



**Biodiversity and
Conservation Science**

A survey of waterbirds using the Parry Lagoons area of the Ord River Floodplain Ramsar site in May 2018



Adrian Pinder¹ and George Swann²

¹ Ecosystem Science Program, Department of Biodiversity, Conservation and Attractions

² Kimberley Birdwatching, Broome



Department of **Biodiversity,
Conservation and Attractions**

Department of Biodiversity, Conservation and Attractions
Locked Bag 104
Bentley Delivery Centre WA 6983
Phone: (08) 9219 9000
Fax: (08) 9334 0498

www.dbca.wa.gov.au

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Ecosystem Science
Department of Biodiversity, Conservation and Attractions
Locked Bag 104
Bentley Delivery Centre WA 6983

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Cover photo: George Swann and Adrian Pinder surveying waterbirds at Parry Lagoons. Photo by David Chemello.

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1 Summary

Waterbirds using the Parry Lagoons area of the Ord River Floodplains Ramsar site were surveyed in May 2008. This comprised a ground survey of the largest area of water and a more extensive aerial survey. Thirty-seven species and 22001 individual birds were counted during the aerial survey, compared to fifty-six species and 28259 individual birds counted during the ground survey (Table 2). The most abundant species were grey teal, wandering and plumed whistling duck, magpie geese, pink-eared duck, black-winged stilt, glossy ibis and Australian pelican. Counts of several species, most notably Australasian grebe, magpie geese, pink-eared duck, glossy ibis, pied heron and red-kneed dotterel, were higher than for previous surveys. The total number of waterbird species recorded on Parry Lagoons by published surveys (combined with Birdlife Australia data) now stands at 81, plus a few other birds such as yellow chats and zitting cisticolas which are dependent on wetland habitats. Twenty-eight species recorded at Parry Lagoons are listed under international migratory bird agreements and nine of these were recorded in May 2018, within the range of previous surveys (8 to 14). Of the three Ramsar criteria for which Parry Lagoons was listed, the current survey showed that the wetland can still support more than 20000 birds (criterion 5), but no 'vulnerable, endangered or critically endangered species were present (criterion 2) and no species was present in numbers greater than 1% of total population estimates (criterion 6). The data is also compared to the provisional limits of acceptable change in the Ecological Character Description. There have been a few previous surveys of this wetland area, the last being in 1995, but variation in the extent of flooding (quantified here using remote sensing dating back to 1988) and in survey methodologies and extent precluded analysis of trends in numbers and diversity of waterbirds over time. Some suggestions for future survey methods are provided.

2 Ord River Floodplain Ramsar site

The Ord River Floodplain Ramsar site is in the Victoria-Bonaparte bioregion of north-eastern Western Australia, just east of the town of Wyndham. The site covers over 140,000 hectares and consists of three distinct areas: The False Mouths of the Ord, the Ord Estuary (including the main channel of the Ord River within the Ramsar boundary – eastern arm of Cambridge Gulf) and the Parry Lagoons floodplain (Hale, 2008), as shown in Figure 1. Parry Lagoons is a complex of floodplain wetlands between the Ord River and the Great Northern Highway south-east of Wyndham. It is fed by occasional floods from the Ord River (which are believed to be less frequent since construction of the Argyle Dam) and more frequent but smaller floods from Parry Creek and other smaller creeks arising from the surrounding hills (Hale, 2008).



Figure 1. Boundary of the Ord River Floodplain Ramsar site. From Hale (2008).

3 Previous waterbird counts on the Lower Ord Floodplains Ramsar site

There are limited data on waterbird usage of the False Mouths of the Ord and the Ord Estuary areas. Surveys conducted in 2005 by Hassell et al. (2006) revealed few waterbirds using these areas. In July 2005, 1059 individuals of 10 species were recorded using parts of the lower Ord Estuary (Lower Ord River, False Mouths of the Ord, Adolphus Island and the West Cambridge Gulf area) and in December 2005 <100 individuals of 18 species were recorded across a similar area.

By contrast, large numbers of waterbirds have been counted in the Parry Lagoons area. The major previous counts of waterbirds using the Parry Lagoons area are summarised in Table 1. This summary notes some uncertainty surrounding a couple of counts cited in Ramsar documents and survey reports. The earliest count cited in the literature was of 15000 Magpie Geese in November 1968 (Jaensch & Watkins, 1999), which would suggest the total number of waterbirds would have been well over 20000. There have been at least three other historical counts exceeding 20000 waterbirds (March 1980, March 1983 and May 1986). Several other counts have exceeded 10000.

The total waterbird counts of the “Lower Ord Floodplains” of 13000, 20000 and 15000 in May 1979, March 1980 and February 1981 were made by Gowland (1983). These were the highest total counts from monthly surveys between September 1978 and July 1981 that showed a strongly annual pattern of waterbird abundance, but with timing of peaks and troughs in abundance varying between years (Figure 2). In March 1983, Roger Jaensch counted around 3000 birds on a small area of the lagoon and estimated that this would equate to >20000 waterbirds across the Parry Lagoons area.

The next series of counts were undertaken by Jaensch and Vervest (1990) in May 1986 (20670), March 1988 (11632) and May 1988 (18914). Jaensch and Vervest (1990) note that the latter count underestimated the numbers of waterbirds present on that date and that the actual number would have exceeded 20000. The May 1986 count of 20670 has sometimes been rounded up to 20700 (including Jaensch & Vervest, 1990) and in some documents this seems to have been transposed to 27000 (e.g. Department of Conservation and Land Management, 2003). A series of counts in 1993 resulted in a maximum count of 2619 (Jaensch, 1994) and in July and November 2005 Hassell (2006) counted 6405 and 1591 respectively.

Table 1. Previous total counts of waterbirds using the Parry Lagoons area of the Lower Ord River Floodplain Ramsar site.

