

ONCE BITTERN, NOT SHY OF RICE

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QUICK TAKE

- › The large numbers of bitterns found in rice fields is a strong case that food production and nature conservation can be potential partners.
- › Several key factors had pointed toward widespread and regular breeding, but until January 2014, there had been no conclusive evidence of any bittern breeding in rice crops.
- › Bitterns show a strong preference for aerial sown rice, probably because earlier inundation is important so that potential prey, such as frogs, can establish populations sooner.
- › While there are clear environmental costs of extracting water from rivers for irrigation, the surrogate habitat values of rice fields are not widely appreciated in Australia.



This is an unusual situation. Here we have one of Australia's most threatened birds and it turns out that their stronghold explicitly comprises agriculture — in the form of rice crops. Nowhere else in the country can we find such large numbers of the globally endangered Australasian bittern.

These new insights, fresh from the Riverina of New South Wales, could be likened to finding unprecedented numbers of southern cassowaries in Queensland's cane fields or discovering widespread breeding of plains wanderers in wheat crops. Odd as it is, this situation compels us to re-imagine food production and nature conservation, not as separate, competing human pursuits, but as potential partners.

Sneaky & rare

The Australasian bittern is right up there among Australia's most poorly-known birds. They're sneaky and they're rare. Often the only clue to their presence is the stirring sound of a booming male at sunrise or sunset during the breeding season. Even the birdiest of birdwatchers typically only logs a handful of sightings in their lifetime. Nationally, Australasian bitterns are listed as Endangered under the Environment Protection and Biodiversity Conservation Act, and the IUCN (International Union for Conservation of Nature) also considers them Endangered at the global level. Only one other Australian waterbird is equally threatened — the Australian painted snipe. Much more unexpectedly, we've found significant numbers of these snipes in rice fields as well, but that's another story (see box on next page).

The total population of the Australasian bittern in Australia has traditionally been estimated at around 2500 mature individuals, though at the end of the decade-long millennium drought in 2010, the lowest estimate on record of just 250–800 birds emerged. In New Zealand, there are between 500 and 1000, and they may persist (or occur as vagrants) in very small numbers in New Caledonia, including the Loyalty Islands.

Significant numbers

The Riverina has long been known as a stronghold for the Australasian bittern, and the bird has used the region's rice crops for at least forty years. Only now have we begun to understand just how important these agricultural wetlands might be. In late November 2012, as *The Bitterns in Rice Project* gained momentum in its first season, some late-afternoon field days signalled what was to come, with one field day yielding four bitterns sighted and another producing six. By mid-December, sightings from rice growers and targeted surveys made it clear that we were dealing with very significant numbers.

There was, of course, a substantial number of misidentified Nankeen night-herons to deal with!

"I'm not sure what all the fuss is about; I've got 20-odd bitterns roosting in my trees, and then fly down on dusk each day to feed in the rice."

Australasian bitterns never roost in trees and they don't occur in flocks!

By the end of the 2012–13 season, we had confirmed a whopping 70 bitterns in rice crops, avoiding double counting and employing a strict verification process. Our coverage of the 113,500 hectare crop was tiny. Bitterns were unevenly distributed across the rice-growing region, with the Coleambally and Barren Box areas supporting relatively high densities, while much of the Murray Valley supported relatively few. It also became evident how easily bitterns could be overlooked and that a key survey window existed from about two months after sowing when bitterns arrive in crops, until late summer when the rice height can make observation prohibitively difficult and booming males quieten.

As the numbers grew toward the 70 mark, we wondered how representative the sightings were. We trialled a random sampling approach in one of the key areas. The results were staggering. We now fully realised we were talking about a population in the rice fields of the Riverina that extended well into the hundreds. In the following season (2013–14), we refined this approach as the foundation for further work and long-term population monitoring. We found bitterns on one quarter of those rice farms and inevitably, birds were missed.

Anecdotes from rice growers and birdwatchers suggest there is nothing particularly new about this phenomenon of bitterns in rice, such as a post-millennium-drought response or because natural wetlands are more degraded than ever. The importance of rice fields as novel bittern habitat and the significance of the population simply appear to have been overlooked. If these birds are breeding successfully and the population is sustainable, then these food production wetlands may support the global stronghold for the species.



Eggs of the Australasian bittern in a rice crop. Until January 2014, there had not been any conclusive evidence of any bittern breeding in rice crops.



The breeding cycle of Australasian bitterns is well timed with the rice crop. Incubation takes just over three weeks, and chicks can fly after seven or eight weeks, allowing ample time before harvest.

