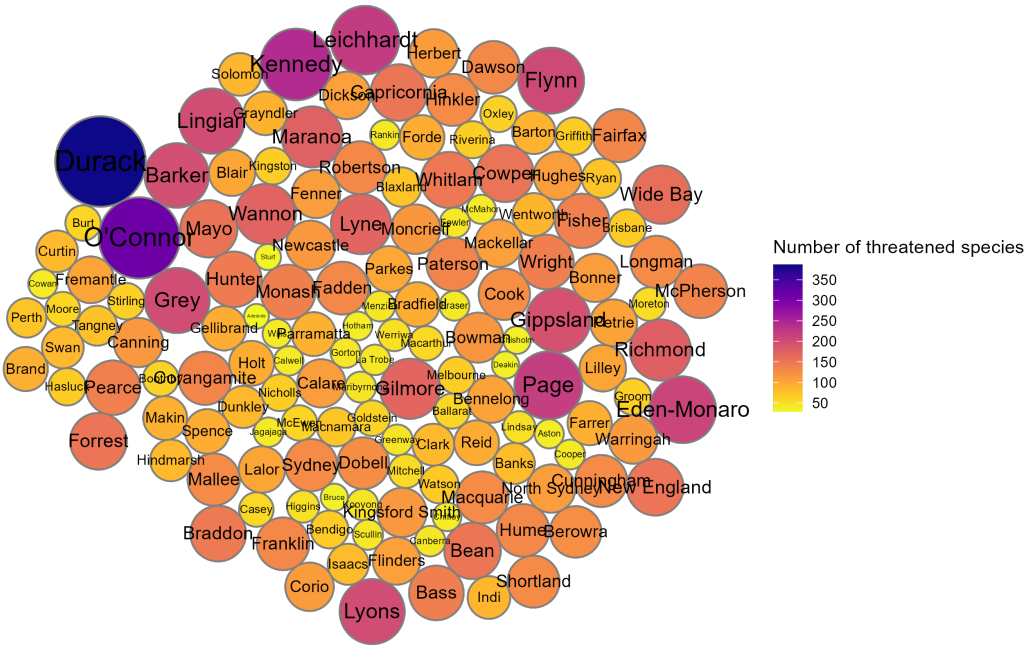

Figure 1: Dorling cartogram of threatened species occurrence within the 151 Australian federal electoral divisions. Size of circles and colour correspond to the number of threatened species within electorates. Positioning of circles roughly represent the geographic location of electorates.

The majority of threatened species reside in a single electorate, comprising forty-three percent of the total on the EPBC list (Figure 2). The median of how many electorates are covered in each species's range is two, mean is nine. One quarter of species have a range that crosses more than four electorates. Two strongly migratory species cover all 151 electorates, the Pacific Swift and the White-bellied Sea Eagle. The threatened status of species seems to have a uniform distribution across the number of electorates in their range but needs further investigation.

