Feathering their nests

HEATHER McGINNESS, KATE BRANDIS, VERONICA DOERR, RICHARD KINGSFORD, RALPH MAC NALLY AND JOHN MARTIN ARE COLLECTING DATA TO PROVIDE MORE INFORMATION ON HOW THE SUCCESS OF WATERBIRDS BREEDING CAN BE IMPROVED IN THE MURRAY–DARLING BASIN.

Environmental watering events in the Murray–Darling Basin (MDB) target a range of environmental outcomes, including supporting the habitat and breeding of waterbirds. Through previous research and observation, we know where the key waterbird breeding locations are in the Basin, and the flows required to trigger and complete nesting events. However, there is limited information about the rates of 'nest success'—which is the number of eggs that hatch into chicks, and the number of chicks that survive to leave the nesting site and join the rest of the population.

As part of the MDB Environmental Water Knowledge and Research (MDB EWKR) project, we are investigating both rates and determinants of 'nest success', by examining the relative influence of flow, habitat and other pressures, as well as threats like predation, habitat changes and weather extremes arising from climate change. This knowledge will enable managers to focus limited resources on maximising nest success and the recruitment of young birds into the population.

Getting 'event ready'

We know from our discussions with water managers that they want to improve water provision, vegetation and feral animal management to ensure 'event readiness' at waterbird breeding sites. Maximising the recruitment of young birds into the adult population depends on having the largest possible number of chicks fledging from each site. Understanding and maintaining appropriate nesting site characteristics is crucial, so the questions our research is answering are:

1. How do nesting-habitat preferences differ among species, sites and events?
2. How do nesting-habitat characteristics influence the numbers of fledglings produced?
   - How much does predator access (nest position, water level) affect fledging rates?
   - How much does nesting habitat influence the exposure of chicks to extremes in temperature or weather?
3. Where do the first arrivals at a colony site decide to start nesting? Are there relationships between site vegetation and water characteristics and these choices? For example, how much does the ratio or distribution of water and vegetation affect the initial locations of nesting birds?
4. How can environmental flows be managed to support better nesting habitats?

Above: Cameras monitor the progress of Australian White Ibis nests.
Photos throughout courtesy of the authors.

Photos in film strip from left: [frame 2] Royal Spoonbills display and gift, [3] Royal Spoonbills display to one another, [4] Royal Spoonbill parents with eggs, [5] Australian White Ibis with egg, [6] Royal Spoonbills with chicks, [7] In a good year Royal Spoonbills can raise four chicks successfully, [11] Royal Spoonbill shades its chicks on a hot day. Photos from CSIRO monitoring cameras. Note: Film strip is for graphic purposes. Photos in egg shapes: Straw-necked Ibis chick and eggs (left), slightly older chick (right).

To answer these questions, we are working on:

- Measuring egg and chick development and survival rates using analysis of images from remote motion-sensing and time-lapse cameras.
- Monitoring predation (predator species, impacts, timing, and location) and waterbird behaviour using analysis of images from remote motion-sensing and time-lapse cameras focused on nests.
- Colony mapping, nest counts, and fortnightly monitoring of eggs and chicks at a subset of tagged nests.
- Surveys of nesting habitat characteristics (e.g. species, nest position, nest materials, water depth, vegetation type and distribution or density, nest density, location within colony, exposure).
- Analysis and modelling of relationships between flows (water-related variables), nesting habitat characteristics (particularly vegetation type and structure), predation, temperature and weather variables and nest success variables.

Straw-necked Ibis with chicks in the Macquarie Marshes.

Our discoveries

A pilot study was conducted in 2015–16 and analyses are underway for data collected in 2016–17, with a final year of data collection planned for 2017–18. The nests of three species are being monitored: Australian White Ibis (*Threskiornis molucca*), Straw-necked Ibis (*Threskiornis spinicollis*), and Royal Spoonbill (*Platalea regia*). So far we have found that:

- Australian White Ibises start new nests throughout the breeding season (spring–summer). Straw-necked Ibises start nesting later than white ibises and tend to be more concentrated spatially and temporally. Royal Spoonbills spend time courting, establishing territory and trampling rushes for several weeks before starting to lay. Consequently spoonbills may appear to be nesting when observed from the air, but may not in fact have nests, eggs or chicks. Young spoonbills are generally present in nests much later than ibis chicks. It is easy to confuse Royal Spoonbills with Australian White Ibis when viewed from the air because both are white.
- Clutch sizes differ among waterbird species and among years, with Royal Spoonbills in 2016–17 generally laying more eggs (two to four; mean 3.7) than Australian White Ibises (one to four; mean 2.9) and Straw-necked Ibises (two to three; mean 2.4). Abnormally large clutches of five or six eggs are sometimes seen.

