6 January 2021

**Submission on the possible arrangements for the 2021 duck season**

Thank you for the opportunity to provide input for consideration of the 2021 duck season.

BirdLife Australia is an independent science-based bird conservation organisation with over 220,000 supporters throughout Australia. Our vision is that native birds are protected, valued and enjoyed by all Australians. We support research, conduct monitoring and run citizen science programs to inform and guide conservation of birds and their habitat. We are the nation's primary repository of information on bird ecology and conservation, periodically reporting on the status and trends in Australia's bird taxa. Our programs and strategy are guided by advice from a Research and Conservation Committee of leading ecologists and ornithologists.

Unfortunately, Australia's wetland dependant birds have experienced long-term declines, with the rate of decline increasing over the last five decades. Eastern Australia's waterbird population, including game species, has declined as much as 90% over the last four decades. Water resource development in the Murray-Darling Basin and climate change have been identified as significant drivers of long-term declines in the abundances of ~50 waterbird species, indicating ecosystem-level change.

BirdLife's submission to the GMA provides evidence to supplement that collated in the GMA's *Considerations for the 2021 duck season* document (referred to as *the Considerations* herein). The submission also provides additional context to data presented in the Considerations in order to better assess the sustainability and conservation implications of a 2021 hunting season for 8 game duck species. It does not specifically consider implications for quail or the collateral implications for threatened species, wetland or grassland dependent birds.

The submission summarises:

- Evidence of ongoing waterfowl declines on several spatial and temporal scales (Porter et al 2020, Clemens et al 2019, Department for Environment and Water 2019.)
- A complacency towards maintaining standard baseline population levels for "common" species (Gaston, K. J., & Fuller, R. A. 2008, Lindenmayer et al 2011.)
- Findings of the Victorian Department of Environment, Land, Water and Planning's independent *Conservation Status Assessment Project* detailing that all three game duck species assessed (Freckled Duck, Australasian Shoveler and Hardhead) currently satisfy Commonwealth mandated Common

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Assessment Method (CAM) and IUCN criteria for retaining threatened status (Endangered and Vulnerable) in Victoria.

- Recent record-setting dry periods in large areas of Australia, and continued water harvesting during subsequent wet periods that is continuing to severely impact documented waterfowl habitat extent and quality in eastern Australia (Porter 2020, Bureau of Meteorology 2020, Sandi et al 2020, Wentworth Group 2020).
- The largely unmeasured, potential implications fire "slugs" from the 2019 megafires are having on wetland ecology and game duck populations (Alexander & Finlayson 2020, McInerney et al 2020.)
- New information reinforcing the universal significance the Murray Darling Basin plays in sustaining national waterbird populations (Howard 2017).
- The lack of obvious evidence of a negative correlation between waterbird trends in coastal and inland wetlands, suggesting that losses in habitat inland are not easily supplemented by waterbird dispersal to coastal refugia (Clemens et al 2019).
- An accumulating population demographic threat posed by sequential poor breeding seasons and the subsequent threat hunting poses to the remaining, ageing breeding-stock (Gauthier et al 2001, Fox et al 2015. Kingsford et al 2017)
- A paucity of robust, consolidated data to enable dynamic yearly reporting on game duck populations (Clemens et al 2019).

When considering the above in addition to the evidence already accumulated by the GMA, BirdLife recommends:

- That a precautionary approach to the sustainability of duck hunting and population recovery requires the cancellation of the 2021 season.
- The development of numerical targets for game bird populations.
- Increased collaboration on collection and consolidation among stakeholders (i.e., a national waterbird monitoring platform) to enable increased sensitivity in the detection of trends.
- That Australasian Shoveler and Hardhead are removed from the Victorian game species list, and thatFreckled Duck remains off the list.