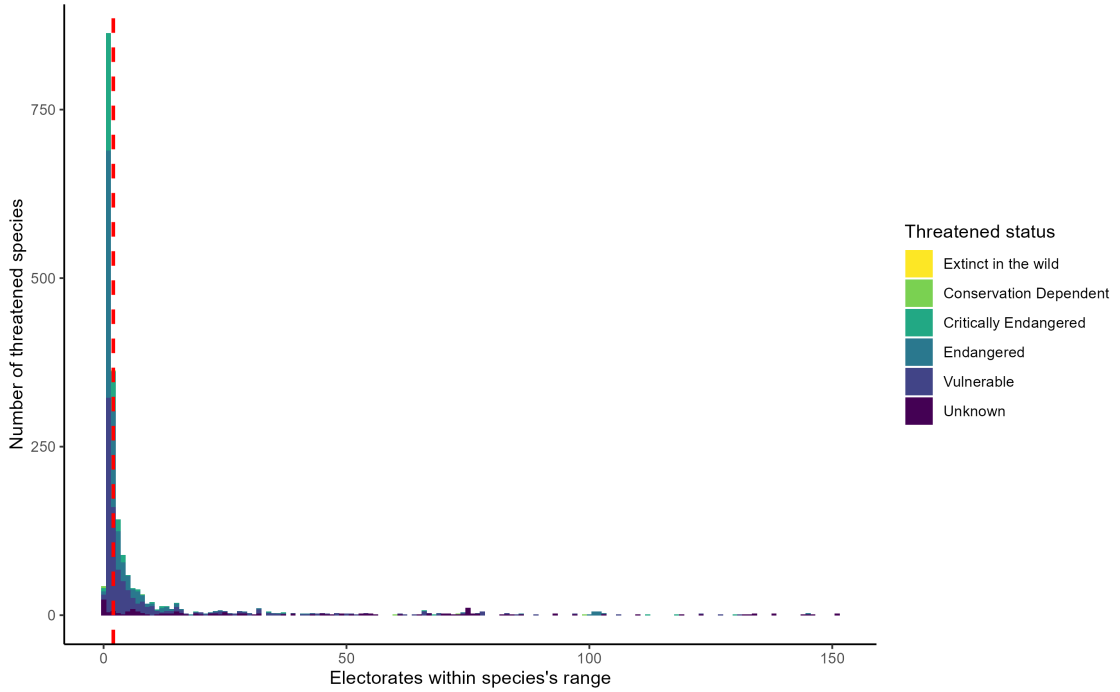

Figure 2: Histogram displaying the number of electorates in a species range and their threatened status. The red dashed line represents the median.

Endemic species were found in 44 electorates (Figure 3). The electorate of Bean contains one endemic species and is the only of inner metropolitan classification. Rural electorates make up seventy-two percent of electorates with endemic species. Species which have greater than eighty percent of their range within an electorate were found in 60. Bean contains the 12th highest number of species with eighty percent of their range within, more than 22 others which are rural. Bean and Pearce contain 26 and 17 threatened species with greater than eighty percent of their range within. Bean contains the 12th highest, more than 22 others which are rural.

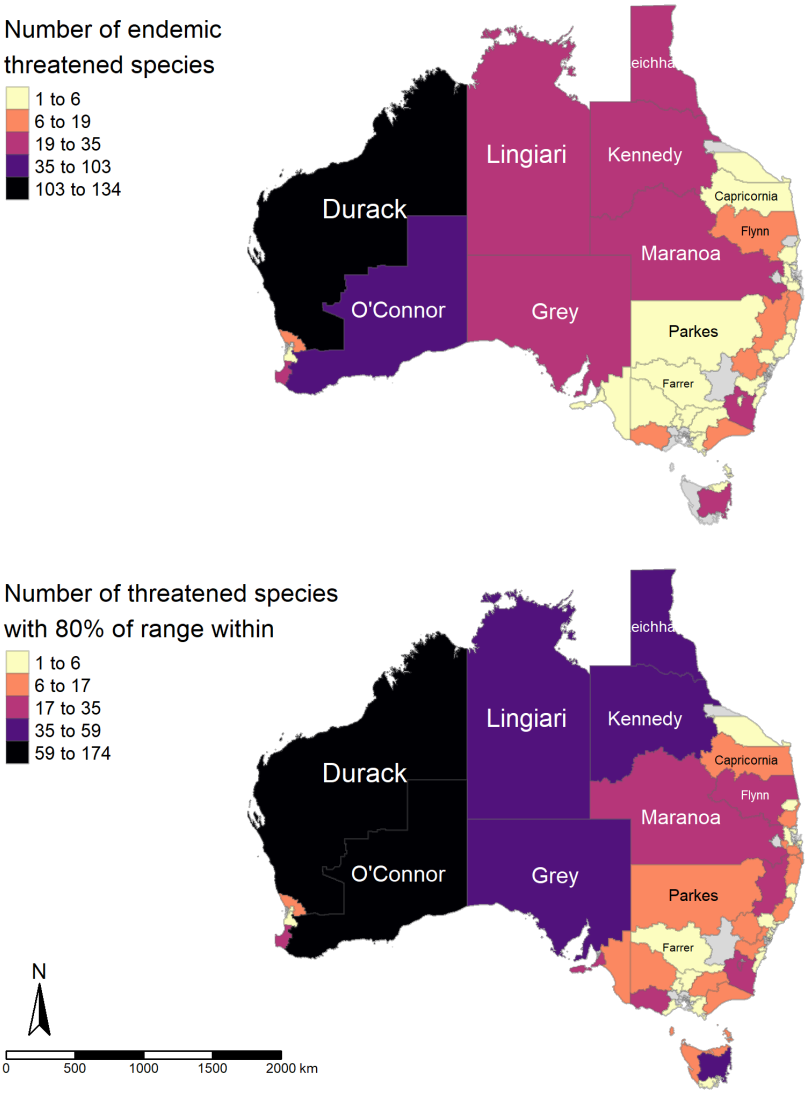

Figure 3: Chloropleth maps displaying A) number of endemic threatened species and B) number of threatened species with at least 80% of their range within continental Australian federal electoral boundaries. External territories (Lord Howe Island, Christmas Island etc) are not included in this map.

