Mass mortality events of birds in Australia

Fact sheet

Introduction

This fact sheet presents some of the **most commonly reported** causes of mass mortality events in Australian **wild** birds. Wildlife Health Australia fact sheets (www.wildlifehealthaustralia.com.au/FactSheets.aspx) provide more information on many of the diseases mentioned. Other possible, but less common, causes of mass mortalities and those likely to result in only a small number of deaths at one time are included for completeness, but have been given less emphasis.

Definition of a mass mortality event

For the purposes of this fact sheet, a mass mortality event is defined as one involving the death of **five** or more birds within a relevant period of time and geographic area.

Common causes of mass mortalities in birds in Australia

Table 1 presents the most commonly reported and recognised causes of mass mortality in wild birds in Australia, by host species, common host factors and environmental factors.

The **majority** of causes fall within the following categories:

1. pesticide or other ingested intoxications (e.g. lead)
2. botulism
3. starvation and exhaustion.

Other **occasional** causes include:

4. heat stress
5. storm trauma
6. infectious causes such as *Chlamydia*, *Spironucleus*, Salmonella DT160, beak and feather disease virus.

In many cases of mass mortality in wild birds in Australia, the cause remains uncertain. Investigation may reveal chronic disease processes (such as beak and feather disease) however, it is often difficult to determine, if, and to what degree, these chronic diseases are contributing to the mass mortality event.

More detailed information is presented in the **Appendix**: Additional information on causes of mass mortality in Australian wild birds.

You can report an avian mass mortality event to your wildlife coordinator (see www.wildlifehealthaustralia.com.au/DiseaseIncidents/ReportanIncident.aspx). If you suspect an Emergency Animal Disease, call the free **Emergency Animal Disease Watch Hotline** (**1800 675 888**).

Table 1: Commonly reported and recognised causes of mass mortality in wild birds in Australia by host species, location or other environmental factors

Cause	Species commonly affected	Common species factors	Common environmental factors	Zoonotic	WHA Fact Sheet
Most commonly reported causes					
Pesticide intoxications	Flocking cockatoo species (e.g. corellas, galahs), pigeons, ducks, passerines.	Species likely to ingest free feeds such as grains; those that frequent farm and/ or urbanised areas.	Birds' exposure to agricultural chemicals (generally via feed), either accidentally or deliberately.	No	Yes
Botulism	Waterfowl, especially ducks.	Species inhabiting typical waterbodies.	Warm weather, stagnant water bodies with lowering water levels, build-up of maggots and rotting carcasses.	No	Yes
Starvation and exhaustion	Shearwaters, barn owls, little penguins, others.	Immature birds, migratory species on first migration.	Annual migration, storms and other weather events, poor food resources.	No	Yes[1]
Enteritis e.g. Spironucleosis/necrotic enteritis	Australian king parrots (and other psittacines)/rainbow lorikeets?	Juveniles.	South-east Australia, winter months. Use of feeding stations. Poor food hygiene.	No	Yes
Other recognised causes					
Heat stress	None commonly reported.	Possibly larger species?	Extremes of hot weather, especially for a prolonged period of time.	No	No
Storm trauma	None commonly reported.	None reported.	Wild weather, hail storm etc.	No	Yes[1]
Chlamydiosis	Psittacines, pigeons, passerines (other species less commonly).	Clustering (possible).	Use of feed stations. Colder weather (possible).	Yes	Yes
Neurological syndrome in black and white birds	Magpies, ravens, currawongs etc.	Primarily families *Dicruridae* and *Artamidae* of *Passeriformes*.	NSW coastal regions (possibly other areas).	No	Yes
Lead poisoning	Waterfowl, raptors (lead shot). Honey-eaters and lorikeets (lead dust).	Subject to, or in the vicinity of, hunting (lead shot). Nectar-feeders (lead dust).	Availability of environmental lead - spent shot and bullets or industrial sources.	No	Yes
Salmonellosis (DT160)	Sparrows. (Other species may be affected).		Clustering of birds, often at feeding stations.	Yes	Yes
Psittacine beak and feather disease (rarely)[2]	Psittacines.	Juveniles (nestlings and fledglings), certain species.	Not reported.	No	Yes

