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AUSTRALIA

# WILDLIFE ON THE BRINK: THE NEED FOR STRONG CLIMATE ACTION

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# THE URGENT CALL FOR 1.5°C ALIGNED CLIMATE AMBITION TO SAVE OUR WILDLIFE

Climate change is profoundly affecting wildlife populations worldwide, leading to shifts in migration patterns, breeding seasons and habitat availability. Rising temperatures and altered weather patterns are causing heat stress and heat-related deaths while disrupting the timing of food availability, making it difficult for animals to find adequate sustenance during critical life stages. The impacts of climate change on Australian species are expected to vary depending on the amount of greenhouse gas emitted over the coming decades, with higher emissions leading to more dangerous climate conditions and greater habitat reductions (1). Many species are forced to relocate to cooler areas or higher altitudes, with numerous species, including rainforest ringtail possums, already stranded at the highest elevations possible.

**Key messages:**

1. Rising temperatures and habitat degradation are severely impacting Australia's unique wildlife, including species like the purple-crowned fairy-wren.

2. Stabilising warming at 1.5°C is critical. At 1.5°C, 39% of purple-crowned fairy-wren habitat will become uninhabitable. But at 2°C, 62% of all purple-crowed fairy-wren habitat will become uninhabitable. This loss of an extra 23% of habitat significantly increases the risk of extinction. Science aligned emissions reductions targets that stabilise warming at 1.5°C give the purple-crowned fairy-wren a better chance of survival.

3. Australia must adopt 1.5°C aligned, ambitious emissions reduction targets as a crucial step to protect biodiversity and ensure the survival of our unique wildlife. Australia's new 2035 climate target needs to be at least 90% below 2005 levels by 2035 and net-zero before 2040.

Australia's current 2030 and net-zero by 2050 climate targets are in line with 2°C of warming. Although it doesn't sound like much, the difference between 1.5°C and 2°C of warming is stark. At 1.5°C of global average warming, the risks of extreme weather events, sea-level rise, and biodiversity loss are substantial. Still, we have some hope of avoiding catastrophic tipping points and returning the climate to a stable state by 2100. This means that within the lifespan of our youngest children, we could return the global climate to a stable state. In contrast, 2°C of global average warming amplifies the climate threats, causing widespread disruption to ecosystems and higher risks of crossing dangerous tipping points, resulting in a future world where children alive today (Generation Alpha and the generations to come) will experience more devastating harm to nature, people and communities. The impacts extend to agriculture, food and water resources, and human health, highlighting the urgent need for effective climate action to mitigate these effects on both people and nature (2,3).

The Australian Government can play its part in ensuring its climate targets are 1.5°C aligned, ensuring the survival of our unique wildlife. The government is due to submit a new 2035 Nationally Determined Contribution (NDC) under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC) by **10 February 2025** (4), which will be Australia's new greenhouse gas emissions reduction target. Australia's new 2035 climate target needs to be at least 90% below 2005 levels by 2035 and net-zero before 2040. Climate targets are only one of the crucial steps Australia must take to deliver 1.5°C-aligned climate ambition. Climate science shows that Australia must stop approving any new fossil fuels and wind down existing fossil fuel infrastructure early, to have policies aligned with stabilising warming to 1.5°C (5).

# THE NEED FOR BOLD CLIMATE TARGETS TO SAVE PURPLE-CROWNED FAIRY-WRENS

The purple-crowned fairy-wren, a threatened small bird endemic to northern Australia, is restricted to dense river-fringing vegetation. There, the species nests, feeds on insects, shelters from heat and hides from predators. It has already suffered steep population declines and localised extinctions, largely because of the loss, degradation and fragmentation of its specialised habitat. Cattle, feral pigs and water buffalo eating and trampling riparian vegetation have caused much of this damage, along with inappropriate fire.

**There is further trouble ahead. The species is particularly vulnerable to climate change impacts that threaten the riparian habitat and climatic conditions it needs to survive.**



As temperatures rise and rainfall patterns become more erratic, the availability of areas with suitable climate and habitat conditions is diminishing (1). More droughts and heatwaves and more intense flooding and wildfires could push fairy-wrens to the brink. The species relies on rainfall to trigger breeding. After rain, insect numbers increase. The additional nourishment helps females produce more eggs and helps adult birds feed their young. Droughts reduce breeding success, fires can destroy habitat, and floods can wash away nests.  In addition to climate impacts, the fragmentation of their habitat due to changes in land use can isolate populations, reducing genetic diversity and resilience (6). Fairy-wrens are important for several First Nations language groups; featuring in Dreaming stories that celebrate the characteristics that make us unique. But the future of the purple-crowned fairy-wren hangs in the balance, underscoring the urgent need for policies that protect their habitat and limit the warming of our environment.