## Large-scale population trends for game duck

As outlined in the Considerations; the 2020 *East Australian Waterbird Survey* (EAWS) documented a 23% decrease in the game duck abundance index from the previous year. Game duck abundance was recorded to be just 44% of the long-term average representing the 7th lowest on record. This result was the latest datapoint on a significant trend of overall decline recorded by the project across all four long-term indices: total waterbird abundance, wetland area, breeding and breeding species richness (Porter et al 2020).

Not only was overall game duck abundance low and continuing a trend of decline, but each game duck species has independently undergone decline over the 38 years of monitoring Figure 1. Long-term trends evident from East Australian Waterbird Survey

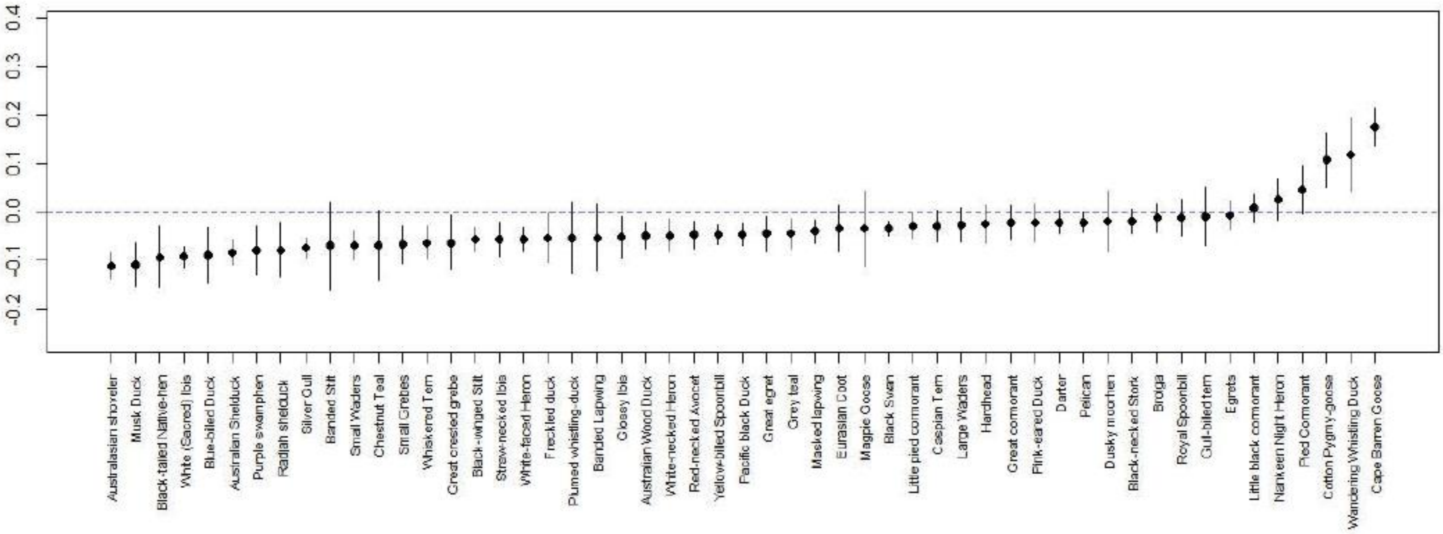


Figure 1. Long-term trends evident from East Australian Waterbird Survey data, the y-axis is roughly equivalent to percentage change per year (Clemens et al 2019)

data, the y-axis is roughly equivalent to percentage change per year (Clemens et al 2019 (Clemens 2019, Porter et al 2020).

Recent research utilizing elemental signatures in bird feathers to identify which of the 13 river basins birds were growing feathers at various stages of life, has reinforced the importance of Murray Darling Basin wetlands for waterbird breeding and recruitment. The FeatherMap project found that the Murray-Darling Basin was the key basin from which birds dispersed to other places in Australia. Overall, 60% of the feathers analysed were found to have grown in the Murray–Darling Basin wetlands. The importance of the Murray–Darling system to Australia’s waterbirds cannot be underestimated and maintenance of sustainable waterfowl populations are of national significance. Eleven of 13 of Australia’s other basins from which feathers were

submitted contained feathers grown in the Murray Darling Basin (Brandis unpublished feathermap.ansto.gov.au).
BirdLife's *Waterbird Index* analysed over two million[1] waterbird records from 25 databases (including the EAWS and waterfowl and wetland databases from six state and territory departments) spanning as far back as 1971. The report illustrated that persistent decline is not unique to eastern Australia but may be more pronounced in certain species and/or regions (Clemens et al 2019).