Date	Count	Aerial/Ground	Source of info	Notes
Nov 1968	>15000	?	(Jaensch & Watkins, 1999; Department of Conservation and Land Management, 2003)	Plumed Whistling Ducks. Total number of waterbirds likely to be >20000.
May 1979	13000	aerial	Gowland (1983)	One of three annual peaks during a monthly monitoring program between Sep 1978 and July 1981.
Mar 1980	20000	aerial	Gowland (1983)	One of three annual peaks during a monthly monitoring program between Sep 1978 and July 1981.
Jan 1981	15000	aerial	Gowland (1983)	One of three annual peaks during a monthly monitoring program between Sep 1978 and July 1981.
Mar 1983	>20000	?	Quoted in Hale (2008) but no citation provided.	Estimate of likely waterbird numbers across the extensively flooded Parry Lagoons, extrapolated from 3000 birds present on the accessible edge of the Parry Lagoons (R. Jaensch pers. comm.)
May 1986	20670	ground	Jaensch and Vervest 1990	Burbidge et al. (1991), (Jaensch & Watkins, 1999; Department of Conservation and Land Management, 2003; Hassell <i>et al.</i> , 2006) quote 27000 birds for this date. Burbidge et al. (1991) cites Stuart Halse as the source for the 27000 count but, while Stuart Halse was in the area in March (not May) 1986, no count was undertaken (S. Halse pers. comm.). A possible explanation for this figure is that Jaensch and Vervest (1990) rounded this figure up to 20700 on page 27 of their report, and this may have been transposed to 27000. This count was conducted over 2-3 days.
Mar 1988	11632	ground	Jaensch and Vervest 1990	This count conducted by R. Jaensch over 2-3 days. Conducted on foot from a 4WD.
May 1988	18914	ground	Jaensch and Vervest 1990. Note that Hale (2008) quotes this count as being May 1998 on page 56 but the correct date is provided in Figure 35 of that publication.	Nineteen observers over 3 days using 3 4WDs and 2 motor bikes. Jaensch and Vervest (1990) suggest the actual number of waterbirds present would have been over 20000.
Apr 1993	2619	aerial?	Jaensch (1994). Note that the count in the Ramsar ECD Hale (2008) is 2500.	In Jaensch (1994) this is recorded as the highest count of several surveys of different areas between 28 Feb and 11 May 1993 but little of the data is provided. Data held by DBCA for the aerial survey, which was conducted by Stuart Halse and Grant Pearson (then with the Department of Conservation and Land Management) suggests a total count of 8145, but this count may have included some areas outside of the Parry Lagoons.
Jul 2005	6405	ground	Hassell (2006).	Water levels very low, most water occurring in billabongs along Parry's Creek plus remnant water in one or two of the larger claypan (dry in November?)
Nov 2005	1591	ground	Hassell (2006).	

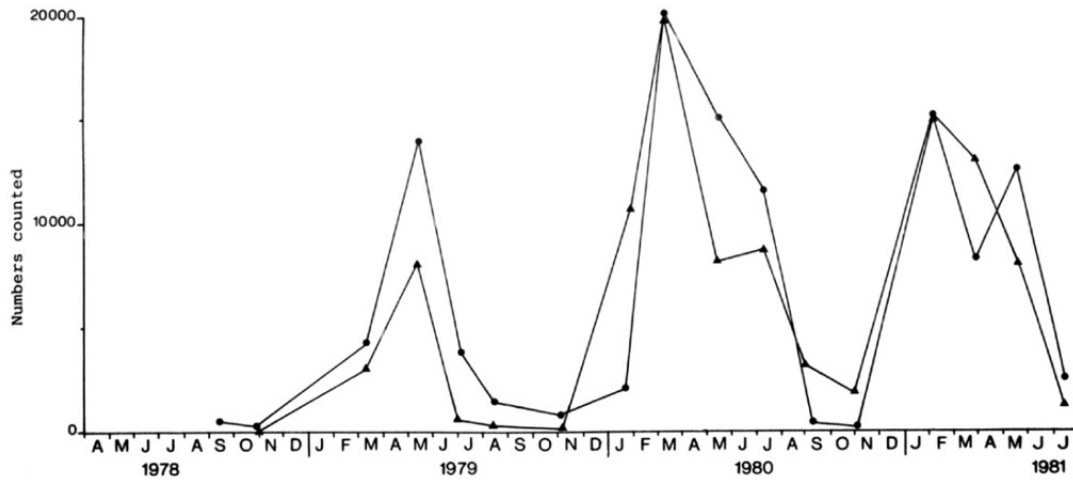


Figure 2. Graph from (Gowland, 1983) showing total counts of waterbirds on the Ord River (Parry Lagoons) floodplain (circles) and the Keep River floodplain (triangles) between Sep 1978 to July 1981.

4 Additional Birdlife Australia data

Additional records of shorebirds and waterbirds were extracted from the Birdlife Australia database by Joris Driessen on 30 Aug 2018¹. These records, from 351 counts and observations conducted within the polygon shown in Figure 3. The great majority of these observations were made within the Parry Lagoons/Parry Creek/Marlgu Billabong area.

¹ Rectangular polygon: ymin = -15.66335050002324, ymax = -15.41821202874042, xmin = 128.10429462815478, xmax = 128.59164530063822

Supertaxa = guilds: Beach nesting shorebird, Migratory shorebird, Waterbird



Figure 3. Polygon (blue) showing extent of the query made of the Birdlife Australia database.

5 Water extent during the May 2018 survey

Landsat data (band 5 infra-red) was used to determine water presence across the Parry Lagoons area for 3 weeks prior to the survey (24 April), 3 days prior to the survey (10 May) and 10 days after the survey (26 May) (Figure 4). These images show that most of the larger individual claypans held water on 24 April (covering an estimated 2982 ha), but that wetlands had dried sufficiently that the estimated area inundated had reduced by half by 10 May (1590 ha) and halved again over the next two weeks. In particular, the Jogalong Billabong/Flats area south of Marlgu Billabong had significantly reduced in area prior to the survey. Figure 5 shows the 10 May 2018 water presence overlain on the Auslig 1:100000 topographic maps showing wetland extent in relation to mapped wetland boundaries. This suggests that wetlands were about a third to half full (in terms of areal extent) immediately prior to the survey. The amount of water made ground access by vehicle easy as we were able to drive close to the inundated areas despite the dense vegetation (especially *Sesbania*) that covered most of the floodplain.

At the time of the survey, Parry Creek upstream and downstream of the semi-permanent Marlgu Billabong had sufficient water to extend beneath the bird hide. This creek was connected to the largest contiguous body of water to its north (labelled Milligan Lagoon on some maps), which, at its northern extent becomes a wooded tidal floodplain until it reaches the Ord River. Also inundated were a chain of un-named isolated claypans along the western extent of the floodplain and areas to the south and east of Marlgu Billabong associated with Jogalong Billabong/Flats, small areas of the Parry Lagoons sensu-strictu, and areas between Butchers Camp and Wild Goose Creek. Maps showing areas surveyed are provided below.