**Five quick purple-crowned fairy-wren facts**

1. At 9-13 grams, they weigh less than a 50-cent piece. The western subspecies is listed as Endangered under the EPBC Act; the eastern population is Near Threatened in NT under the *Territory Parks and Wildlife Conservation Act 1976* and Vulnerable under the *Nature Conservation Act 1992* in QLD. There is no recovery plan for the species.
2. With its stunning purple head and perky blue tail, males seasonally display their striking breeding plumage. In other species, the males' bright plumage attracts females to cheat on their partner. Purple-crowned fairy-wren plumage serves a different function – to make males more competitive with other males for fiercely contested breeding positions.
3. Unlike other fairy-wrens that are renowned for their promiscuity, purple-crowned fairy-wren are very faithful and form monogamous 'breeding pairs'.
4. Purple-crowned fairy-wrens live in social groups that breed cooperatively, seemingly going against the evolutionary principle that individuals should only care for their own progeny.
5. Breeding pairs works together with 'helpers' in the group to raise young and defend against predators such as goannas, snakes and goshawks. These helpers are not acting purely altruistically, they help young likely to return the favour in the future, and they only help birds they might breed with in the future, or breeders that are relatives.

Using two modelled climate scenarios (see Appendix 1), we calculated the difference in suitable habitat based on underlying climate and landscape factors available for four flagship species, including the purple-crowned fairy-wren, at both 1.5°C and 2°C of warming. Of the species examined, purple-crowned fairy-wrens had the biggest difference in suitable habitat between the two warming scenarios. At 1.5°C of warming, 39% of purple-crowned fairy-wren habitat will become inhospitable, an already alarming figure for a range-restricted, threatened species. But at 2°C of warming, the purple-crowned fairy-wren will see its habitat shrink by 62%, significantly increasing the risk of extinction for this species (Table 1). Under the 2°C warming scenario, habitat reductions are largely driven by reductions in the eastern parts of their range, resulting in a concentration of suitable habitat in the west (Fig. 1).

**If warming is stabilised at 1.5°C, the purple-crowned fairy-wren retains more than 60% of its habitat, but at 2°C, the purple-crowned fairy-wren loses more than 60% of its habitat.**

**Table 1.** Impacts of 1.5°C versus 2°C warming on the purple-crowned fairy-wren. This table summarises the key ecological and behavioural changes expected to affect the purple-crowned fairywren under two different temperature scenarios (7), highlighting potential risks to habitat, reproduction, and overall survival.

| Impact | 1.5°C | 2°C |
|---|---|---|
| **Heat – “chicks living hot likely to die young”** Nestlings of fairy-wrens that are raised in hot and dry conditions have reduced adaptive capacity, meaning they grow old quicker and die younger (6). | Warm spell duration **+14 days** (+9–+19 days)<br><br>Frequency of warm extremes over land **+149%** | Warm spell duration **+26 days** (+18–+36 days)<br><br>Frequency of warm extremes over land **+406%** |
| **Drought - “the timing when birds can lay their eggs will diminish”** Fairy-wrens breed when the weather is wet and use all the available windows year-round. As hot and dry conditions increase, the times the birds can lay their eggs will diminish (6). | Likelihood of high temperatures seen in 2006 drought in SE Australia **52%** (45–59%) | Likelihood of high temperatures seen in 2006 drought in SE Australia **74%** (67–81%) |
| **Fire – “reduced breeding success and longer recovery time needed”** Fires can destroy habitat and reduce the number of fairy-wrens in burnt areas by up to 80% for at least two and a half years (8). | Likelihood of another 2012-13 "angry summer" **57%** (50–65%) | Likelihood of another 2012-13 "angry summer" **77%** (70–84%) |
| **Floods – “lower adult survival, territory occupation and nesting success”** Fairy-wrens can be injured during and after floods. Habitat and nests may be washed away, which can delay breeding, and persistent moisture can create ideal conditions for parasites, reducing bird health (9). | Frequency of rainfall extremes over land **+8%** | Frequency of rainfall extremes over land **+17%** |
| **Area of suitable habitat – “shrinking spaces for fairy-wrens”** Species are expected to face greater habitat reductions with higher emissions and as climate conditions worsen (1). | **39% reduction** of suitable habitat, area of suitable climate space 105,004 $km^2$ | **62% reduction** of suitable habitat, area of suitable habitat space 65,193 $km^2$ |

