Endemic infectious diseases of biodiversity concern in Australian wildlife

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Introduction

Due to long geographic isolation, Australia's native wildlife is particularly susceptible to the interacting threats of competitors, predators and disease [1]. Some of the infectious diseases occurring in free-living Australian wildlife species are of concern due to their impacts at the population level. This document identifies endemic (present in Australia) infectious diseases that are known to have (or considered likely to have) population level impacts on Australian native wildlife species, and that could consequently pose a concern for biodiversity.

Inclusion of an endemic disease in this document does not guarantee or mandate any biosecurity, veterinary or diagnostic activities linked to mitigation of the disease impact. However, by identifying these diseases, Wildlife Health Australia (WHA) aims to:

- raise awareness of these diseases in the context of Australian wildlife health
- promote discussion of the population-level effects of these diseases in Australian native wildlife
- provide a basis for enhanced support for surveillance, research and management of these diseases in Australian wildlife.

Readers are encouraged to share the document widely to support these aims.

The document will be reviewed and updated by WHA, as needed.

Defining "biodiversity concern"

Infectious disease can threaten biodiversity through direct reduction of the number, size or distribution of populations of a given species. Additionally, disease-induced population declines can lead to broader consequences in ecosystems [2, 3], or exacerbate the impacts of other stressors acting on a species. For example, infectious disease may compound other threats such as habitat loss and climate change, driving a wildlife species closer to extinction [4], or hindering the recovery of endangered species populations [5]. Alternatively, existing stressors may make individuals more vulnerable to infectious disease [6].

It can be difficult to conclusively demonstrate that infectious disease is causing impacts in wild species sufficient to present a concern to biodiversity. For the purposes of this document, an endemic disease is considered to be of "biodiversity concern" to Australian wildlife [7] if any of the following outcomes are known, or suspected, to occur as a result of the disease:

- the number of populations of a species are reduced
- the size of individual population/s of a species are reduced
- the overall geographic distribution of a species is reduced
- any population decline occurs that is sufficient to worsen the conservation status of the species at the national or jurisdictional level
- there is a loss of genetic diversity within the species.

Scope for disease inclusion

To be considered for inclusion in the list, diseases were required to fall within the following scope:

- **Infectious diseases only**. Although non-infectious diseases are acknowledged to have impact on Australian wildlife, this document is restricted to infectious diseases (that is, those caused by bacteria, fungi, viruses or parasites that can spread from one individual to another).
- **Species scope:** the disease occurs in *free-living Australian native wildlife* species (mammalian, bird, reptile and amphibian). Fish and invertebrate diseases are not addressed.
- **Geographic scope:** mainland Australia, Tasmania and Australia's near offshore islands. Off-shore islands, such as Christmas Island, are not included.
- **Impact of the disease** is primarily of concern to free-ranging wildlife, not humans or domestic animals.
- **Currently present in Australia.** For more information on diseases that are exotic (not present in Australia) but which pose a potential threat to native wildlife populations, refer to WHA Fact Sheets for animal diseases exotic to Australia and to the National Priority List of Exotic Environmental Pests, Weeds and Diseases – Native Animal Diseases.

Table 1 Endemic infectious diseases of biodiversity concern to Australian wildlife
Diseases are listed in alphabetical order. WHA Fact Sheets are available for all diseases in the table.

Disease and causative agent	Species of concern	Biodiversity impact
Beak and feather disease (Psittacine circovirus)	Psittacine birds	Widespread, population-level impacts are likely in endangered species [8]. Believed to be long-term endemic disease in some Australian psittacines.
Bellinger River virus (Serpentovirus; *species Berisnavirus*)	Bellinger River snapping turtle (*Myuchelys georgesi*)	In 2015, an outbreak of this novel nidovirus caused deaths of hundreds of free-living Bellinger River snapping turtles with an estimated 90% population decline [9]. The turtle is now listed as critically endangered due to severe threat of extinction as a result of the disease [10]. The source and geographic extent of the virus are not known.
Chlamydiosis (*Chlamydia pecorum*)	Koala (*Phascolarctos cinereus*)	This intra-cellular bacterium causes widespread infections in koalas with population-level impacts of poor welfare, morbidity, reduced fertility and mortality [11]. Northern koala populations are federally listed as “vulnerable” [12]. This disease was most likely introduced to Australia since European colonisation, in spill-over events from livestock species [13].
Chytrid fungus (*Batrachochytrium dendrobatidis*)	Many frog species	This fungus causes widespread infections; with significant population level impacts of morbidity and deaths; there is documented extinction of several frog species [14]. Federally listed as a “Key Threatening Process” with a Threat Abatement Plan [15]. The fungus was most likely introduced to Australia in recent decades.
Devil facial tumour disease	Tasmanian devils (*Sarcophilus harrisii*)	This transmissible neoplastic disease has caused massive decline of Tasmanian devils with resultant ecosystem impacts [16]. It is a recently evolved disease threat [17]. It is included in this list as it is directly transmitted from one individual to another.
Sarcoptic mange (*Sarcoptes scabiei*)	Wombats (bare-nosed; *Vombatus ursinus* and southern-hairy nosed; *Lasiorhinus latifrons*) and koalas	This parasitic disease has a widespread occurrence with population level impacts in bare-nosed wombats (morbidity, welfare, death) [18, 19]. It is a potential threat to the critically endangered northern hairy-nosed wombat. There are significant animal welfare concerns. It was almost certainly introduced to Australia with European colonisation [20].
Toxoplasmosis (*Toxoplasma gondii*)	All native mammals, some species considered particularly susceptible (e.g. bandicoots, wombats)	This protozoon is spread by cats; persists in environment for extended periods; and has a very wide intermediate host range with likely population level impacts [21]. Australian native species may be evolutionarily naïve [22, 23] and sub-lethal infection in intermediate hosts may increase risk of predation or capture [24-26]. It was introduced to Australia with European colonisation.
Uncinaria sanguinis hookworm	Australian sea lion (*Neophoca cinerea*)	Australian sea lions are endangered, and this parasite contributes to high pup mortality, which can vary from season to season [27, 28].

Other information

See Wildlife Health Australia’s Fact Sheets (https://wildlifehealthaustralia.com.au/Resource-Centre/Fact-Sheets) and the Australian Registry of Wildlife Health website (https://arwh.org/common-diseases) for more detailed information on the many diseases found in Australian wildlife.

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