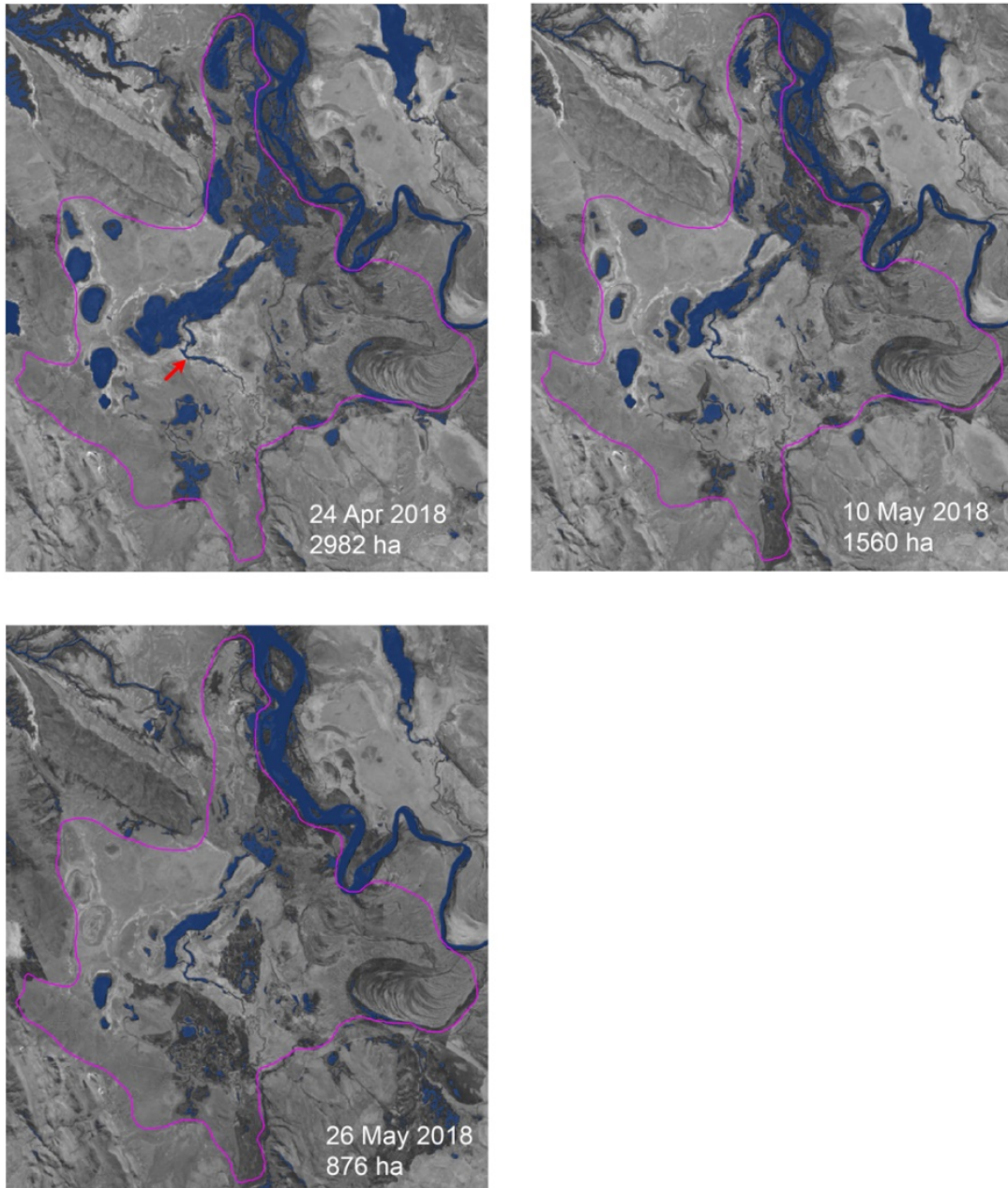


Figure 4. Landsat image indicating presence of surface water derived from short-wave infra-red (band 5) Landsat data from United States Geological Survey captured between 24 April and 26 May 2018. Blue areas indicate presence of water. The pink line is the boundary within which inundated areas were calculated. The location of Marlgu Billabong on Parry Creek is indicated by the red arrow on the 24 April image. The meandering Ord River can be seen traversing the image from middle right to middle top. Image produced by Bart Huntley of DBCA's Remote Sensing and Spatial Analysis Program.

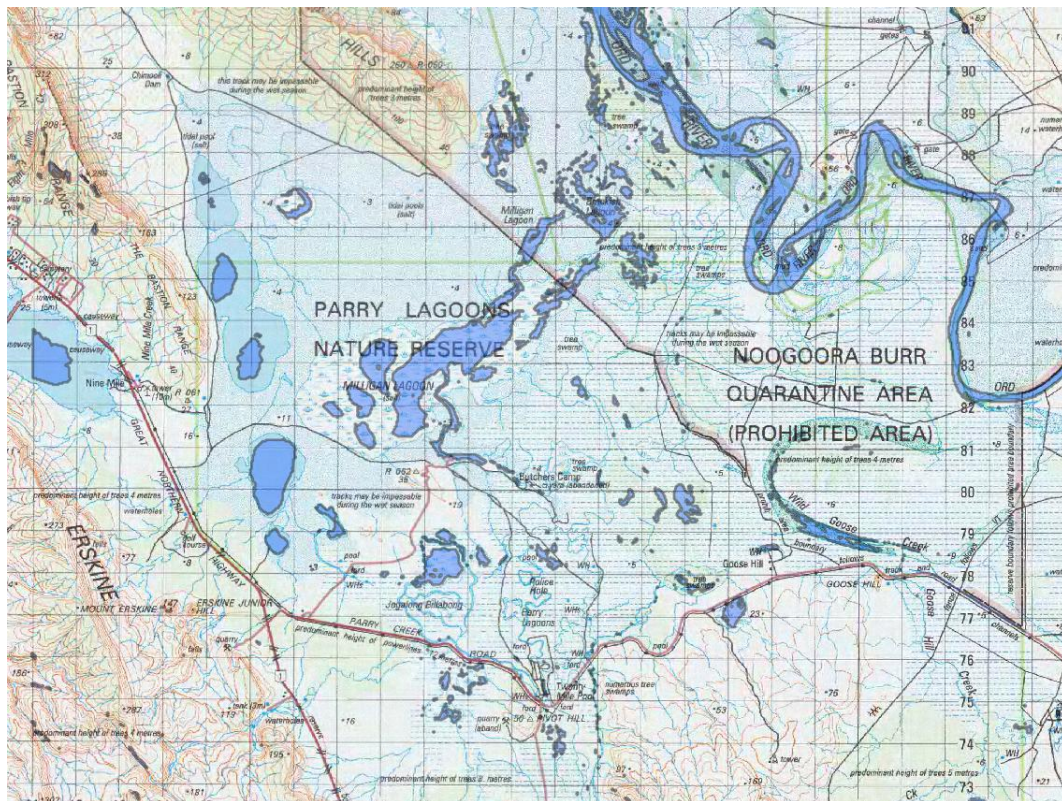


Figure 5. Remotely sensed water presence (blue areas) from 10 May 2018 (see Fig. 4), overlain on the Auslig 1:100000 topographic map.

