The Whistler

Latham's Snipe
Grey-crowned Babblers
White-throated Nightjar
Deep Pond
Manning River
Southwest Hunter
Warakeila
Timor Caves
Moon Island

Number 2
2008

An occasional publication of the
Hunter Bird Observers Club Inc.

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The aims of the Hunter Bird Observers Club (HBOC), which is affiliated with Bird Observation and Conservation Australia, are:

- ***To encourage and further the study and conservation of Australian birds and their habitat***
- ***To encourage bird observing as a leisure-time activity***

HBOC is administered by a **Committee**:

Authors wishing to submit manuscripts of bird surveys or behavioural studies for consideration for publication should consult **Instructions for Authors** on page 57 and submit to the **Editors**: Mike Newman omgnewman@bigpond.com and/or Harold Tarrant proclus@bigpond.com

Authors wishing to contribute articles of general bird and birdwatching news to the club newsletter, which has 6 issues per year, should submit to the **Newsletter Editor:** Robert McDonald spinifex@y7mail.com

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Front cover: Welcome Swallow *Hirundo neoxena* – Photo Chris Herbert

Back cover: Sharp-tailed Sandpipers *Calidris acuminata* at Deep Pond – Photo Chris Herbert

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The *Whistler* – Editorial

The Whistler Number 1 sets an impressive standard for which Liz Huxtable the previous Editor is congratulated. In taking over from Liz our challenge is to sustain that standard and help the journal to become the cornerstone of bird study and conservation in the Hunter Region.

In publishing the Whistler the Hunter Bird Observers Club (HBOC) has three primary objectives:

1. To provide an authoritative record of bird distribution and behaviour in the Hunter Region; this will inform present and future generations, and provide a factual basis for the conservation of birds.
2. To nurture the study of birds by providing opportunities for publication by both professional and amateur ornithologists.
3. To produce a journal, at least annually, which interests, informs and engages the HBOC membership in the range of systematic bird studies undertaken by its members.

This editorial explores the opportunities and challenges associated with delivering a Whistler which fulfils these objectives.

During the last ten years many HBOC members have become involved in the systematic study of birds either as part of group activities like the monthly Hunter Estuary Wader Surveys or through individual studies. Often these surveys have been initiated as part of national projects organised by Birds Australia (BA) such as the Atlas project. HBOC members' efforts provide an important contribution through these projects to publications like "The New Atlas of Australian Birds" and the recently published "State of Australia's Birds 2008", which provide a valuable commentary on the status of Australia's Birds at the continental and regional scale. Arguably this knowledge should drive the direction and priorities for the conservation of birds. However, these publications lack the detail at the regional and local scale which is provided by articles appearing in this volume of the Whistler that describe the bird populations of a variety of habitats including Deep Pond on Kooragang Island, the Manning River Estuary, "Warakeila" a cattle property in the Allyn Valley and a number of dry bushland sites to the west of Jerrys Plains. These papers contribute to our first objective by providing comprehensive records of the birds of particular parts of the Hunter Region which can be used for conservation purposes.

Bird populations are dynamic with long-term trends in distribution and numbers which can only be understood through enduring studies. Three of the papers in this volume of Whistler involve investigations ranging from seven to twelve years. Through our personal involvement we are acutely aware of the dedication required to sustain ongoing systematic effort of this magnitude. But the satisfaction of getting to know the bird population of an area intimately can amply reward the effort involved. Through the analysis and publication of their results, Whistler authors are not only unravelling intriguing stories underlying their field work, but also discovering that their work poses numerous unanswered questions. In essence documenting what has happened to the birds of your patch unleashes natural curiosity as to why it happened, generating both for yourself and for readers a new set of challenges for ongoing study. Suddenly there becomes a compelling reason to do the next survey and perhaps to be more insightful of what the birds are doing, how their habitat is changing, and how the behavioural changes and habitat changes are interlinked. The short note on the roosting behaviour of Grey-crowned Babblers is an excellent example of how understanding bird behaviour can provide a new dimension to one's interest in birds.

As mentioned earlier most of the papers in this volume of Whistler also feed into national projects run by BA. It is very important that there is local ownership and detailed documentation of the data generated because this identifies complexities associated with data collection and analysis. The article on surveys of the Manning River Estuary is an excellent example. Two other papers involve the interpretation of data submitted to the BA Atlas project in which a 2ha 20 min survey method is used. This is BA's preferred survey technique

because it can be used to discern long-term trends in bird populations at the landscape scale, involving the analysis of very large data sets collected by many contributors. The concern is that at a single site or a small group of sites in close proximity the data set will be too small for meaningful interpretation. However the papers on the bird surveys at "Warakeila" and the Jerrys Plains area demonstrate that meaningful analysis is possible at least to the point where speculative conclusions can be reached. Even more encouraging is the synergy between these two studies which became apparent to the authors during the preparation of these papers. Clearly the publication of papers and notes for Whistler nurtures and invigorates involvement in bird study in line with our second objective.