[1] *Shearwater mass mortalities* Fact Sheet

[2] Although not typically associated with mass mortalities wild birds, PBFD is included here because of potential importance to some threatened psittacine species

Appendix: Additional information on causes of mass mortality in Australian wild birds

A. Intoxications

I. Pesticide toxicity

The majority of cases involve exposure to organophosphates, but other documented cases include organochlorines and anticoagulant rodenticides. See WHA fact sheet "Pesticide toxicity in Australian native birds'.

II. Lead poisoning

Mass mortality events in birds have been associated with the ingestion of spent lead shot and bullets and exposure to lead dust from industrial sources. Mass die-offs of honeyeaters and purple-crowned lorikeets occurred in Esperance in 2006-2007 from lead intoxication, following environmental contamination from industrial sources. See WHA fact sheet "Lead poisoning in Australian Birds"

B. Botulism

In Australia, the most commonly affected avian groups are waterbirds and mortality events are relatively common (Grillo et al. 2013b). See WHA fact sheets "Botulism in Australian Wild Birds" and "Diagnosing Botulism in Birds in Australia".

C. Natural population events

Starvation and exhaustion

Common examples include: death of large numbers of shearwaters (*Puffinus* and *Ardenna* spp.) at the end of their trans equatorial migration (Grillo et al. 2014a); mortalities of little penguins (*Eudyptula minor*), thought to be the result of increasing population in the face of decreasing food supply, and mortalities of barn owls (*Tyto alba*) following a crash in house mouse (*Mus musculus*) numbers (Obendorf and McColl 1980; McOrist S. 1989; Ladds 2009). Exacerbation of existing parasitic burdens and effects of severe weather events are thought to contribute to these mortalities (Obendorf and McColl 1980; Ladds 2009). See the WHA fact sheet "Shearwater mass mortalities" and information on storm trauma, floods and droughts, below.

D. Diseases of unknown origin

Neurological syndrome in black and white birds

Neurological syndrome in black and white birds, also known as "black and white bird disease", is a syndrome of neurological, respiratory and gastrointestinal disease affecting Australian magpies (*Cracticus tibicen*), Australian ravens (*Corvus coronoides*) and pied currawongs (*Strepera graculina*) with occasional reports in other species. Most reports are from NSW coastal regions. Three events occurred in 2003, 2005-2006 and 2015, with sporadic cases continuing to occur. Clinical signs include varying paresis to paralysis, blood in the oral cavity and faeces with some diarrhoea and increased respiratory effort. A viral aetiology is suspected (Jarratt and Rose 2016). See WHA fact sheet "Neurological syndrome in black and white birds".

E. Weather events and natural disasters

I. Heat stress

Reports of deaths of large numbers of birds from exposure to extreme environmental heat in Australia date back to at least 1791 (McKechnie et al. 2012). Recent examples include over 200 Carnaby's black cockatoos (*Calyptorhynchus latirostris*) dying near Hopetoun, WA on a day when temperatures reached 48˚C, and thousands of birds, mainly budgerigars (*Melopsittacus undulatus*)

and zebra finches (*Taenopygia guttata*) dying at the Overlander Roadhouse in northern WA when temperatures rose to over 45˚C for several days running (Grillo and Post 2010b; Saunders et al. 2011; McKechnie et al. 2012). In this latter case, birds were often found next to water holes, indicating heat rather than dehydration was the cause of death (McKechnie et al. 2012).

