



**FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE
FINAL RECOMMENDATION ON A NOMINATION FOR LISTING**

**Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse
gases
(Potentially Threatening Process)**

Date of receipt of the nomination: 7 December 1998
Date of preliminary recommendation: 16 November 1999
Date of final recommendation: 5 September 2000

File No.: FF/54/0003

Validity: The nomination is for a valid item

Prescribed Information: The prescribed information was provided.

Name of the Nominator is adequately provided.

Name and Description of the process:

In the opinion of the SAC the process is adequately defined and described.

The nominated process is 'Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases'.

Climatic habitat refers to the bioclimatic range within which a given species or ecological community exists.

Anthropogenic emissions refers to the emissions induced by human activities identified in table 2 of the National Greenhouse Gas Inventory (NGGIC 1997). The categories of human-induced activities include combustion, fugitive fuel combustion, industrial processes, enteric fermentation, animal wastes, rice cultivation, agricultural soils, agricultural waste burning and land use change particularly land clearance and forestry.

Greenhouse gases refers to the main greenhouse gases identified in the National Greenhouse Gas Inventory (carbon dioxide, methane, nitrous oxide and Perfluorocarbons - PFCs).

Bioclimate refers to the elements of climate that affect or govern the distribution and abundance of fauna and flora.

Climatologists have proposed that the increase in concentrations of greenhouse gases will lead to a greater amount of infrared radiation being absorbed by the atmosphere, thus causing the Earth to become warmer. The increase in greenhouse gases caused by human activities resulting in warming of the atmosphere is known as the enhanced greenhouse effect. There is increasing evidence linking changes in greenhouse gases to changes in global temperatures.

The United Nations Intergovernmental Panel on Climate Change Working Group 1 (1990) used the results of theoretical global climate models (GCMs) to make predictions regarding the timing and magnitude of the enhanced greenhouse effect. IPCC predicts that an effective doubling of the atmosphere levels of carbon dioxide will occur between now and 2025 - 2050. If greenhouse gases continue to increase at the present rates there will be a rise in global mean temperature of about 0.3° C per decade. This will result in a rise in global mean temperature of about 1° C by 2025 and a 3° C rise before 2100. Associated global mean sea level rises would be about 6 cm per decade, mainly due to thermal expansion of the oceans and the melting of some land ice.

The range of flora or fauna affected or potentially affected was adequately stated in the nomination.

Significance of the threat which the potentially threatening process poses or has the potential to pose was adequately stated in the nomination.

Eligibility for listing as a potentially threatening process under the Flora and Fauna Guarantee

The nominated item satisfies at least one criterion of the set of criteria prepared and maintained under Section 11 of the **Flora and Fauna Guarantee Act 1988**, and stated in Schedule 1 of the Flora and Fauna Guarantee Regulations 1991.

Evidence that criteria are satisfied:

Criterion 5.1 *The potentially threatening process, in the absence of appropriate management, poses or has the potential to pose a significant threat to the survival of a range of flora or fauna.*

Evidence:

Climatologists' predictions suggest that the enhanced greenhouse effect will change the global climate and consequently present major new problems for the survival of a range of species. Wholesale changes in the distribution of climate patterns imply potentially dramatic changes in the distribution of flora and fauna. Species, populations and communities most at risk from climate change are as follows:

- species with small population sizes that have slow growth rates with poor dispersal abilities and recruitment eg. the Giant Gippsland Earthworm *Megascolides australis*.
- peripheral populations located at the edge of a species range eg. the south-eastern population of the Alpine She-oak Skink *Cyclodomorphus praealtus*.
- Geographically isolated species or habitat island species eg. the Helmeted Honeyeater *Lichenostomus melanops cassidix* which is isolated in small reserves.
- Genetically impoverished species eg. the Eastern Barred Bandicoot *Perameles gunni*.
- Specialised species eg. the New Holland Mouse *Pseudomys novaehollandiae* which is dependent on recently burnt heathlands.
- Poor dispersers eg. alpine stoneflies *Thaumatoperla* species.