**Predicted reductions in Purple Crowned Fairywren habitat suitability under 1.5°C and 2.0°C warming scenarios**

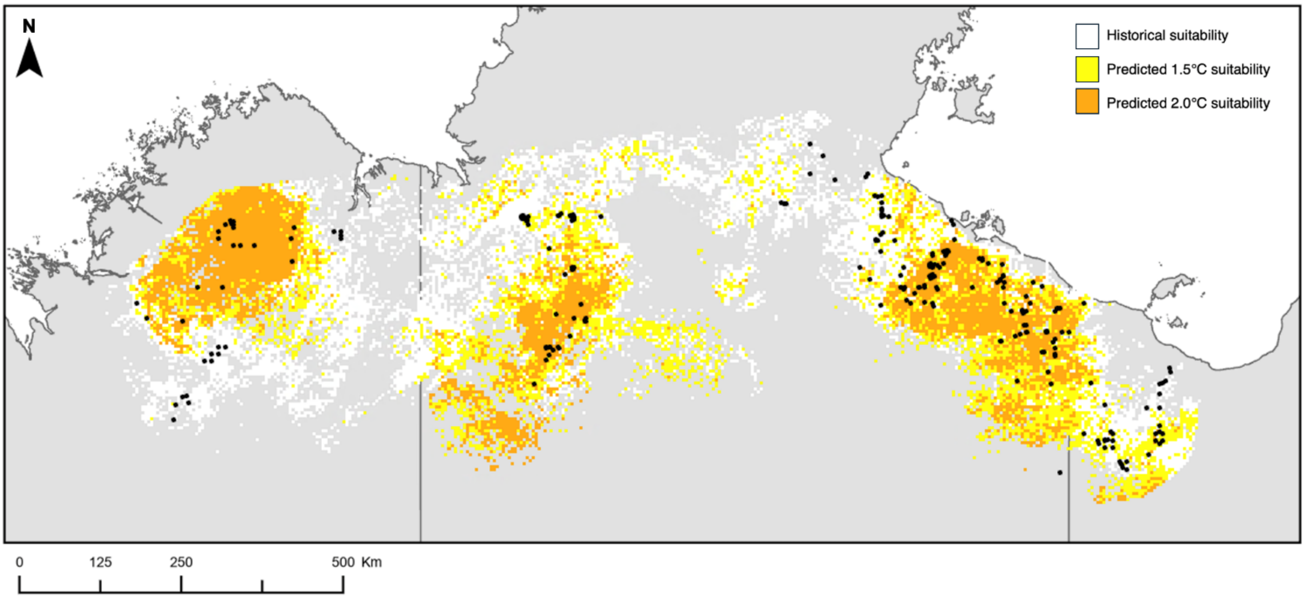


**Figure 1.** Comparison of the projected shifts in suitable habitat for the purple-crowned fairy-wren (records symbolised as black dots) under 1.5°C (shown in yellow) and 2°C (shown in orange) warming scenarios, highlighting areas of likely habitat loss as temperatures increase.

# THE URGENT CALL FOR CLIMATE AMBITION TO SAVE OUR WILDLIFE

Green ringtail possum © WWF-Australia

The case for science-aligned emissions reductions targets is strong for the purple-crowned fairy-wren, but they are not alone. Our rainforest ringtail possums, like the green ringtail and lemuroid ringtail, are endemic to Far North Queensland and are increasingly threatened by climate change. These possums are restricted to cool, moist, high-altitude rainforests, known as 'cloud forests', which have already been significantly degraded through a changing climate and land use. Any additional increase in temperature will further reduce their available habitat and impact their ability to maintain their body temperature (10).