II. **Storm trauma**

Storm conditions can add stress to already compromised birds, leading to increased mortalities from other causes, but can also be the primary cause of death. In an example from Perth, WA, 57 Carnaby's black cockatoos are reported to have died from trauma after being struck by hailstones during March 2010 (Saunders et al. 2011). Cyclones also cause direct mortality from exposure to wind, rain and storm surges as well as indirect mortality from loss of food supplies and increased risk of predation (Wiley and Wunderle 1993).

III. **Other less common environmental causes**

Flooding can result in direct mortality of birds, particularly ground nesters, through drowning, and indirectly through the introduction of infectious agents. Paradoxically, a boom in reproduction post flooding can also lead to mass mortality (e.g. Australian pelicans (*Pelecanus conspicillatus*) breeding on inland waterbodies) as food resources eventually dwindle, leading to death by starvation, particularly of young of the year (Kingsford et al. 1999; Poiani 2006). **Drought** and low rainfall periods can result in mass die-offs, particularly in bird species dependant on waterbodies for survival (Kingsford et al. 1999). **Large, hot bush fires** can result in very high avian mortality, with birds apparently dying of suffocation, smoke inhalation and direct incineration. In smaller spot fires and controlled burns, birds appear to be able to escape. Impacts on resource availability following the fire can lead to indirect mortality of species reliant on small fragments of specific habitat (Woinarski and Recher 1997).

F. Infectious diseases

The following have been confirmed as **occasional** or **rare** causes of mass mortality in Australian birds:

I. **Avian chlamydiosis**

Avian chlamydiosis is caused by the bacterium *Chlamydia psittaci*. Psittacine birds (parrots) are most susceptible, but disease can occur in any species, with mortality occurring as individual events and mass mortalities. Mass mortalities were reported in Australian ringneck or 'twenty-eight' parrots (*Barnardius zonarius semitorquatus*) and red-capped parrots (*Purpureicephalus spurius*) in two separate events in SW WA, where wild birds had been using feeding stations. A significant proportion of Chlamydia associated cases entered into eWHIS involve mass mortalities (Grillo and Post 2010a). This pathogen is **zoonotic**. See WHA fact sheet "Chlamydia in Australian Wild Birds".

II. **Salmonellosis (*Salmonella* Typhimurium DT160)**

Salmonellosis caused by *Salmonella* Typhimurium DT160 has recently emerged in Australia with the first report in birds occurring in Tasmania in 2009 and on mainland Australia in 2016 (Grillo 2009; Grillo et al. 2016). Outbreaks are most commonly associated with house sparrows (*Passer domesticus*), but a range of avian species have been affected. This pathogen is **zoonotic**. See WHA fact sheet "*Salmonella* Typhimurium DT 160 in house sparrows in Australia".

III. **Spironucleosis**

Spironucleosis is a parasitic disease caused by flagellated protozoa from the genus *Spironucleus*, which populate the intestine. It leads to wasting, diarrhoea and death in young parrots (Philbey et al. 2002). The disease affects primarily Australian king parrots (*Alisterus scapularis*), but is occasionally reported in other psittacines (Grillo et al. 2014b). See WHA fact sheet "Spironucleosis in Australian wild birds".

Other potential causes (which are present in Australia) but with no or scant reports of mass mortalities in Australia to date:

I. **Pasteurellosis**
In some areas of the world *Pasteurella multocida* causes vast mass mortality of birds, most often waterfowl (Samuel et al. 2007). In Australia, in 2013 two small mortality events occurred in Victorian waterfowl (Grillo et al. 2013a). See WHA fact sheet "Pasteurellosis in Australian waterbirds".

II. **Haemosporidia**
Haemosporidia are single-celled parasites in the genera *Leukocytozoon, Haemoproteus* and *Plasmodium*. Many haemosporidia are highly host-adapted and rarely cause mortality in their primary host. When infection occurs in a naïve population, mortality rates can be high (Atkinson 2008). Disease and mortality events associated with haemosporidia have been reported in wild little penguins and Nankeen kestrels (*Falco cenchroides*) in Australia (Raidal and Jaensch 2000; Cannell et al. 2013). See WHA fact sheet "Haemosporidia and Australian wild birds".