The study demonstrated that six of the eight game duck species have undergone significant long-term population declines (Table 1). Although declines were more prevalent across the longer term, trends were also detected continuing over the medium-term for three species and short-term trajectories were trending downwards for seven (Table 1, Table 2.) No game species have shown population recovery.

*Table 1.* Waterfowl showing wide-spread long-term population declines in Australia, with medium term trends (last 21 years), and short-term trajectories (last 5 years) also reported: Declining = 95% confidence intervals of slope were negative and did not span zero, no trend = insignificant results, increasing = 95% confidence intervals of slope were positive and did not span zero, trajectory in last 5 years was judged visually from 13 year smoothed averaged

| Species | Long-term trend | Medium-term trend | Short-term trajectory |
|---|---|---|---|
| Australian Shoveler | Declining | Declining | Flat |
| Musk Duck | Declining | Declining | Flat |
| Blue-billed Duck | Declining | No-trend | Flat |
| Australian Shelduck | Declining | Declining | Down |
| Radjah Shelduck | Declining | Declining | Down |
| Chestnut Teal | Declining | Declining | Down |
| Freckled Duck | Declining | No-trend | Down |
| Australian Wood Duck | Declining | No-trend | Down |
| Pacific Black Duck | Declining | No-trend | Down |
| Grey Teal | Declining | No-trend | Down |

*Table 2.* Waterfowl, showing no evidence of long-term population declines in Australia, with medium term trends (last 21 years), and short-term trajectories (last 5 years) also reported: Declining = 95% confidence intervals of slope were negative and did not span zero, no trend = insignificant results, Increasing = 95% confidence intervals of slope were positive and did not span zero, trajectory in last 5 years was judged visually from 13 year smoothed averaged.

| Species | Long-term trend | Medium-term trend | Short-term trajectory |
|---|---|---|---|
| Pink-eared Duck | No-trend | No-trend | Down |
| Hardhead | No-trend | No-trend | Down |

[1] BirdLife's reporting selected two million records from over four million utilising only data with sufficient timescales and methods for robust analysis.

## Conservation targets for waterfowl

The Waterbird Index demonstrated large decreases in waterbird abundance since the 1980s. Furthermore the boom many populations experienced following the 2010/11 floods in eastern Australia was short-lived and abundance and breeding returned to drought levels, negating hopes of recovery. These large scale-declines point towards a need to review the conservation targets of waterbird species in order to ensure large flocks of waterbirds persist in Australia (Clemens et al 2019).

Traditionally conservation and monitoring efforts have been focused on species with small populations and/or geographic ranges however, as we are witnessing with waterfowl, seemingly common species are also susceptible to decline.

Such declines in large waterbird populations are perhaps most evident and well documented in migratory shorebird populations. Long-term monitoring projects have allowed us to detect these declines and implement management interventions and policy changes leading to national and international threatened species listings for several species including the Critically Endangered (EPBC) Eastern Curlew (Figure 2). A complacency towards the status of common species like Australian game ducks poses a real threat to their long-term conservation especially in species that may be:

- Eruptive or cyclical and hence periodically common (e.g. Krebs et al., 2001; Robin et al., 2009).
- Generalists capable of exploiting a wide range of environmental conditions.
- Specialized on widespread environmental conditions (Lindenmayer et al 2011).