Sub-criterion 5.1.1 *The potentially threatening process, in the absence of appropriate management, poses or has the potential to pose a significant threat to the survival of two or more taxa.*

Evidence:

Of the 42 species studied by Bennett *et al.* (1991), 15 (36%) have no climatic habitat in south-eastern Australia with a 3°C rise in temperature under the most likely rainfall scenario. The 15 species comprise five mammals (Eastern Barred Bandicoot, Little Pygmy-possum, Mountain Pygmy-possum, Heath Mouse and Mitchell's Hopping Mouse), five birds (Red-tailed Black Cockatoo, Western Whipbird, Rufous Bristlebird, Mallee Emu-wren and Helmeted Honeyeater), two reptiles (Murray Striped Skink and Brooks' Striped Skink), one amphibian (Spotted Tree Frog) and two invertebrates (Giant Gippsland Earthworm and Altona Skipper Butterfly). The most rapid response to climate change is shown by the climatic range of the Mountain Pygmy-possum, which disappears with a 1 °C rise in temperature. The bioclimatic range of a further five species disappears at +2 °C and of another nine species disappears at +3 °C.

Sub-criterion 5.1.2 *The potentially threatening process, in the absence of appropriate management, poses or has the potential to pose a significant threat to the survival of a community.*

Evidence:

Ecological communities located in a range of ecosystems are potentially affected by climate change. These are:

- Alpine and montane habitats. Local increases in temperature may cause vegetation and associated animals to shift their altitudinal range upwards eg. the Mountain Pygmy-possum.
- Wetlands and coastal ecosystems. Sea level rises will affect numerous coastal environments, particularly saltmarshes and mangroves.
- Temperate forests eg. Antarctic Beech *Nothofagus cunninghamii* forests will decline.

Criterion 5.2 *The potentially threatening process poses or has the potential to pose a significant threat to the evolutionary development of a range of flora and fauna.*

Evidence:

Climate change presents an evolutionary challenge to all species. Organisms, particularly those with long generation times and slow reproductive rates (e.g. many mammals, rainforest trees), are particularly challenged because the rate at which they can evolve to adapt to climate change may not be fast enough to maintain viable populations. As bioclimatic habitats reduce in area for many species, so too will their population numbers because smaller habitats will be unable to sustain the same population levels. As population numbers decline the pool of genetic diversity is reduced which in turn reduces the potential of species to adapt to changed environments. Species that are already genetically impoverished, such as the Eastern Barred Bandicoot, will find it particularly hard to adapt.

Additional Information

- Species or groups of species which occupy restricted habitats or have narrow habitat requirements appear to be very sensitive to climatic warming. Of the 24 species that lose between 90-100% of bioclimate at +3 °C, eight inhabit mallee habitats, two are alpine species, four occur in coastal habitats and the remainder occupy restricted habitats (eg. Helmeted Honeyeater, Giant Gippsland Earthworm, Heath Mouse, Red-tailed Black Cockatoo) [Bennett *et al.* (1991)]. Species that do not have the physiological ability to develop and reproduce at the (new) elevated temperatures or if development or reproduction are impaired then they will be less competitive and therefore survival will be threatened.

- Climate change may cause local extinction by e.g.:
 - changing the climate of an area so it no longer complies with a species' physiological tolerances
 - changing the relative competitive advantages, thus promoting new parameters of interspecific competition
 - altering species' interactions (eg. predation or competition) so that a formerly successful species may be eliminated from a habitat in which it can still physiologically survive.
- Bennett *et al.* (1991) examined 42 species of fauna (6% of Victoria's terrestrial vertebrate fauna) and their results indicated that nearly all would undergo a reduction in bioclimatic range in response to climatic warming; the most extreme response being the extinction of bioclimatic range.
- Australia's flora is also likely to be highly sensitive to climate change (Woodward and Rochefort 1991 cited in Bennett *et al.* 1991).
- FFG-listed fauna which are threatened by climate change include: Red-tailed Phascogale, Heath Rat, Mountain Pygmy-possum, Eastern Barred Bandicoot, Bridled Nailtail Wallaby, Eastern Quoll, Brush-tailed Bettong, Western Barred Bandicoot, Leadbeater's Possum, Smoky Mouse, Black-eared Miner, Red-lored Whistler, Orange-bellied parrot, Hooded Plover, Little Tern, Malleefowl, Regent Honeyeater, Sooty Owl, Plains Wanderer, Swift Parrot, Legless Lizard, Spotted Tree Frog, Trout Cod, Australian Grayling, Altona Skipper Butterfly and Giant Gippsland Earthworm.