6 2018 survey methods

6.1 Aerial counts

An aerial count was undertaken early in the morning (take-off 6am) of 14 May 2018, with two observers (George Swann and Adrian Pinder) counting on either side of a GA8 Airvan aircraft chartered from Shoal Air. The pilot was Paul Davis who was certified for low-level flying but had not previously undertaken waterbird surveys. The count lasted for 2 hours and 12 minutes from take-off to landing at Kununurra airport. Altitude during counts was about 100' and airspeed about 90 knots. Wetlands included in the aerial count are shown in Figure 6. The western-most claypans and the largest area (Milligan Lagoon west to north of Marlgu Billabong) were flown along a series of transects while the smaller southern and south-eastern wetlands were only flown once or twice. Since both observers counted the whole time it was assumed that both observers counted the whole area and counts were combined by using the maximum observer count for each species for each of three areas. These areas were 1) Milligan Lagoon, 2) The main channel of Parry Creek east of Marlgu Billabong and 3) other wetland areas.



Figure 6. Inundated wetland areas (based on Landsat band 5 infra-red imagery captured on 10 May 2018) on the Parry Lagoons Floodplain, with areas surveyed for waterbirds from the air on 14 May 2018 coloured red.

6.2 Ground counts

A count of waterbirds visible from the Marlgu bird hide area was undertaken by AP on the 13th May. Ground counts over 2.5 days over the 14th to 16th May by AP and GS, assisted by DC and PH, concentrated on Milligan Lagoon and Parrys Creek west and north of the Marlgu bird hide, but (unlike the aerial survey) the ground survey did not extend north-east as far as Ord River. That area closer to the river was more wooded, tidally influenced and not so continuously inundated. It was not entered on foot due to risk from crocodiles. Figure 7 shows the gps tracks of the ground count. Counts were made with at least one observer on the top of a hard canopy on the back of one of the 4WDs which provided an elevated view over the vegetation. Counts were made in segments from points each separated by a few hundred metres.

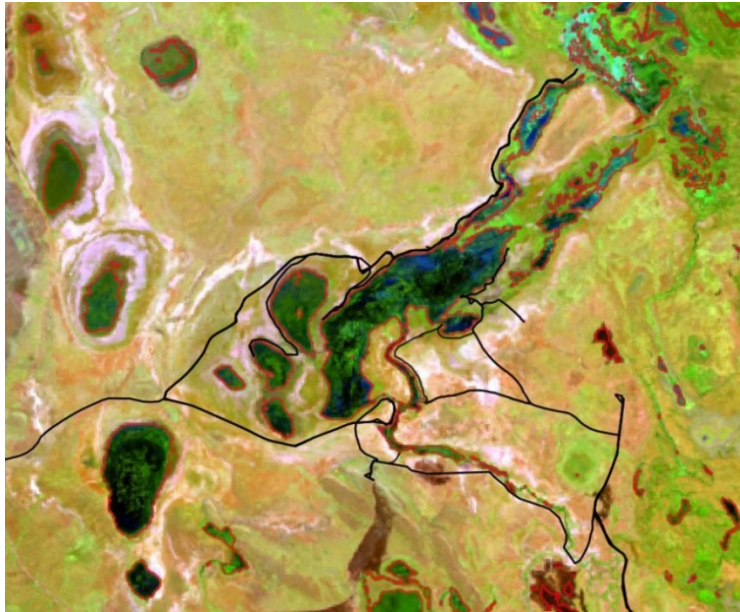


Figure 7. Image indicating presence of surface water (red boundaries) derived from short-wave infra-red (band 5 Landsat data captured 10 May 2018) overlain on a false colour Landsat image from the same date, with gps tracks (black lines) for the ground survey carried out between 14th and 16th May 2018.

7 Results

7.1 Aerial survey

Thirty-seven species and 22001 individual birds were counted during the aerial survey (Table 2). The most abundant species were grey teal (3845), glossy ibis (946), magpie goose (2157), wandering whistling-duck (2095), plumed whistling-duck (1360) and Pacific black duck (1861). The counts of the two whistling-duck species are under-estimates because they were mostly not identified to species by one observer (AP). These were included in the total aerial count only after accounting for the whistling-duck numbers identified by GS (leaving 2430 unidentified). Only two species, intermediate egret and little black cormorant, were significantly more abundant on the western and southern wetlands (which were not counted from the ground), than on Milligan Lagoon. Twenty-two species that were counted from the ground were not seen from the air. These were mostly small (especially shorebirds) or cryptic (rails, moorhen) species or small wetland associated birds such as cisticolas and chats or species that occurred in small numbers (e.g. freckled duck).

7.2 Ground Survey

Fifty-six species and 28259 individual birds were counted during the ground survey (Table 2). The most abundant species were grey teal (7142), glossy ibis (2649), magpie goose (5405), wandering whistling-duck (1219), plumed whistling-duck (2116), pink-eared duck (1262), black-winged stilt (2067) and masked lapwing (956).

The only species seen from the air but not from the ground was yellow-billed spoonbill. For the areas covered by both aerial and ground counts, the ground counts were higher for most species. This is not surprising for species that were in low abundance (Australian wood duck, freckled duck), smaller (shorebirds), more cryptic (crakes, grebes, night heron) or tend to occur individually or in small groups (darter). However, the most abundant species (grey teal, whistling-ducks, magpie geese, glossy ibis) also had higher ground counts, although this is partially offset by the 1140 unidentified whistling ducks and 1040 other unidentified ducks counted from the air over the area of the ground count. Accounting for these, the total number of whistling ducks identified from the air (3000) is similar to the ground count (3335) for the area covered by both counts.

