# Nocturnal detection of Australian Little Bittern and Australian Painted-snipe – Prospects for nocturnal survey methods for rare wetland birds

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Some of the most difficult to detect Australian wetland birds include bitterns and snipes. Here I present novel nocturnal observations of the Australian Painted-snipe *Rostratula australis* and the Australian Little Bittern *Ixobrychus dubius* on Kooragang Island, NSW and discuss possible alternative survey methods based on these observations, in hopes of stimulating ideas for methods that increase the detection probability for these birds. The site contained 2.6 ha of wetlands which were surveyed for birds almost weekly (once during the day and once at night) from September to March during 2016 – 2019. During this time, a female Australian Painted-snipe was observed on three separate nights in September 2017, and a female Australian Little Bittern was observed once at night with certainty in November 2018. A male Australian Little Bittern was flushed during the day on 22/10/2019. There were several similarities for these observations: they all occurred within the same wetland, they occurred in spring when the wetlands had been charged with water for ~7 months and were in the process of drying, and most of the birds (with one exception) were observed at night. The snipe was detected from its eye-shine while the bittern was detected during a nocturnal reed search. Both species did not flush immediately when found in close-quarters at night time. I hypothesise that nocturnal visual encounter surveys in drying ephemeral wetlands during spring will lead to a higher detection probability of these species compared to traditional survey methods.

## INTRODUCTION

Some of the most difficult to detect and secretive Australian wetland birds include the bitterns, Australasian Bittern *Botaurus poiciloptilus*, Black Bittern *Ixobrychus flavicollis* and the Australian Little Bittern *Ixobrychus dubius*, as well as the snipes which include the Australian Painted-snipe *Rostratula australis* and Latham's Snipe *Gallinago hardwickii* (Weston *et al.* 2012). Currently, survey techniques for these birds usually involve area searches with binoculars during the day in attempts to flush the birds, or in the case of bitterns, using call playback at dusk to elicit a response (Gibbs & Melvin 1993; Pickering 2010, 2012). To my knowledge there have been no documented spotlight observations of these species. All these birds have the following traits in common: they are highly dispersive; their long-distance movements are somewhat unpredictable; they are low in abundance; and they have cryptic behaviours (Kingsford & Norman 2002). Any insight into increasing the detection probability of these rare wetland birds is of high importance so that their ecology can be further understood for more effective conservation management. This article focuses on the Australian Painted-snipe and the Australian Little Bittern.

The Australian Painted-snipe and the Australian Little Bittern are more commonly encountered in the Riverina region of New South Wales (NSW) and are comparatively rarely encountered within the Hunter Region of NSW (Birds Australia & Australasian Wader Studies Group 2002; BirdLife Australia 2015). The Murray-Darling River in western NSW has the most Australian Painted-snipe observations, however they are known to be highly nomadic and disperse to distant locations during periods of heavy rainfall and wetland inundation in other regions of Australia (Knuckey *et al.* 2013). The Australian Painted-snipe and the Australian Little Bittern can often go several years without detection in the Hunter Region (Stuart 1994-2018; Roderick 2014; Fraser 2020). Although the region does not fall within what is considered the core distribution of these species, there is circumstantial evidence of breeding for both species (Stuart 2005;

Roderick 2017; Fraser 2020). The overall pattern of records suggests that both species may be usually present in this region during favourable conditions in most years, but that they are often undetected.

The aim of this article is to present the first nocturnal detections of the Australian Little Bittern and the Australian Painted-snipe, found at the same wetland on Kooragang Island, NSW, and discuss trends and insights from these observation in order to stimulate ideas for more effective survey methods of these rare species.

## METHODS

The observations occurred in a 2.6 hectare wetland complex which was created in 2015 and 2016 as habitat for the Green and Golden Bell Frog *Litoria aurea* (Beranek *et al.* 2020a). The wetlands consist of 11 water bodies that have varying hydrology, some being ephemeral and others being permanent. Each wetland was surrounded by an earthern bunding wall that was designed to prevent overland flow of water to limit Plague Minnow *Gambusia holbrooki* dispersal. There are several wetland plant species that occur in dense stands through this area, including Marsh Club Rush *Bolboschoenus caldwelli*, River Bulrush *B. fluviatalis*, Common Reed *Phragmites australis* and Broad-leaved Cumbungi *Typha orientalis.* Despite the large coverage of wetland vegetation, there are also large portions of the wetlands that are open and do not contain stands of dense emergent vegetation. These areas are usually characterised by water that is >1 m deep which is apparently too deep for growth of emergent vegetation.

Routine visual encounter surveys of the wetlands were conducted about once a week over three years from September – March over 2016-17, 2017-18 & 2018-19, as well as September – October 2019. Each water body was searched once a day and once at night per week with 2 – 8 observers. Nocturnal surveys were conducted using head torches (LED Lensor 7.2R and 14.2R). During day-time surveys, the paths used in nocturnal surveys were re-searched, and an additional 20-minute perimeter walk was conducted with binoculars. Before a visual encounter survey commenced, a five-minute auditory survey was used to detect vocalisations. Birds were recorded as using the wetlands if they were located within the boundary of the bunded walls. The visual encounter survey periods ranged from 20 – 60 minutes.