FOR FURTHER INFORMATION

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- Hatching rates are quite low (30–60 per cent). Royal Spoonbill eggs are more likely to survive to hatching than Straw-necked Ibis eggs, while Australian White Ibis eggs are the least likely to survive to hatching.
- Most egg mortality is from predation, with some from parental rejection or abandonment of nests.
- Most predation events in Barmah-Millewa forest are in daylight by native bird species, including Purple Swamp Hens (*Porphyrio porphyrio*), Swamp Harriers (*Circus approximans*), Australian Ravens (*Corvus coronoides*) and White-bellied Sea-Eagles (*Haliaeetus leucogaster*). Anecdotally, predation by feral animals such as pigs, foxes and cats is more of a problem in other breeding sites like the Macquarie Marshes. Most predation events occur in limited areas of the colony, while other areas are not affected much. Entire clumps of nests are typically affected within short periods (minutes to days).
- Once hatched, chick survival (fledging) rates are generally high and similar among the three species (88–92 per cent).
- Nest-attendance patterns differ significantly between species and years. Royal Spoonbills are the most attentive to their nests, which may explain the relatively low mortality rates for their eggs and chicks. Australian White Ibises are the least attentive, and the most erratic in their nest-attendance patterns. Differences in attendance between years may reflect food availability.
- Nesting-habitat choices differ within and among sites. In Barmah-Millewa forest and parts of the Macquarie Marshes, both ibis species appear to prefer tall common reed (*Phragmites australis*) with 'water views' in the centre of regularly-inundated wetlands. Straw-necked Ibises in Barmah-Millewa forest also nest in large numbers in giant rush (*Juncus ingens*) surrounded by water. Royal Spoonbills appear to prefer giant rush surrounded by water at Barmah-Millewa, but nest in trees in other sites. Lignum is important in other systems such as Narran Lakes, the lower Murrumbidgee and lower Lachlan rivers. Although Royal Spoonbills congregate, they do not nest in as close proximity to one another like the ibises do, maintaining at least a couple of metres between nests.

Data analyses to be conducted as part of the broader MDB EWKR project will explore these results in more detail with recommendations for land and water managers during the next stage of this project.

Straw-necked Ibis attending to a nest in the Macquarie Marshes.

The MDB EWKR project is funded by the Australian Government's Commonwealth Environmental Water Office.

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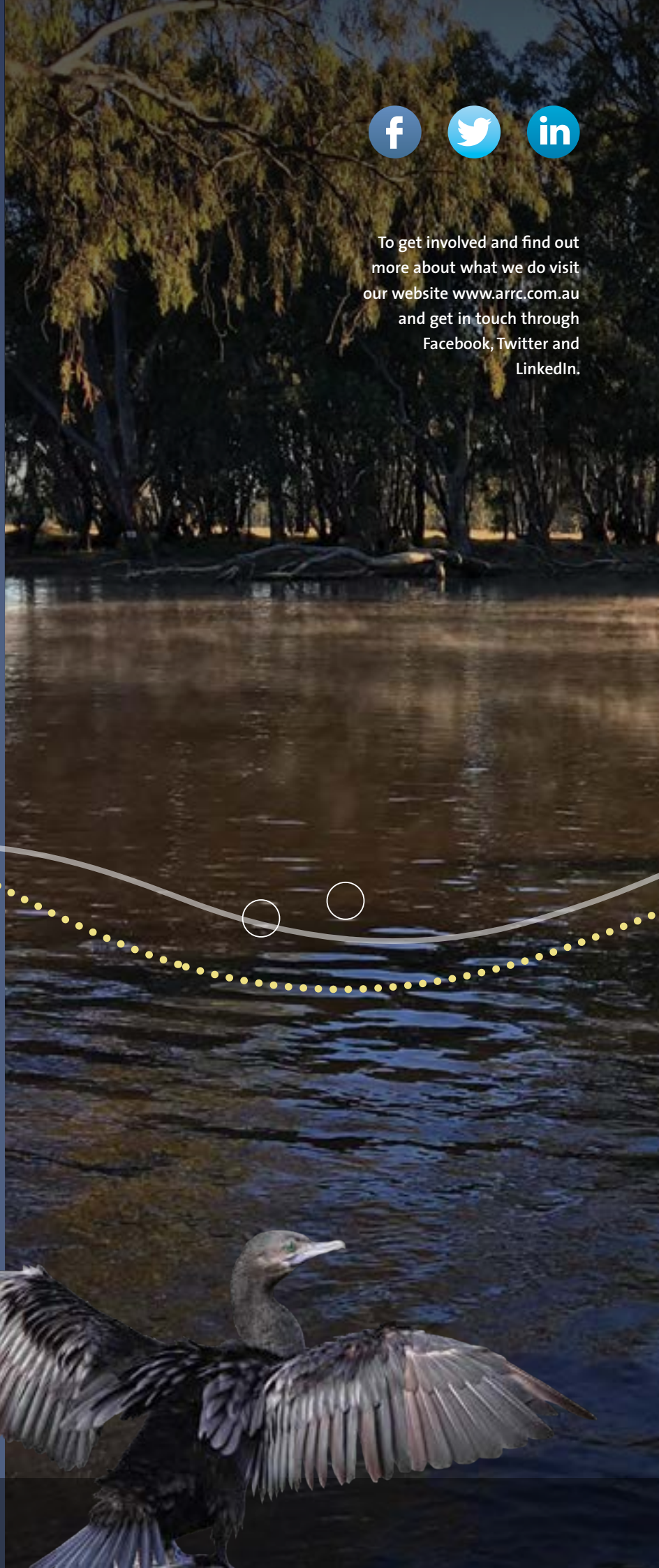

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