To reduce extinction risks caused by incremental or dramatic depletion events of abundant species, we believe there is a need to develop better monitoring programs that can detect changes in the population trajectories, help identify the reasons for temporal changes in such populations, and underpin timely management interventions (Gaston & Fuller 2008, Lindenmayer et al .2011, Clemens et al 2019). Furthermore, baseline population estimates and thresholds for satisfactory population fluctuation need to be developed. Currently there is an overwhelming lack of accountability and expectation around game duck population recovery based on annually quoted long-term population average.

It is important to note that two game species, Australasian Shoveler and Hardhead, have both recently satisfied threatened species criteria in the Victorian Department of Environment, Land, Water and Planning's 2020 independent *Conservation Status Assessment Project*. The species retained Vulnerable status assigned in the *Fauna Guarantee Act 1988* and the revised *Advisory List of Threatened Vertebrate Fauna 2013* by satisfying Commonwealth approved Common Assessment Method (CAM) criteria based on international standards developed by IUCN[2]. Given the recent confirmation of the threatened status of these species BirdLife requests that they join Freckled Duck (affirmed as Endangered in the 2020 CAM) as species removed from the list of game species.

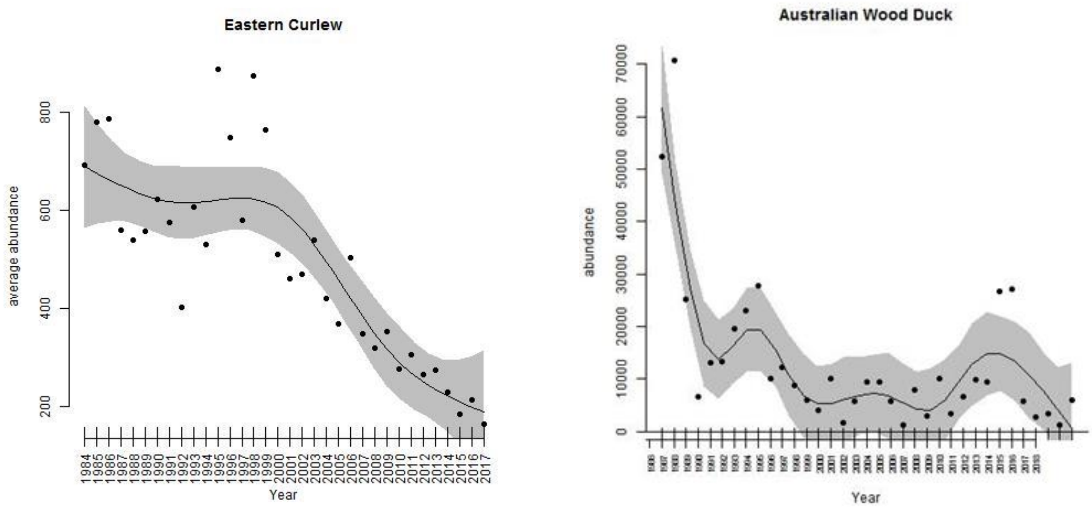


*Figure 2. Trends for two declining Australian waterbirds. Eastern Curlew (left) has met criteria for threatened species listing and is recognised as Critically Endangered federally, attracting high conservation priority. Australian Wood Duck (right) has undergone similar declines historically however does not satisfy current threatened species listing criteria and remains unlisted.*

## Habitat extent

As outlined in the Considerations, the EAWS documented the 5th lowest wetland area index in 38 years, representing just 42% of the long-term average. There was only a marginal net gain in total wetland extent as wetland area increased in the Murray Darling Basin but decreased in the Eyre Basin.

The Bureau of Meteorology (BOM) reports that over half of the country has been in severe rainfall deficiency for the 32-month period from April 2018 to November 2020. Regions affected include northeast New South Wales and the southeastern quarter of Queensland, western New South Wales, north-western and eastern Victoria, much of South Australia, Western Australia, and the Northern Territory. The 2018-2019 and

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[2] Only previously listed species were assessed in the project however given the obvious ecological and life-history overlaps between these species and the other 6 game species BirdLife will be investigating additional FFG listing nominations.