Advertisement for public comment

In accordance with the requirements of Section 14 of the **Flora and Fauna Guarantee Act 1988**, the preliminary recommendation was advertised for a period of at least 30 days.

The preliminary recommendation was advertised in:

'The Age' - on 21 June 2000

'The Weekly Times' - on 21 June 2000

The *Government Gazette* - on 29 June 2000

Submissions closed on 4 August 2000.

Further evidence provided:

No public comments were received by the Scientific Advisory Committee.

No evidence was provided to warrant a review of the Scientific Advisory Committee's preliminary recommendation that the taxon is not eligible for listing.

Documentation

The published information provided to the SAC has been assessed. To the best of their knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported.

Final Recommendation of the Scientific Advisory Committee

The Scientific Advisory Committee concludes that on the evidence available the nominated item is eligible for listing in accordance with Section 11 of the Act because primary criterion 5.1 has been satisfied. The SAC also concludes that sub-criteria 5.1.1 and 5.1.2 have been satisfied and that no evidence exists to suggest that primary criterion 5.1 cannot be satisfied as a consequence of sub-criteria 5.1.1 and 5.1.2 being satisfied.

The Scientific Advisory Committee recommends that the nominated item be supported for listing on Schedule 3 of the **Flora and Fauna Guarantee Act 1988**.

Selected references:

- Bennett, S., Brereton, R., Mansergh, I., Berwick, S., Sandiford, K. and Wellington, C. (1991) The potential effect of the enhanced greenhouse climate change on selected Victorian Fauna. Report to the Greenhouse Unit, Office of the Environment. *Arthur Rylah Institute for Environmental Research Technical Report Series No. 123*.
- Busby, J. R. (1988) Potential impacts of climate change on Australia's flora and fauna, in: G. I. Pearman [ed]. *Greenhouse: Planning for climate change*. Pp: 387-398. CSIRO Division of Atmospheric Research: Melbourne.
- Dexter, E. M., Chapman, A. D. & Busby, J. R. (1995) The impact of global warming on the distribution of threatened vertebrates (ANZECC 1991). Report prepared for the Climate Change Unit. DEST, Canberra.
- Intergovernmental Panel on Climate Change Working Group 1 (1990) *Report 1: Scientific assessment of climate change*. Report to the IPCC: United Nations.
- Mansergh, I. M. & Bennett, S. (1989) Greenhouse and wildlife management. *Vic. Nat.* **106** (6): 248-252.
- NGGIC (1997) *National Greenhouse Gases Inventory 1995*. National Greenhouse Gases Inventory Committee. Department of Environment Sport and Territories, Canberra.

Woodward, F. I. & Rochefort, L. (1991) Sensitivity analysis of vegetation diversity to environmental change. *Global Ecol. Biogeog. Let.* 1: 7-23.

The National Greenhouse Gas Inventory (NGGI) for the year 1998 provides a comprehensive view of Australia's greenhouse gas emissions. Six sectors are covered: Energy, Land Use Change and Forestry, Agriculture, Industrial Processes, Solvent and Other Product Use, and Waste.

The Australian Greenhouse Office can be found at the following web address:

<http://www.greenhouse.gov.au/>

Endorsement by the Convenor of the Scientific Advisory Committee

Date



Prof. Virginia Studdert
Convenor

18 SEP 2000