Maximum water depth was measured weekly during the survey period. This was achieved by comparing water levels to measurement increments scribed onto polyvinyl-carbon piping that was inserted in the middle of each wetland in the study site.

Fyke netting and opportunistic capture with a hand-held net was used to collect information on potential prey items of the birds present within the wetlands. Fyke nets are designed with wing nets that direct aquatic fauna to a central entry hoop that leads to a netting bag with several valves. They were originally designed for the capture of eels but have since been used for the capture of a range of other aquatic fauna (Wassens *et al.* 2017). The Fyke nets used in this study had a 70 cm diameter hoop opening, with 2.5 m wings both sides and a mesh size of 5 mm. The hand-held net had a surface area of 30 x 30 cm with a mesh size of 5 mm. Both techniques were targeted in microhabitats of the wetlands that were well vegetated to maximise capture of potential prey items. Freshwater macroinvertebrates were either identified in the field or if this was not able to be done, they were placed in 70% ethanol and identified under a microscope using the water bug guide provided by the Murray–Darling Basin Authority (2009). Amphibian larvae were identified in the field using Anstis (2013).

## RESULTS

A list of all birds encountered during nocturnal visual encounter surveys within the wetlands is presented in the **Appendix** available on-line. The Australian Little Bittern and the Australian Painted-snipe were found at the same wetland (GPS: -32.8520 S, 151.7116 E), which was ephemeral and dominated by Common Reed. For both species, this wetland was in the process of drying up after having been inundated for 7 – 8 months.

All the records of Australian Painted-snipe and Australian Little Bittern from the current study are presented in **Table 1**.

There were several potential food items observed in the wetland close to the times when the birds were observed. These included a freshwater macroinvertebrate assemblage consisting of the dragonfly larvae of the Australian Emperor *Anax papuensis*, and dragonfly larvae in the Libullidae family, damselfly larvae of the *Austrolestes* genus, backswimmers (Notonectidae), water boatmen *Agraptocorixa* sp., and the Hunter endemic yabby *Cherax setotus*. Amphibian species commonly observed in this wetland at the time of the observations were juvenile and adult Green and Golden Bell Frogs *Litoria aurea* and tadpoles of the Striped Marsh Frog *Limnodynastes peronii*.

## DISCUSSION

Here I discuss the spotlight observations of the Australian Painted-snipe and the Australian Little

**Table 1**. List of observations. ALB = Australian Little Bittern. APS = Australian Painted-snipe.

| Time & Date | GPS | Species observed | Detection | Water depth (cm) | Observation description |
|---|---|---|---|---|---|
| 2228 h 13/09/2017 | -32.851968 S, 151.711431 E | APS (Female) | Eye-shine | 16 | Observed ~1.5 m from the nearest Common Reed stand. Did not flush and was able to get within ~50 cm to it. If approached too close it would walk quickly away, but remained in open water. |
| 2021 h 20/09/2017 | -32.851968 S, 151.711431 E | APS (Female) | Eye-shine | 14 | Observed in similar circumstances as the previous observation, and likely to have been the same bird. |
| 2131 h 27/09/2017 | -32.851970 S, 151.711787 E | APS (Female) | Eye-shine | 4 | Observed in the puddles of the same wetland in a different location. The original locations where the bird was found in previous weeks were dry. Found in open water within the puddle within ~80 cm of a stand of River Club Rush *Schoenoplectus validus*. |
| 2125 h 1/11/2018 | -32.852019 S, 151.711613 E | ALB (Female) | Visual encounter | 28 | Observed perched ~130 cm above the ground on Common Reed. It displayed a typical bittern camouflage posture and remained for ~2 minutes before taking flight. I was able to get within 50 cm of the bird. |
| 2145 h 7/11/2018 | -32.851912 S, 151.711949 E | ALB (sex unknown) | Flushed | 24 | Observed flushed at the edge of a wetland in thick River Bulrush. It flushed during the approach, at ~7 m distance. It cannot be confirmed as an ALB, but is highly likely an ALB since no other heron-type birds have been observed in any of the wetlands at night. |
| 10:04 h 22/10/2019 | -32.852019 S, 151.711613 E | ALB (Male) | Flushed | ~30 | Observed flushed at the edge of a wetland in thick River Bulrush. It flushed during the approach, at ~5 m distance. Clear view of the bird and confident of identification. |

Bittern in the Hunter Region which may also be the first such detections throughout Australia (Stuart 1994, 1995, 2004, 2005; Roderick 2014, 2017). While no definitive conclusions can be made from just three observations of each species, there are two interesting commonalities which can be used to formulate hypotheses that relate to improving detection probability of rare wetland birds.