2017-2019 were classified as the record lowest two and three year rainfall totals, respectively, for the Murray–Darling Basin and for New South Wales. Rainfall for the northern Murray–Darling Basin for these periods was lowest on record by a substantial margin, breaking records originally set during the Federation Drought in 1900−1902. In Victoria, West Gippsland and East Gippsland each had their driest three years on record from 2017- 2019.

For one or more months in early 2020, average or above average rainfall for south east Australia partially restored groundwater levels and soil moisture in the Murray Darling Basin however serious or severe longer-term rainfall deficiencies persist over very large areas. More importantly these drought-breaking rains were evidently not sufficient to boost waterbird numbers and facilitate the large-scale breeding events witnessed on the back of 2010/11 flooding associated with Cyclone Yasi (Porter et al 2020). Consistently low wetland extent index results suggest that water which would have historically flowed over floodplains, providing critical episodic breeding opportunities for waterbirds, is now being increasingly diverted into dams and irrigation or lost from the system via other mechanisms (Wentworth Group 2020). Where flooding did occur in the Murray Darling Basin and waterbirds congregated (e.g. the Macquarie Marshes) flood events were smaller and shorter. This reduced hydroperiod and lower water quality from reduction in water level and flow limits sites used by waterbirds. In dryland wetlands these factors may reduce chick survivorship as they cannot metabolize saline water, which makes suitable freshwater conditions a limiting resource (Haig et al 2019).

The size of the rainfall deficit accumulated over annual and longer timescales remaining over very large areas of Australia, effecting soil moisture content, streamflows and overall wetland extent and quality. Persistent, widespread, above-average rainfall is needed to lift areas out of deficiency in annual and longer timescales and provide wetland ecosystems relief from prolonged periods of drought (BOM 2020).

A combination of drought tolerance and dormancy strategies allow wetland vegetation and overall condition to recover after droughts and recolonize areas invaded by terrestrial species. However, recent climate change modeling has illustrated projected scenarios of more frequent and prolonged drought result in reduced wetland resilience and suggest widespread degradation during drought and limited recovery after floods. Importantly, the combination of degradation extent and increase in drought duration will severely influence habitat services wetland systems provided for waterbirds and fish (Sandi et al 2020).

Prolonged dry periods, low habitat extent and poor recruitment magnify effects of any external threat including hunting (Kingsford 2017). A population bottleneck may also act to concentrate birds in remaining wetlands making a larger proportion susceptible to hunting pressure further impacting population recruitment.

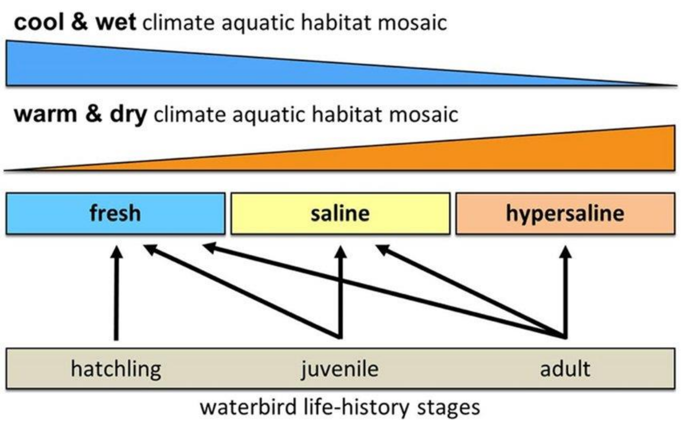

Figure 3. Hydro-climatic relationships in dry systems. Associations of climate variability with wetland water type (fresh, saline and hypersaline) and the connection to specific waterbird life-history stages. The relationship between wetland type and climate illustrates the contraction of variability in wetland type during wet (blue wedge) and dry (orange wedge) years. As shifts continue toward a warmer, drier climate, the diversity of wetland types will transform. With the exception of waste water processing facilities, wetlands with stable near full water levels as a result of river regulation rather than from overbank flows are not as beneficial for waterfowl due to the low nutrient cycling. (Haig et al 2019)

Predicted above average rainfall associated with the current La Niña event has so far been suppressed with a drier than expected November. This has resulted in lower than expected increase in soil moisture for the east coast with some localized flooding.