Otherwise, the greater ground counts suggest either 1) undercounting from the air (perhaps real or flocks not taking to the air and being partially hidden by the dense vegetation) or 2) over counting on the ground, with movement of flocks between ground counting sessions then the most likely explanation. Very little movement of abundant species was observed during the day, other than when disturbed by us or by birds of prey and then this was accounted for during the count as far as was possible. Overnight movement of birds could have occurred but the largest congregations of ducks and geese (especially grey teal and magpie goose) were observed at the same claypan area (immediately WSW of Marigu Billabong) from both the air and on the ground on different days. Movement of birds is unlikely to account for some of higher ground counts, such as for pink-eared duck (1262 on the ground versus 165 from the air), glossy ibis (2649, 718), green pygmy goose (232, 17) and black-winged stilt (2067, 415). Pacific black duck were observed in substantially higher numbers from the air (1529) than on the ground (562), as were cattle egret (725 in the air, 82 on the ground). Most of the cattle egret were present on the northern extent of Milligan Lagoon closer to the Ord River which was not surveyed from the ground due to crocodile risk. From the ground it was also difficult to see into the middle of the Milligan Lagoon area.

7.3 Combined counts

Combining ground and aerial counts is problematic. If the ground count is taken as the best for the area covered by both methods, then a total count could be 28529 plus the aerial count for areas not counted from the ground (5368), which would be 33897. Taking the maxima of the aerial and ground counts for each species gives a total count of 37011. However, it is probably best to consider the ground and aerial counts separately for comparisons with previous and future surveys.

Fifty-two species of waterbird were recorded during the survey, plus five other species of wetland-dependant birds (yellow chat, zitting cisticola, golden-headed cisticola, red-chested button quail and tawny grassbird).

Table 2. Counts from the May 2018 survey

SPECIES	Aerial Survey			Ground count
	Western claypans	Milligans Lagoon	Parry Creek	
unidentified duck				50
grey teal	44	3800	1	7142
Pacific black duck	332	1529		562
magpie goose	136	1940	81	5405
wandering whistling-duck	1095	1000		1219
plumed whistling-duck	500	860		2116
unidentified whistling-duck	1210	1140	80	
Australian wood duck				3
hardhead				166
pink-eared duck	2	165		1262
green pygmy-goose		17		232
freckled duck				3
Burdekin duck (= radjah shelduck)	116	210	40	50
black-fronted dotterel		2		2
red-capped plover				125
red-kneed dotterel		80		792
red-necked stint				7
sharp-tailed sandpipers				21
black-winged stilt	70	415	22	2067
black-tailed godwit				121
sharp-tailed sandpiper				10
marsh sandpiper				11
masked lapwing (northern)	160	637	1	956
small shorebirds	75			
Australian pratincole		10		226
comb-crested jacana				52
whiskered tern	53	30		75
gull-billed tern		29		10
great egret	101	304	4	50
cattle egret		725	27	82
intermediate egret	569	218	74	57
little egret		13		8
white-faced heron	16	33	1	1
white-necked heron		2	1	1
pied heron	16	301	1	261
nankeen night heron		1		11
black-necked stork				2
royal spoonbill		2	1	493
yellow-billed spoonbill		35		
glossy ibis	222	718	6	2649
Australian white ibis	121	873	78	99
straw-necked ibis	6	617		125
swamp harrier		1		8
white-bellied sea-eagle				2
brolga	2	274	2	390
Eurasian coot		150	6	321
dusky moorhen				1
buff-banded rail				4
purple swamphen (northern)		10		51
Australian spotted crane				10
yellow chat				2
darter	5	2	1	20
Australian pelican	40	480		918
little pied cormorant	5	5		65
little black cormorant	40	5		38
Australasian grebe	5			167
tawny grassbird				1
red-chested button quail				1
zitting cisticola				4
golden-headed cisticola				2
	4941	16633	427	28529

8 Discussion

8.1 Significant species and counts

Numbers of individual species are not available for the earliest counts, so comparisons are only made with surveys conducted from May 1986. Table 3 shows presence/absence of species across surveys since 1986.

Dusky moorhen have not been observed during previous surveys of Parry Lagoons. The single dusky moorhen, seen on Parry Creek just as Marlgu Billabong turns north, is a new record for the area, although there is a Birdlife Australia record from Lily Creek Lagoon in Kununurra (Birdlife Australia birdata accessed 14/07/2018). Cattle egrets, present in high numbers in May 2018, were not recorded in previous published surveys but are otherwise regularly seen in the area. White-bellied sea-eagles are also occasionally seen over Parry Lagoons (Birdlife Australia data) but were not noted in the previously published surveys.

The 2018 ground count of Australasian grebes (167) was the highest of the published counts, with the next highest being 40 in July 2005 (Hassell *et al.*, 2006). The ground count (5405) and aerial count (2157) of magpie geese are higher than other published counts over the last 35 years. The numbers of pink-eared duck (1262 from the ground) is also relatively high. Red-kneed dotterels were more abundant than previously recorded (792 compared to the next highest count of 504 in May 1988). The Parry Lagoons may be a particularly important site for the red-kneed dotterel², which is consistently present and often in significant numbers (e.g. 450 in May 1986, 504 in May 1988 and 792 in May 2018). Pied heron numbers (ground count 261, aerial count 318) were also higher than for previous counts (maximum 90 in May 1988). Great egrets have generally been present in lower numbers in previous surveys (up to 76) than in the present survey (509 seen from the air) as were intermediate egrets (861 from the air, previous counts up to 155). Different species of egret can be difficult to distinguish during aerial surveys, but the total numbers of egrets are nonetheless much larger than recorded during previous surveys. Most previous surveys have counted a few hundred glossy ibis but in May 2018 2649 were seen on the ground and nearly 1000 from the air. Jaensch and Vervest (1990) cite a count of 4000 glossy ibis but did not provide a source.

Twenty nine waterbird species recorded in previous surveys (including some ad-hoc records included in Appendix 1 of Jaensch and Vervest (1990) and on the Birdlife Australia 'birdata' database) were not observed in May 2018. Some of these were recorded by Jaensch and Vervest (1990) only on areas that were not surveyed in 2018 (especially the smaller claypans) and some, such as Australasian shoveler and pied cormorant have only been recorded in low numbers during one of the previous surveys.

² Roger Jaensch pers. comm.

The number of waterbird species recorded in May 2018 (52) is near the upper end of the range for previous surveys (34-54), despite low shorebird richness (9 species compared to a range of 9-12 species for previous surveys).

The total number of waterbird species recorded on Parry Lagoons during the surveys listed in Table 1 now stands at 81, plus a few other birds such as yellow chats and cisticolas which are dependent on wetland habitats.