At 1.5°C warming, these species will experience serious challenges, but their habitats could still offer some refuge; however, at 2°C, the risks escalate dramatically. Forecasted increases in mean annual temperature and increased frequency of extreme heatwaves are predicted to trigger crashes in populations as the ringtails struggle to survive for more than four days above 30°C (11). The lemuroid ringtail possum is currently being considered for listing as a threatened species under the EPBC Act but has already seen a population decline of 68% since 2011 and is expected to decline by 80% in the next eight years (12). **This is a species that is very likely to go from Least Concern to Functionally Extinct in the next decade alone without bold climate action** (12)**.**

The best available climate science shows that for Australia's new 2035 NDC to be aligned with pursuing efforts to limit temperatures to 1.5°C, it must be at least 90% below 2005 levels by 2035 and net-zero before 2040 (13). That climate target will still only give us a 50% chance of stabilising global average temperatures to 1.5°C above pre-industrial levels, while faster action of reaching net-zero by 2035 will improve our chances. To protect Australia's unique wildlife and ecosystems, including vulnerable species like the purple-crowned fairy-wren, and rainforest ringtails, we must adopt ambitious emissions reduction targets aligned with stabilising warming at 1.5°C and apply Australia's diplomatic efforts to encourage all other countries to do the same. The impacts of climate change—such as habitat loss, heat stress, and more frequent disturbances (fire and floods)—pose significant threats to these species and many others compounding the effects of climate change. At 1.5°C, we can still maintain some resilience in their habitats, but at 2°C, the risks multiply, leading to irreversible damage and potential extinction for numerous species. By committing to stronger emissions reductions, Australia can help mitigate these threats, safeguard biodiversity and support the health of our natural ecosystems. It's not just a matter of environmental responsibility; it's a crucial step towards climate action that will give our unique wildlife a future and provide us with a chance to maintain the ecological balance that sustains life in this country.

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# APPENDIX 1. SUMMARY OF REPORT DATA ANALYSIS METHODS

This analysis was conducted by Dr Carla Archibald from Deakin University with support from Prof Brett Bryan (Deakin University) and Dr Kita Ashman (WWF-Australia). We conducted a spatial and temporal analysis to assess how key species are predicted to be impacted by climate warming under 1.5°C and 2°C scenarios in Australia. We used open-access data on the impacts of climate change scenarios on Australian species, modelled by Archibald et al. (2024). This data modelled four climate change scenario combinations of Shared Socioeconomic Pathway (SSP) Representative Concentration Pathways (RCP): SSP1-RCP2.6, SSP2-RCP4.0, SSP3-RCP7.0 and SSP5-SCP8.5 at multiple periods.

To pinpoint the effects of the 1.5°C and 2°C scenarios on key species in Australia, we first needed to determine which year and climate scenario corresponded to these temperature increases relative to pre-industrial levels. We established the pre-industrial temperature using the WorldClim (14) average temperature from the historical climate, centred around the 1990 epoch, of 21.7°4C. This value is slightly lower than the commonly used figure of 21.9°C, which may mean that reaching the 1.5°C and 2°C scenario comes earlier when using the WorldClim pre-industrial levels (15). The SSP1-RCP2.6 climate scenario for the year 2050 and the SSP3-RCP7.0 climate scenario for the same year are the two combinations that closely approach warming of 1.5°C and 2°C, with temperatures of 1.54°C and 2.09°C, respectively.

We used open-access Maxent habitat suitability models, which predict habitat suitability for species under various climate change scenarios (1). These models were fitted using Atlas of Living Australia (ALA) data for occurrence data, WorldClim climate data (14) for bioclimatic information and the Soil and Landscape Grid of Australia for landscape factors (16,17). Detailed climate modelling methods are available here. For this report, we focused on the following species groups:

| Study Species or Group | Species names |
|---|---|
| Purple-crowned fairy-wren | *Malurus coronatus* |
| Tropical ringtail possums (lemuroid ringtail possum, green ringtail possum, Daintree River ringtail possum) | *Hemibelideus lemuroides, Pseudochirops archeri, Pseudochirulus cinereus* |

For each species, we selected the SSP1-RCP2.6 and SSP3-RCP7.0 climate scenarios for the year 2050. We refined the habitat suitability spatial limits using the species' Extent of Occurrence (EOO), which we calculated based on occurrence points from the ALA. This allowed us to apply a buffer around known occurrence areas to achieve a more precise area calculation. We summarised the absolute and percentage weighted suitable habitat area ($km^2$) and absolute and percentage changes, plus a habitat overlap indicator between the pre-industrial climate as well as each of the 1.5°C and 2°C warming scenario. We also quantified the quality-weighted area and percentage difference between the 1.5°C and 2°C warming scenarios. This analysis was conducted through the programming language Python.

To create the maps for this report, we thresholded suitability projections at 0.5 and plotted values between 0.5 and 1 as a binary value. Therefore, these maps present a simplified visual representation of the changes in suitable habitat under the different warming scenarios.

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