4.2 Demography and threatened species

Our analysis examines the overlap of species and the demographic classification of electorates. Of the 1995 species included in this analysis, eighty-seven percent have at least part of their range within rural electorates 4.

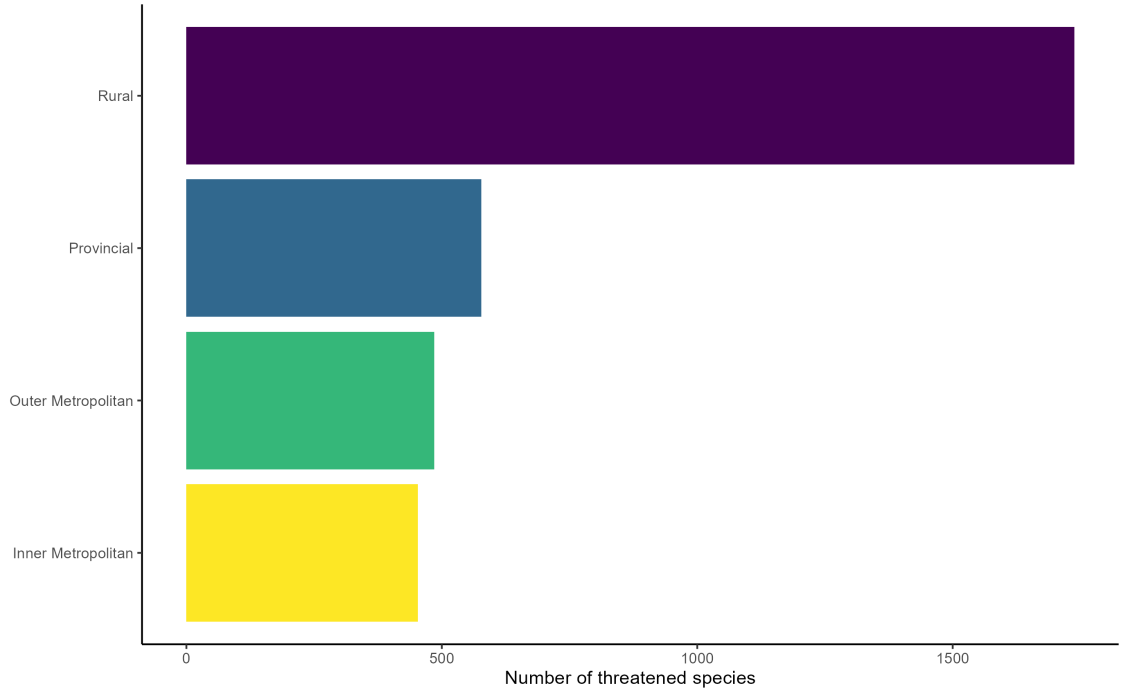

Figure 4: Occurrence of threatened species's range within demographic classifications of Australian federal electoral boundaries. An individual species range can intersect with more than one demographic classification. Break this down into taxongroups ?

DISCUSSION

Connecting members of parliament with the threatened species that occur within the boundaries of Australia they are tasked with maintaining and advocating for is powerful. Powerful because members of parliament are responsible for ultimately deploying both resources and legislative change. Addressing this democracy deficit and pushing advocacy for threatened species onto local constituents and members has the potential to have drastic implications for changing our trajectory. Due to Australia's low population density, existing megadiversity, political stability, affluence, and large areas remaining some of the last pressure-free zones in the world (**venterSixteenYearsChange2016**), Australia should be performing better. Despite these motivations, obligations, advantages, and Australia's policy attempts to provide better protection **wardLotsLossLittle2019**), our biodiversity continues to decline.

So A clear mismatch exists. Massive opportunity for some electorate leaders to stand up and for citizens for demanding accountability. Leaders should work with state and local council counterparts. Species can only persist if the rule are in place that work for them, the funding is place that enable the threats to be abated. Thats means champions. Some ideas for enabling

this conversation further each electorate should have their own threatened species emblem? A flagship for cross party support

REFERENCES

SUPPORTING INFORMATION

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The authors would like to recognise . . . The authors declare no conflicts of interest.

DATA