Additional Birdlife Australia data from the Parry Lagoons area³ include observations of Australian little bittern (1 record), black swan (5), great cormorant (17), great crested grebe (3), hoary-headed grebe (24), ruff (1) and straited heron (8).

8.2 Counts, survey effort and water presence

Figure 8 shows Landsat imagery for six waterbird surveys between Mar 1988 and May 2018. (Landsat data are not available for surveys prior to Mar 1988). These are detailed below.

Mar 1988. Jaensch and Vervest (1990) noted that on 26-29 Mar 1988, following a below average wet season, the wetlands were less extensively inundated than they were in May 1986 when ‘... the main claypans all held large areas of water less than 0.5 m deep’. Figure 8 suggests that a few days prior to the Mar 1988 survey the western-most claypans were mostly dry and the area inundated was just over 2000 ha. The Mar 1988 count of 11632 was little more than half the count of 20670 made in May 1986 when more water was present. Both counts involved one observer (R. Jaensch) over 3-4 days covering the major waterbodies with water.

May 1988. Jaensch and Vervest (1990) note that for the 7-9 May 1988 survey “the claypans were each still inundated but much reduced in area and depth” [compared to March of the same year]. A hand-drawn map of inundation extent during the survey (Jaensch & Vervest, 1990, Fig. 8) suggests more water was present than indicated by the closest available Landsat image (838 ha) in Figure 8, but the Landsat image is based on data captured after a further two dry weeks (on 23 May 1988). The Apr to May 2018 series of Landsat images (Figure 4) shows that the area of inundation can halve in two weeks, so the 23 May 1988 Landsat image is almost certainly an underestimate for the 7-9 May 1988 survey. The total count for May 1988 (18914) was nearly the same as for May 1986 (20670) despite the likely drier conditions, but the survey effort was much greater (19 observers over 3 days).

Table 3. Occurrence of waterbirds during surveys of Parry Lagoons from 1986 to 2018.
 ** = recorded during the month prior to survey.

	Listed on migratory bird agreements	Jaensch and Vervest 1990			Jaensch 1994	Hessell 2006		additional from Birdlife "Birdata"	This survey
		May-86	Mar-88	May-88	additional in Jaensch and Vervest 1990 Appendix 1	presence across several 1993 counts	Jul-05		
grey teal		•	•	•		•	•		•
chestnut teal									
Pacific black duck		•	•	•		•	•		•
Australasian shoveller									
maggie goose		•	•	•		•	•		•
wandering whistling duck		•	•	•		•	•		•
plumed whistling duck		•	•	•		•	•		•
Australian wood duck		•	•	•		•	•		•
hardhead		•	•	•		•	•		•
garganey	Y	•	•	•		•	•		•
pink-eared duck		•	•	•		•	•		•
green pygmy goose		•	•	•		•	•		•
freckled duck		•	•	•		•	•		•
Burdakin duck (= radjah duck)		•	•	•		•	•		•
black-fronted dotterel		•	•	•		•	•		•
red-capped plover		•	•	•		•	•		•
greater sand plover	Y							•	
golden Pacific plover	Y				•				
Oriental plover	Y				•				
red-kneed dotterel		•	•	•		•	•		•
red-necked stint	Y	•	•	•		•	•		•
long-toed stint					•				
sharp-tailed sandpipers	Y	•	•	•		•	•		•
black-winged stilt		•	•	•		•	•		•
red-necked avocet		•	•	•		•	•		•
black-tailed godwit	Y	•	•	•		•	•		•
bar-tailed godwit	Y							•	
sharp-tailed sandpiper	Y								•
marsh sandpiper	Y	•	•	•		•	•		•
curlew sandpiper	Y	•	•	•		•	•		•
common sandpiper	Y				•				
pectoral sandpiper	Y	•	•	•		•	•		•
wood sandpiper	Y					•	•		•
common greenshank	Y	•	•	•		•	•		•
little curlew	Y	•	•	•		•	•		•
eastern curlew	Y							•	
Australian painted snipe	Y	•		**					
Swanhoe's snipe	Y		•	•					
masked lapwing (northern)		•	•	•		•	•		•
Australian pratincole		•	•	•		•	•		•
Oriental pratincole	Y		•	•		•	•		•
comb-crested jacana		•	•	•		•	•		•
whiskered tern		•	•	•		•	•		•
white-winged tern	Y		•	•		•	•		•
gull-billed tern	Y	•	•	•		•	•		•
Caspian tern	Y		•	•		•	•		•
silver gull		•	•	•		•	•		•
great egret	Y	•	•	•		•	•		•
cattle egret	Y								•
intermediate egret		•	•	•		•	•		•
little egret		•	•	•		•	•		•
white-faced heron		•	•	•		•	•		•
white-necked heron		•	•	•		•	•		•
pieb heron		•	•	•		•	•		•
nankeen night heron		•	•	•		•	•		•
black-necked stork		•	•	•		•	•		•
royal spoonbill		•	•	•		•	•		•
yellow-billed spoonbill		•	•	•		•	•		•
glossy ibis	Y	•	•	•		•	•		•
Australian white ibis		•	•	•		•	•		•
straw-necked ibis		•	•	•		•	•		•
swamp harrier		•	•	•		•	•		•
white-bellied sea eagle	Y							•	
osprey									•
booby		•	•	•		•	•		•
Eurasian coot		•	•	•		•	•		•
darky moorhen									•
buff-banded rail									•
black bittern				•			•		•
purple swamphen (northern)		•	•	•		•	•		•
black-tailed native hen		•	•	•		•	•		•
Australian spotted crane		•	•	•		•	•		•
Bairon's crane					•				
unidentified crane									•
white-browed crane				•					
darter		•	•	•		•	•		•
Australian pelican		•	•	•		•	•		•
pieb cormorant		•	•	•		•	•		•
little pieb cormorant		•	•	•		•	•		•
little black cormorant		•	•	•		•	•		•
Australasian grebe		•	•	•		•	•		•
clamorous reed warbler		•	•	•		•	•		•
yellow chat		•		•					•
tawny grassbird									•
red-chested button quail									•
zitting cisticola			•			•			•
golden-headed cisticola									•
Survey species count	28	53	52	54	52	42	34		52

April 1993. The estimated extent of inundation was much higher (3349 ha) in Apr 1993 than for the 1988 counts (Figure 8), but very few waterbirds were counted. Ground access was probably difficult and only 5% of the wetland was surveyed (Jaensch, 1994). Jaensch (1994) records a maximum count (out of several undertaken between Feb and Sep 1993) of 2619. This was an aerial count on 6 April. Jaensch (1994) says that the aerial count was from only one of two observers and included areas outside of the Ramsar boundary. DBCA data (provided by Stuart Halse) suggests a higher tally of 8145 for the whole aerial count on that date.