III. **Necrotic enteritis in lorikeets**
This condition is seen in rainbow lorikeets (*Tachyglossus haematodus*) and is also reported in other lorikeets and Australian king parrots (McOrist Steven and Reece 1992; Rose 2005b). The enteritis appears to develop following consumption of inappropriate food, typically high in carbohydrates, which allows for overgrowth of bacteria (Rose 2005a). Inappropriate and supplementary feeding by humans and poor hygiene of feed stations are believed to be contributing factors (Grillo and Post 2012).

IV. **Pigeon paramyxovirus**
See WHA fact sheet "Avian paramyxoviruses in Australian wild birds".

V. ***Escherichia albertii***

VI. See WHA fact sheet "Escherichia albertii in birds in Australia".

VII. **Psittacine beak and feather disease**
Psittacine beak and feather disease (PFBD) affects a wide range of parrot species in which it causes peracute death or acute disease and death in young birds, and chronic damage to the beak and feathers in older birds. Multiple cases resulting in mortality (but occurring over prolonged periods), have been reported in several wild species, notably sulphur-crested cockatoos (*Cacatua galerita*) and rainbow lorikeets (Grillo and Post 2010b). It has also been implicated in mass mortality of wild orange-bellied parrot (*Neophema chrysogaster*) nestlings (Das et al. 2015) and may pose a threat to endangered and vulnerable psittacine species in the wild (Peters et al. 2014; Raidal et al. 2015). The disease is caused by a group of related viruses in the *Circoviridae* family, including beak and feather disease virus (BFDV) and budgerigar circovirus. Research continues to discover new strains and further species are also expected to be found. Recent work indicates that many non-psittacine species also carry the virus and may act as reservoirs, but do not appear to be clinically affected (Amery-Gale et al. 2017). See WHA fact sheet "Psittacine Beak and Feather Disease".

Other potential causes which are <u>not</u> present in Australia:

(should be ruled out as part of routine mass mortality event investigations)

I. **Highly pathogenic avian influenza** has **not** been detected in Australia but has caused mass mortalities of wild birds in other areas of the world, including Asia. See WHA fact sheet "Avian influenza in wild birds in Australia".

II. **Exotic** strains of **avian paramyxovirus-1** have been responsible, **outside** Australia, for mass mortalities of wild double-crested cormorants (*Phalacrocorax auritus*), rock pigeons and psittacine and tropical species captured for the pet trade (Leighton et al. 2007). See WHA fact sheet "Avian paramyxoviruses in Australian wild birds".

III. **Exotic strains of West Nile virus**. Strains of West Nile virus present in Australia do not cause mortalities in birds, unlike strains present in North America. See WHA fact sheet "West Nile and Kunjin virus in Australia".

Conclusions

A wide range of causes of avian mass mortality have been identified in Australia, affecting a broad range of bird species. Some causes may also pose a disease risk for humans or other domestic and wild animals. It is important that mass mortalities in wild birds are thoroughly investigated to identify the inciting cause. In some cases, the aetiology may be difficult to identified and multiple factors may be contributing to the mortality event. Ongoing investigation is required to better understand the drivers and proximate causes of mortality events in avian species in Australia.

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To provide feedback on this fact sheet

We are interested in hearing from anyone with information on this condition in Australia, including laboratory reports, historical datasets or survey results that could be added to the National Wildlife Health Information System. If you can help, please contact us at admin@wildlifehealthaustralia.com.au.

Wildlife Health Australia would be very grateful for any feedback on this fact sheet. Please provide detailed comments or suggestions to admin@wildlifehealthaustralia.com.au. We would also like to hear from you if you have a particular area of expertise and would like to produce a fact sheet (or sheets) for the network (or update current sheets). A small amount of funding is available to facilitate this.

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