Although above average rainfall is expected this summer, BOM have reviewed streamflow forecasts since they were reported on in the Considerations. Normal to low streamflow is now expected for 50% of locations with higher flows concentrated on the east coast (Figure 4). These coastal systems, many ravaged by fire in the summer of 2019/20, have already received some extreme pulses in early 2020. After fires, these burnt areas are highly vulnerable to erosion and heavy rain will bring large quantities or 'slugs' of sediment, ash, and nutrients along with much greater flows of water than from an unburnt catchment. Fires can also lead to soil "hydrophobia", where soil refuses to absorb water, which can generate more runoff at higher intensity. Ash and contaminants from the fire, including toxic metals, carbon and fire retardants (PFAS), along with the associated turbidity can also threaten biodiversity in streams and accumulate in wetlands (Alexander & Finlayson 2020, McInerney et al 2020).

Large areas of northeast Victoria were burnt in the 2019 megafires. While this region accounts only for 2% of Murray-Darling Basin's entire land area, water flowing in from northeast Victorian streams (also known as in-flow) contributes 38% of overall in-flows into the Murray-Darling Basin.

While we can't predict when major runoff events will occur, we can predict that they will adversely affect water quality and waterway health (Alexander & Finlayson 2020, McInerney et al 2020). The long-term implications of this for game duck and those who eat them is yet to be fully realised and requires ongoing monitoring.