July and Nov 2005. Hassell *et al.* (2006) notes that “At the time of both of our surveys, water levels were very low on Parry Floodplain, with most water occurring in billabongs along Parry’s Creek”. Areas of inundation estimated from Landsat imagery are 468 ha (2 days prior to the July survey) and 181 ha (1 month after the Nov survey but with significant rains during this period). The ground counts were higher in July (6405) than in November (1591).

May 2018. On 10 May 2018 (3 days prior to the survey) the area of inundation based on the Landsat data was 1560 ha. Comparison with Jaensch and Vervest’s Figure 8 suggests there was more water present in May 2018 than in May 1988. Compared to the latter survey, the May 2018 ground survey effort was lower, with just two people counting (aided by two spotters) and just covering the main wetland complex immediately west and north of Marlgu Billabong (Milligan Lagoon), although we followed that wetland further north-east than is indicated on Jaensch and Vervest’s map. Ground count was 28259 and aerial count 22001.

It is clear from the above that total waterbird counts are not strongly related to the amount of water present, probably due to varying survey effort and methods which have usually been poorly documented.

8.3 Waterbirds listed under international migratory bird agreements

Twenty-eight species recorded at Parry Lagoons are listed under international migratory bird agreements. Nine of these were recorded in May 2018 (great egret, cattle egret, white-bellied sea-eagle, glossy ibis, red-necked stint, black-tailed godwit, sharp-tailed sandpiper, marsh sandpiper and gull-billed tern). Previous published surveys have recorded 8 to 14 of these listed species. However, Jaensch and Vervest (1990) note that in the 1980s several species (including most of the shorebird species) were only present on the smaller claypans that were not surveyed in 2018. Hassell (2006) recorded three shorebirds not seen in May 2018 around Marlgu Billabong but this was about the only water present in 2005 (the claypans being dry). Some of the species that have occurred infrequently, such as the greater sand plover, bar-tailed godwit and eastern curlew, are normally associated with intertidal flats and would not be expected to occur regularly on freshwater habitats.

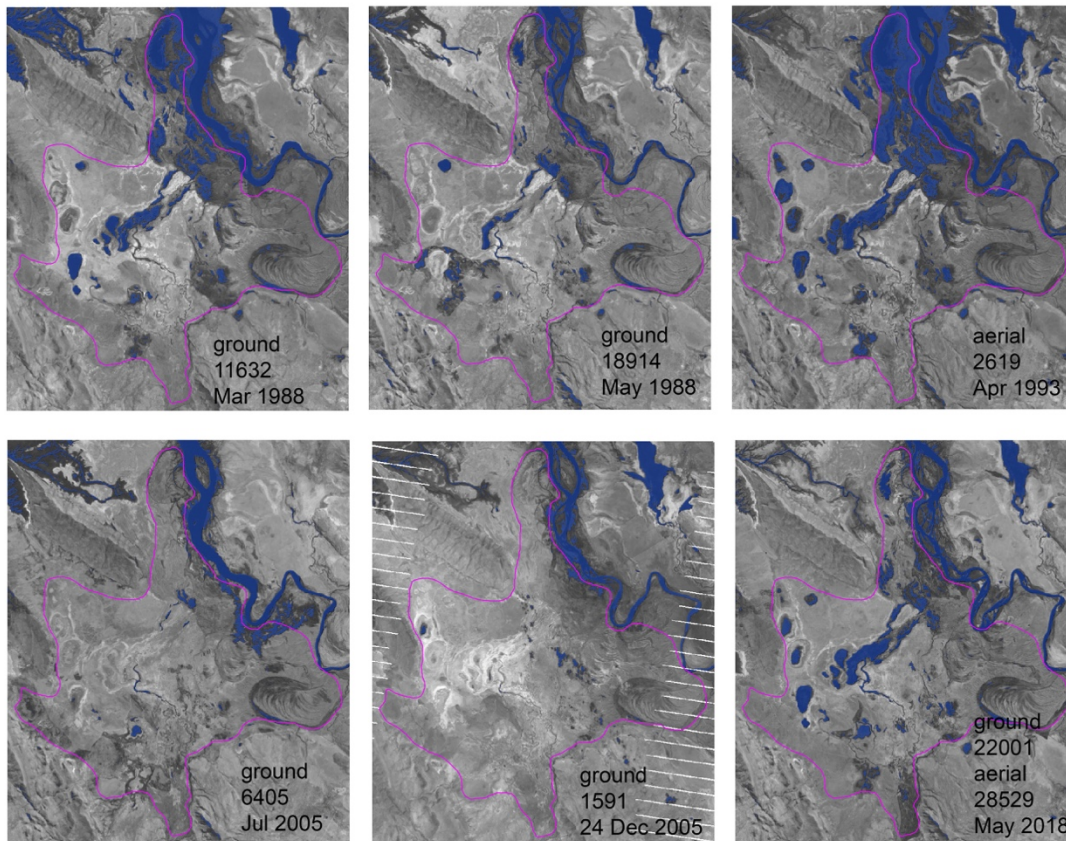


Figure 8. Landsat band 5 infra-red imagery of Parry Lagoons for the closest available dates for six waterbird surveys between March 1988 and May 2018, with type of count, total count and date of the Landsat imagery. Most imagery dates are within a few days of the respective survey except for the 24 Dec 2005 which is was a month after the Nov 2005 survey (but after 164 mm rainfall in the intervening period at Kununurra airport). Diagonal lines on the Dec 2005 plot are missing satellite data.

8.4 May 2018 counts in relation to Ramsar listing criteria and limits of acceptable change

8.4.1 Ramsar criterion 2. Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Five of the waterbird species recorded at Parry Lagoons are EPBC listed as threatened: greater sand plover, bar-tailed godwit, Australian painted snipe, eastern curlew and curlew sandpiper. Most of these have only rarely been observed at Parry Lagoons and only in low numbers. None were seen in May 2018.

8.4.2 Ramsar criterion 5. Regularly supports 20000 or more waterbirds.

The very high counts of waterbirds in May 2018 show that the Ramsar site continues to support greater than 20,000 waterbirds.