It has been demonstrated that wetland bird species prefer wetlands that are drying and relatively shallow as they have more concentrated food items, and therefore this ecological trait can confer a way of optimising targeted surveys of rare wetland birds (Kushlan 1981). I detected both the Australian Painted-snipe and the Australian Little Bittern during a period of wetland drying after being inundated for ~7-8 months. Similar observations have been made; for example, a study which used camera footage to quantify foraging behaviours of an Australian Little Bittern in Canberra found that the bittern would most often forage in water that was knee-deep but would occasionally forage in water which was as deep as the bittern's belly (Wallace 2013). The Australian Painted-snipe is also reported to mainly use shallow ephemeral wetlands for breeding and foraging (Birds Australia & Australasian Wader Studies Group 2006).

Diet may also determine wetland choice. It has been found that the Australian Painted-snipe predates on freshwater macroinvertebrates in the Corixidae and Notonectidae families and there is a published photo of an Australian Painted-snipe consuming a dragonfly larvae (Odonota order) (Birds Australia & Australasian Wader Studies Group 2009). The Australian Little Bittern is a known predator of tadpoles (Barker & Vestjens 1989). All of these prey items were present within the wetland during the times of observation, presumably at high concentrations due to wetland drying. Using this information, I hypothesise that the Australian

Painted-snipe and the Australian Little Bittern are most likely to be detected in wetlands that are drying up after a long period of retaining water, as such situations may result in high concentrations of prey in the water column.

Nocturnal visual encounter surveys may result in higher detection rates of Australian Little Bittern and Australian Painted-snipe compared to diurnal surveys due to less sensitivity to flushing (conferring an advantage in identification), and higher detectability with head torches via eye shine. While the Australian Little Bittern was not detected by eye shine, the Australian Painted-snipe was detected on all occasions by its eye shine. This difference in means of nocturnal detection may be explained by habitat use. The Australian Painted-snipe inhabits wetlands that contain thick vegetation bordering shallow open water (Birds Australia & Australasian Wader Studies Group 2006; Herring & Silcocks 2014). In contrast, the Australian Little Bittern is known to primarily inhabit dense stands of reeds (Wallace 2013). Both species are known to forage in shallow open water. I observed the Australian Painted-snipe primarily occupying an open-water section of the wetland, although I could not confirm any foraging behaviours. However, this use of habitat at night enabled efficient detection of the snipe with eye-shine reflection as there was no impairment of the view of the bird due to reeds.

The Australian Little Bittern was not observed by its eye-shine on any occasion, and it was either visually encountered during intensive searches through Common Reed or it was flushed. However, neither of the two birds that I encountered flushed easily and they could be approached to within a distance of ~1 m, which is against most other observations (Jaensch 1989; Knuckey *et al.* 2013). For example, the mean flight-initiation distance of the Australian Little Bittern in day time is 12.9 m (Weston *et al.* 2012), which is much larger than the flight-initiation distance of *circa* 0.5 m for the two birds I encountered. Australian Painted-snipe are also reported to take flight readily when approached (Birds Australia & Australasian Wader Studies Group 2009). Indeed, close proximity mobile-phone photographs were taken of both birds (see **Figure 1**), which to my knowledge have not been possible for these birds during diurnal observations. It appears these species are less prone to flushing when being viewed with a head torch at night time, which enables easier confirmation of species identity and therefore it is likely these species are more detectable at night time.

**Figure 1.** Mobile-phone photographs. Above: Australian Painted-snipe (female), date: 13/09/2017. Below: Australian Little Bittern (female), date: 1/11/2018.

## CONCLUSION

In the future, studies should conduct replicated surveys in wetlands of known sites of the Australian Little Bittern and Australian Painted-snipe, both in night and day time to determine which method has higher detection probability. Surveys should target wetlands which are drying after prolonged inundation, which typically occurs from September to February in the Hunter Region. Evaporation rates decrease in the colder months of autumn and winter, which results in most wetlands that are filled in late summer remaining inundated throughout this period (Beranek & Mahony 2018). These ideas are likely most efficiently testable under an occupancy modelling experimental design which accounts for imperfect detection.

Given that the Australian Little Bittern appears to flush less easily at night time and occupies dense vegetation in wetland solitarily, this species and similar rare wetland bird species might be detected effectively using drones with thermal imagery. Drones with thermal imaging mounts have been increasingly used to improve detection rates of rare and cryptic animals such as the koala (Beranek *et al.* 2020b), and this technology appears useful for wetland birds (e.g. Afán *et al.* 2018). The feasibility of using drones to detect bitterns and other rare wetland birds depends on the emissivity of their thermal signature while obscured by wetland vegetation. This should also be trialled in future studies.

The combination of rarity, dispersive nature and shyness of wetlands birds such as the Australian Little Bittern and the Australian Painted-snipe make them difficult to survey, however the observations presented in this article coupled with knowledge gleaned from the available literature (Jaensch 1989; Birds Australia & Australasian Wader Studies Group 2006; Fraser 2020) provides insight for novel survey strategies. This includes: surveying wetlands that are drying after long periods of inundation or that are recharged after dry conditions; surveying wetlands during September – December; and conducting nocturnal surveys with a head torch, while wading through the wetland. These ideas should be combined with the methods used by Jaensch (1989) to improve detection probability. However, these ideas should be assessed statistically in future studies to determine if they present superior alternative methods.

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