More than just bitterns in the rice . . .

It's not unusual to see dozens of herons, egrets, spoonbills and cormorants using a rice field. There are also the not-so-welcome flocks of common ducks, which can wreak havoc at the start of some seasons. Keen observers of Riverina rice fields are also familiar with the large numbers of glossy ibis and whiskered tern. Less obvious is the significance of the golden-headed cisticola and Baillon's crane populations. There are migratory shorebirds like the sharp-tailed sandpiper to be found as well, especially early in the season when water depths and rice height are low. In the 2013–14 season, we were amazed to stumble across several eastern grass owls roosting in rice fields. In New South Wales, this threatened wetland owl is normally restricted to the north coast region. One was roosting so close to a bittern nest that we feared bittern chicks might be on the menu. What a conundrum! Fortunately, our fears were allayed.

The most significant additional species though, is the globally endangered Australian painted snipe, whose total population estimates are similarly low as the Australasian bittern. During the 2012–13 season, and much to our surprise, they began

appearing at some of our bittern sites. In total, there were 44 birds at five sites, and an additional 43 birds seen by observers at three other rice fields. The sites were spread across the rice-growing region. Again, our survey effort and coverage was miniscule, and the total of 87 birds was highly likely to be indicative of at least several hundred using Riverina rice fields during that summer. It might have been a particularly good season for them, but, like the Australasian bittern, the extent of their use of rice fields as novel habitat has probably just been overlooked. With potentially conflicting habitat requirements (snipe avoid vegetation that is too tall and dense), there is a new challenge for managing rice fields to benefit both the Australasian bittern and the Australian painted snipe.

It's not just about waterbirds either. Our surveys have reaffirmed the significance of Riverina rice fields for the nationally threatened southern bell frog (also widely known as the growling grass frog), and considering Peter Menkhorst observed an Australasian bittern at Werribee eat 17 of them, it's reasonable to suggest they're an important food source in rice crops.

Breeding & harvest

Several key factors had pointed toward there being widespread and regular breeding, but until January 2014, we'd been unable to find conclusive evidence of any bittern breeding in rice crops.

Eventually we managed our first glimpse into the very secret reproductive life of the Australasian bittern. The initial nest for the 2013–14 season was a glowing beacon of bittern reproduction: three chicks and two eggs. All up, we found four nests, three of which were from randomly selected rice farms, giving us some confidence in extrapolating our results. Trials using a small drone helped find one nest and showed promise for complementing existing methods in the future.

We have learnt that chicks leave the nest and begin roaming within about two weeks of hatching. We found two chicks, about 18 days old, dubbed 'Bazza' and 'Beatrice', a good 50 metres from their nest. They were hiding in the tall, thick banyard grass on a bank between two rice bays. With such mobile chicks and so many places to hide in a rice field, it makes it difficult to determine breeding success, although all indications so far are positive. So, what about the impending harvest? Incubation takes just over three weeks, and the chicks then need seven or eight weeks before they can fly. All four breeding sites had ample time before harvest, although one was close.

This leaves us with a burning question. Where do all of these bitterns go when fields are drained and the rice is harvested? We have begun targeted surveys of key wetland areas in the Riverina in the hope of finding some of their non-breeding, post-harvest haunts, but we may well be better off searching near the coast. Monitoring data from the Edithvale–Seaford Wetlands near

Melbourne indicate relatively large numbers of bitterns arrive in autumn (when rice harvest occurs). They remain present throughout winter and depart before summer.

Are these bitterns from the rice fields? Time will tell.

Food production & nature conservation

Paradoxes are plenty in this unusual situation. One of the primary threats to the Australasian bittern and apparent causes of its decline — the diversion of water for irrigation — is, in the case of Riverina rice fields, ultimately providing important surrogate habitat. The familiar narrative of a threatened species clinging to the 'best bits', the least disturbed, last remaining chunks of their customary habitat doesn't apply. The traditional story of habitat loss, where animals are left homeless, doesn't fit here either. Understandably, for some it's rather sad and confronting that species might be increasingly reliant on such modified environments. Pragmatically, situations like the bitterns in rice may well be just the sort of opportunities that conservationists need to seize.

Protected areas like national parks are central to nature conservation, yet alone they'll be vastly inadequate to wave off the forecast mass-extinction due to human impact on global ecosystems. With over 200,000 additional mouths around the world to feed each day, and a mid-century forecast of 9–10 billion people, there is an inevitable need for increased agricultural production. A recent report from the United Nations Food and Agriculture Organisation insists efforts to reduce both food waste and meat consumption will only partly fill the gap. Somehow we need to reconcile the need for more food with a desire to avoid extinctions. Wildlife-friendly farming is one of the most promising solutions.