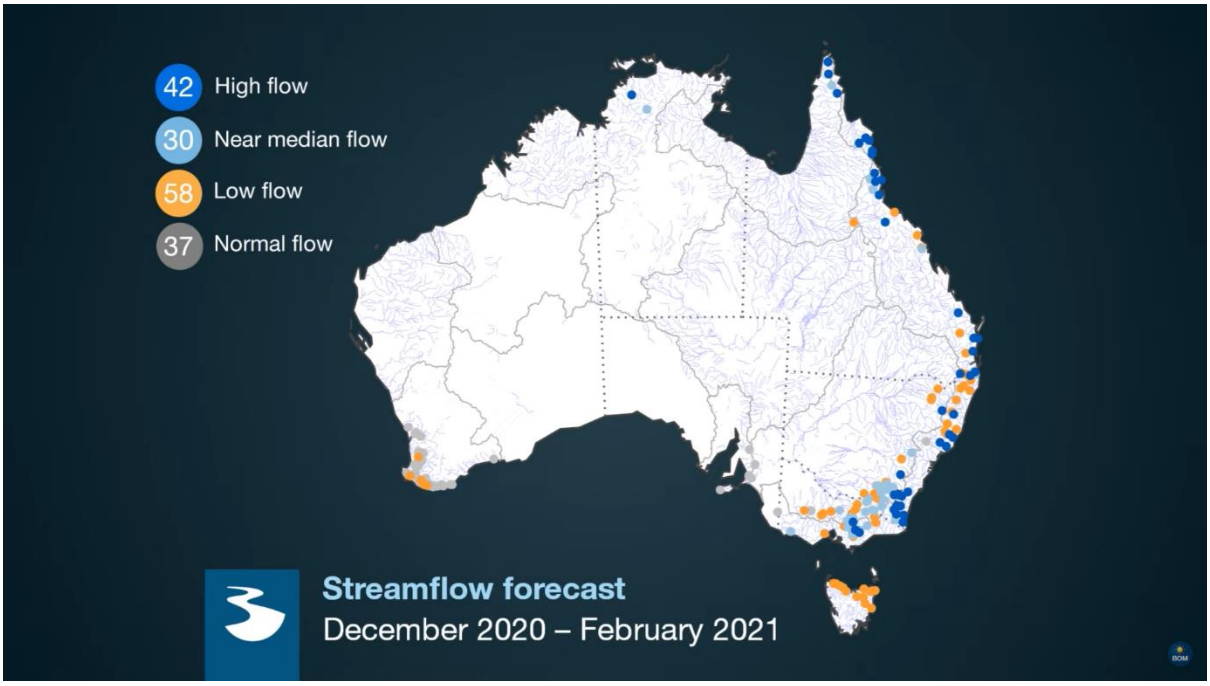


*Figure 4. Streamflow has a direct influence on waterbird habitat extent. The updated BOM forecast for December 2020 to 21 indicates increased flows will by largely concentrated on the eastern side of the range.*

## Alternative habitats in dry periods

It has been previously argued that the loss of inland wetlands is supplemented by capacity at coastal and marine and habitats. Indeed the Waterbird index project expected to find large and obvious negative correlation in waterbird data between coastal and inland wetlands due to reported evidence of birds movement to and from the coast (Alcorn, Alcorn et al. 1994, Wen, Saintilan et al. 2016). However available data did not show much evidence of negative correlation (mean r = 0.16; range: -0.23 to 0.76). Trends were often similar between coastal data and inland sites suggesting that losses in habitat inland are not easily supplemented by waterbird dispersal to coastal refugia (Clemens et al 2019).

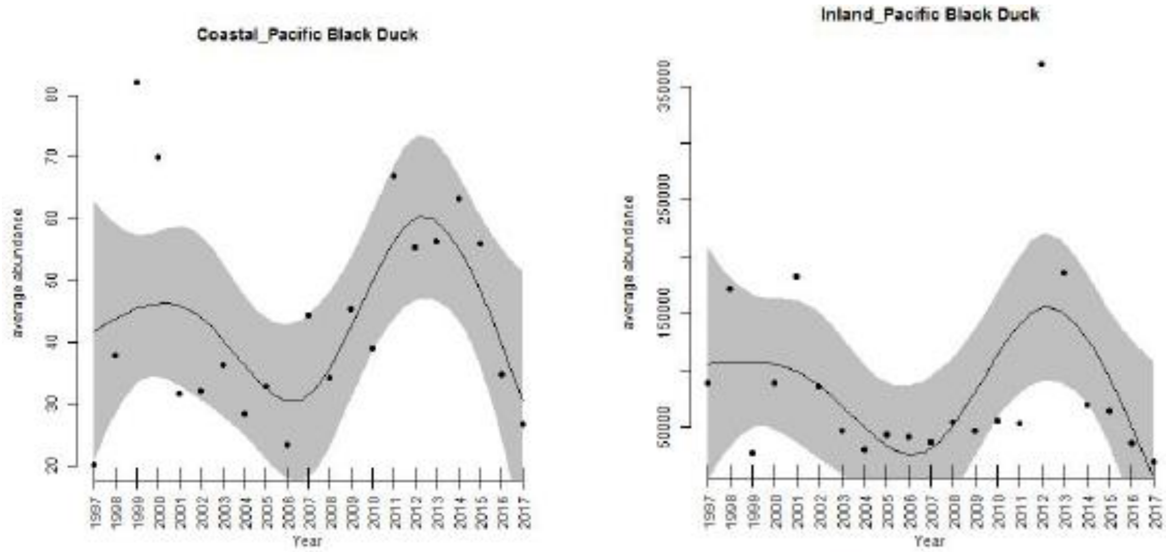


*Figure 5. Comparisons of average abundance observed between coastal and inland wetlands for Pacific Black Duck*

| Species | Correlation | Species | Correlation |
|---|---|---|---|
| Australian Shoveler | -0.15 | Australian Wood duck | 0.13 |
| Chestnut Teal | -0.02 | Pacific Black Duck | 0.14 |
| Australian Shelduck | 0.02 | Musk Duck | 0.14 |
| Hardhead | 0.10 | Grey Teal | 0.75 |