8.4.3 Ramsar criterion 6. Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

None of the May 2018 counts of migratory shorebirds exceeded 1% of the estimated East Asian-Australian flyway populations for migratory species (Hansen *et al.*, 2016) or 1% population thresholds for Australian/Australasian populations (using estimates in Wetlands International, 2018). The closest were red-kneed dotterels (0.8%) and Australian pelicans (0.7%). Jaensch and Vervest (1990) stated that:

“In terms of numbers counted at any one wetland, Parry is of national importance for the red-kneed dotterel, wood sandpiper and garganey and possibly also for the glossy ibis, plumed whistling duck and Swinehoe’s snipe. In addition, numbers counted of the green-pygmy goose, comb-crested jacana, masked lapwing, little curlew, Australian pratincole and yellow chat have been exceeded at few (or no) other wetland in Western Australia.”

Parry Lagoons also remains an important area for zitting cisticola, this wetland associated species being only known from this area to the NT border in WA.

8.5 Limits of acceptable change

Hale (2008) note that the limits of acceptable change are not well defined because “Abundance, breeding and species composition is data deficient, with quantitative counts limited to two years prior to listing and one since. Preliminary LACs are set based on Ramsar criteria and reason for listing”. This May 2018 survey is the first survey since the ECD was written in 2008.

The ‘preliminary LACs’ are:

In most of the years in which the Parry Floodplain Wetlands is extensively inundated, the system supports:

- **>20000 waterbirds**

About half of the counts have recorded more than 20000 birds.

- **Substantial numbers of migratory shorebirds**

Between 710 and 2151 migratory shorebirds were recorded in the 1980s by Jaensch and Vervest (1990) but subsequent counts have been under 300. Only 170 migratory shorebirds were counted in May 2018. However, the lower post-1980s counts could reflect extent of inundation during some surveys (very low in 2005) or the extent of the survey, rather than a change in numbers of shorebirds the wetlands support. Jaensch and Vervest (1990) observed most shorebirds on claypans that were not surveyed during subsequent counts. This

points to the need for a standard protocol for surveying shorebirds that takes into account extent of inundation and ground access. Of course, greater numbers of shorebirds are likely to be observed during and immediately after the wet season while the bulk of migratory waders are present in Australia.

- **Substantial breeding by waterbirds**

Jaensch and Vervest (1990) noted six species breeding in May 1986 but did not indicate that breeding was observed in Mar and May 1988. Breeding was not noted in Jaensch (1994) and Hassell et al. (2006). In May 2018, we observed four broods of wandering whistling-duck, a brood of comb-crested jacana and juvenile magpie geese. Parry Lagoons is likely to be an important waterbird breeding site, but this has not been quantified. Poor access to large areas on the ground (due to crocodiles and the dense vegetation) has probably hindered assessment of waterbird breeding. Surveys earlier in the year would probably result in more breeding records.

- **Large numbers of plumed whistling-duck and little curlew**

Jaensch and Vervest (1990) counted 400 little curlew in Mar 1988. This would represent about 0.2% of the global population estimate for 1994 (Wetlands International, 2018) and about the same for the most recent population estimates. Hassell et al. (2006) recorded 138 in November 2005. None were recorded in May 2018, but these are more likely to be seen in summer/early autumn.

Jaensch and Vervest (1990) recorded 698 to 6500 plumed whistling-duck in the 1980s but only 266 were recorded in 1993 (despite high water levels) and Hassell et al. (2006) counted just 232. About 2500 were seen in May 2018 representing about 0.25% of the estimated Australian population (Wetlands International, 2018).

- **At least occasional (1 in 20 year) occurrence of Australian painted snipe provided that appropriately frequent, systematic and comprehensive surveys of waterbirds have been conducted at these times**

This species was recorded in low numbers in May 1986 (2 birds) by Jaensch and Vervest (1990), who also noted its presence in May 1988, but not in subsequent surveys, though there are undoubtedly other unpublished records for the Parry Lagoons area. Most surveys of Parry Lagoons for which counts of individual species are available have been carried out in late autumn to winter whereas painted snipe are more frequently recorded over summer (Lane & Rogers, 2000). Painted snipe may have been present during other surveys but not seen. Targeted survey effort is likely to be required to detect this species more reliably.

The Birdlife data has no additional records of painted snipe from 352 individual surveys in the Parry Lagoons area (see methods).

9 Recommendations

Survey of waterbirds at Parry Lagoons has been infrequent and variable in extent and timing in relation to season and extent of wetland inundation, making meaningful temporal comparisons impossible at present. Nonetheless, the large number of waterbirds counted in May 2018 confirms the ongoing significance of this wetland.

Designing a consistent but relatively inexpensive program of surveying waterbirds across such a large and variable wetland is not simple.

Hassell et al. (2006) recommended monthly surveys from three fixed points that are accessible by vehicle most of the time, with a focus on Marlgu Billabong and the Parry Lagoons *sensu strictu* (south of Marlgu). This may provide consistent temporal data over longer time frames provided it is interpreted in relation to extent of flooding of the broader system. It is unlikely that monthly survey could be resourced, but 2 or 3 well-timed surveys of this nature would serve the same purpose if repeated each year. However, this would not provide estimates of the larger numbers of many species using the broader system and would not as consistently detect many of the species known to regularly occur on the floodplain.

It is difficult to undertake more extensive surveys in a consistent way given the size and complexity of the wetland and the varying extents of inundation between seasons and years. Consistency is probably easiest to achieve with aerial surveys and this would be the only viable method of surveying during the late wet-season if flooding is extensive, but aerial survey can miss or underestimate rarer or cryptic species, especially considering the dense vegetation in parts of the system. Hassell et al (2006) also suggested aerial surveys when the area is extensively flooded, followed by ground counts on 'quad-bikes or shallow-draught boats'. Issues of safety aside (especially use of shallow draft boats in salt-water crocodile habitat), undertaking simultaneous aerial and ground counts is probably the best option for monitoring against the original Ramsar criteria and for further developing and monitoring against limits of acceptable change. Assessing some of the Ramsar and ECD criteria will require a series of later summer surveys in good summer rainfall years. Greater comparability of results could also be achieved by recording counts separately for each wetland area and by detailed documentation of survey effort on maps (with GPS tracks) and remotely sensed inundation. Remote sensed inundation extents and frequency could assist with division of the region into discrete survey areas.

An additional or alternative approach could be surveys spatially and temporally targeted to just species of interest (e.g. those with limits of acceptable change).

10 References

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