Chicks begin roaming from the nest within about two weeks of hatching. Two 18-day old chicks were found about 50 metres from their nest, hiding in tall, thick banyard grass on a bank between bays.

Working with the industry to improve habitat

Rice farmers could take the lead on bittern conservation. Many of them are chuffed to be providing habitat for such a special bird and are keen to benefit them further. They can tweak their rice-growing methods to suit bitterns, especially where there is little or no effect on the hip pocket. Where there is a significant cost or loss of production, support could be made available from a range of potential sources. Demonstrating how farming and threatened species conservation can work together is an appealing outcome. Perhaps consumers would pay a premium for bittern-friendly rice. There is a small market already willing to do so for organically grown rice.

The *Bitterns in Rice Project* is slowly but surely uncovering the characteristics of rice crops and their management that bitterns like most. Bitterns show a strong preference for aerially-sown crops, rather than drill-sown or combine-sown crops. It appears that the earlier inundation of aerially-sown crops is important. Potential prey, such as frogs, can establish their populations sooner. In yet another paradox, the key motivations for growers to move away from aerially-sown crops are to save water and avoid duck damage early in the season. New varieties with shorter growing periods are also likely to be bad news for bitterns.

The rice season means bittern breeding is delayed and the earlier crops are sown, the better their chances of supporting bitterns. We've also noted the value of cumbungi (*Typha* spp.) patches in and around rice fields. They are frequently used by bitterns for feeding and roosting. As explained earlier, weedy banks (e.g. barnyard grass, *Echinochloa* spp.) are important as cover for roaming chicks, and the control of foxes and cats should also improve the likelihood of chick survival.

Bitterns seem to go for the biggest bays, but because the open edges around each bay are often used for feeding and smaller bays mean more edges, a combination is likely best. Reduced pesticide use is also likely to increase bittern prey populations. In future seasons, we are planning to trial some alternative rice field designs with dedicated bittern habitat bays, and test the effectiveness of our bittern-friendly rice-growing techniques. Outside of the rice-growing season, the management of bittern habitat in natural wetlands, farm dams, channels and other areas are all practical measures rice farmers can make to benefit Australia's 'bunyip' bird.

Closing remarks

There is an increasing number of rice farmers keeping their eyes and ears peeled for this elusive species, which helps us to learn more about them, and enhance conservation efforts. They feel they have been unjustly vilified as environmental vandals and that the habitat values of rice growing are too often ignored. Images of severe drought in the Murray–Darling Basin, of dying river red gums and thirsty floodplains have often led the proverbial finger to be pointed at the water used by irrigators. While there are clear environmental costs of extracting water from rivers for irrigation, the surrogate habitat values of rice fields are not widely appreciated in Australia.

A common misconception is that if a rice farmer doesn't grow rice then they use less water and there is more for the environment. The amount of water available to an irrigator and used on their farm each year is determined by regional allocations and individual property entitlements. If not rice, then something else will be grown. As far as we can see, no practical alternative agricultural use of the water would provide the same benefit to waterbirds and other biodiversity that rice does.

Nothing beats natural wetlands and they should always be our priority for conservation. The delivery of environmental water to natural wetlands on public and private land has been a godsend for conservation. The current Australian Government has indicated a strategic shift in environmental water recovery, from water buybacks to infrastructure upgrades. Instead of buying the entitlements from landholders willing to sell or buying entire properties and the water that comes with them, it will be looking more to water saving measures like the replacement of channels with pipelines. This approach will likely mean less rice fields are lost. In the season just prior to the drought, with 100% water allocations, there was approximately 180,000 hectares of rice. The 2012–13 season, also with 100% allocations, was down to 113,500 hectares, the reduction largely attributable to buybacks.

Deciding how much water should be made available for food production and how much should be spared for environmental flows is difficult and value-laden. There is also much uncertainty ahead for the Murray–Darling Basin's wetlands, including its rice fields. Climate change, increasing competition and demand for water, and changes in global markets are but a few of the key challenges. Perhaps the current separation of food production and nature conservation is just part of the same false dichotomy of the economy versus the environment. Maybe we really ought to be on the lookout for 'win-wins'. This unusual situation of bitterns thriving in rice fields presents such a potential partnership. It's one where bitterns, other waterbirds and biodiversity generally would be the beneficiaries alongside the production of food.

About the authors

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Bitterns in Rice Project

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