*Table 3. Correlation values r for all game duck species with adequate data in Australian coastal and inland areas*

## The accumulating risk of poor breeding and recruitment – the demographic cliff

Recruitment (via dispersal or reproduction) is an important driver of population dynamics and community composition. The effects of recruitment are most significant when populations and communities are resource dependent. Many waterbird species, for instance, are aquatic obligates and depend on freshwater habitats to support every aspect of their life history. Variation in recruitment success among waterbirds is often the result of compounding, broad-scale factors, including climatic patterns and flow regime modification. These factors may strongly impact the number of successful recruits by removing habitat and changing the food supply thereby limiting the abundance of some species and excluding others, altogether. Data on variation in recruitment success, and on the role of broad-scale environmental factors in driving this variation, is therefore critical for understanding changes in waterbird population dynamics and community composition.

An unfortunate and critical shortcoming regarding most waterbird species in Australia is that we lack reliable data on recruitment success at the catchment and basin-level. Most long-term datasets use breeding events, breeding species richness and overall abundance of waterbird species as proxies for recruitment. While these are useful indices, they are granular and lack the resolution to track demographic change within waterbird populations. The EAWS dataset, for instance, is one such independent large-scale monitoring program, which provides informative trends of breeding population sizes for game duck species, and these can be compared to those of close relatives which are not hunted. The EAWS dataset is rare in the Australian context in terms of scale with breeding populations of both common and rare waterbirds being monitored for decades, enabling the assessment of individual species' trends. This dataset has the significant advantage of providing independent assessments of spatial and temporal variations in the abundance of many species with a standardised protocol.

Nevertheless, there are limits to what can be derived from the EAWS dataset. While recruitment indicators (i.e. breeding success) have been trending down for approximately four decades, recruitment success can only be coarsely garnered from this dataset. Despite this, only three species were recorded breeding in 2020 with Black Swan comprising 81% of all breeding records in the EAWS.

Of the eight species of native duck that may be hunted in Victoria, few breeding events have been recorded since 2012 according to the EAWS (well below the long-term average). The average lifespan of these species is approximately eight years with sexual maturity reached within one year of hatching. Given this, there are reasonable concerns that these species are approaching a "demographic cliff" with questions relating to whether reproductive individuals are replaced at the same rate as they are removed, looming large. While the EAWS does monitor the proportion of breeding individuals and the number of offspring produced, the turnover of reproductive individuals is difficult to accurately determine and so, the true magnitude of the problem may yet to be realised.

Controls on hunting are intended to ensure a balance between the social and economic value of the activity, and the long-term interest of maintaining healthy and viable populations of huntable waterbird species. This means that such controls should be informed by and responsive to in-depth monitoring of waterbird population dynamics and demographics. Despite this, data that would provide insights into the population demographics of huntable Australian waterbirds are largely absent or inaccessible. Drawing from European examples, collecting targeted data can provide greater clarity around the structure of populations. Traditionally, intensive individual banding schemes have been used to track the impact of hunting on waterbird population dynamics and demographics and have revealed that mortality rates associated with hunting can be additivity to natural mortality rates (Gauthier et al.). Other methods have also been used, for example, the percentage of yearlings in wintering flocks has been used as a measure of annual wild geese productivity (e.g. Alisauskas 2002; Patterson and Hearn 2006). Similar proxies for wigeon have been developed, based on the proportion of first-year birds in annual wing samples provided by hunters (Mitchell et al. 2008; Clausen et al. 2013; Fox et al. 2015, 2016b).

In conclusion, in light of the evidence presented by the GMA and the supplementary information presented above, BirdLife Australia recommends that recovery and long-term sustainability of game duck population require that the 2021 Duck Hunting season be cancelled.

If you require further information, please contact BirdLife Australia Conservation Campaigner Erin Farley at erin.farley@birdlife.org.au

Yours sincerely,

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