Our final objective of producing a Whistler which interests, informs and engages the HBOC membership is more difficult because creating a comprehensive and scientifically sound record of the field studies of birds may not result in an article which is easy to write, read or digest. In addition we encourage contributions from both amateur and professional ornithologists, and this will inevitably involve a new experience for some contributors. We would like to see more short notes and this is an ideal starting point for novice authors. In attempting to achieve a balance we have adopted a more flexible attitude to style of presentation, hopefully without compromising the clarity and scientific authority of the articles, all of which are subject to peer review.

The production of Whistler is supported by an advisory committee the members of which play essential roles in obtaining copy, helping where necessary with the drafting of papers, design of the cover, formatting, soliciting funding and finally expediting printing. We also wish to thank referees for their timely contribution to the peer review process. We are especially indebted to Liz Crawford for her meticulous attention to detail in the formatting and layout of Whistler Number 2.

Finally we wish to acknowledge the financial support of the Hunter-Central Rivers Catchment Management Authority, who have sponsored this volume of the Whistler. Without their support it would be difficult for HBOC both to produce a journal of the standard set for the Whistler and to distribute it more widely than our membership. A wider distribution will ensure that it reaches and informs those charged with making decisions and taking actions which conserve birds and their habitat in the Hunter Region, and hopefully beyond. This is the primary purpose of our endeavours.

Mike Newman and Harold Tarrant
Joint Editors

The birds of Deep Pond – Kooragang Island 1993 - 2007

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Waterfowl and shorebirds are the main subjects for discussion in this article. The population of birds at Deep Pond was surveyed monthly over seven years from 2000 to 2007 as part of the Hunter Estuary Wader Surveys by members of the Hunter Bird Observers Club (HBOC). The surveys were conducted as close to high tide as possible by a varying number of observers. Fifteen species of waterfowl and seventeen species of waders have used the wetland during the seven years, many of which are listed under Commonwealth and State conservation legislation. There is an exchange of species between Deep Pond and Area E depending on weather and water level conditions. Deep Pond forms an integral part of the chain of wetlands in the Hunter Estuary. The total list of 104 species for Deep Pond includes observations from 1993 to 2007.

INTRODUCTION

Deep Pond is a freshwater wetland on Kooragang Island formed over a number of years through the infilling of surrounding estuarine wetlands with industrial waste, mainly slag from BHP Steelworks which commenced production in 1915. Deep Pond, 32^0 51' 54" S 151^0 43' 40" E, is situated on land earmarked for industrial development. The wetland is irregular in shape, measuring approximately 700 by 500 metres with an area of about 26 hectares (**Figure 1**). The western and northern sides are bounded by the industrial railway embankment which was built between the years 1966 and 1969. The railway is in constant use with slow moving trains transporting coal to the Port Waratah Coal Services export terminal day and night. The embankment is steep and has exposed rocks at the waterline. The bank on the southern side rises gently with edges vegetated with *Phragmites australis* and various grasses. During dry periods, when the wetland gradually dries out, mudflats are formed on this southern side. The bank on the eastern side is about five metres high and very steep but, at its base, is a narrow "beach" made from weathered slag material. This "beach" is favoured as a roost site for shorebirds and ducks. Waders roost on a row of rocks running for a short distance east-west out into the wetland. The land surrounding Deep Pond is flat and covered in grasses and weeds with few trees. This wetland is not affected by tidal movement and water levels appear to be dependent on rainfall.

Deep Pond will undergo considerable changes to its hydrology in future years as it lies in the path of the Newcastle Coal Infrastructure Group's Coal Export Terminal approved by the NSW State government in 2007. As part of Stage 2 of the Project, not expected to be implemented until 2020, a railway line will be built on a high embankment in an east-west direction across this wetland effectively cutting it in two. The ensuing fragmentation will remove wader and waterfowl habitat on the eastern "beach" and rocks. It will also degrade wader habitat on the southern side.

It is noteworthy that on the western side of the industrial railway embankment and Deep Pond is a large saline wetland known as Area E (**Figure 1**). It receives tidal flow from the South Arm of the Hunter River through Wader and Fish Fry Creeks. The vegetation on Area E is a complex of saltmarsh and mangroves. There is an exchange of birdlife between Deep Pond and Area E depending on the state of the wetlands in terms of water level and the availability of muddy edges, as exemplified by the Marsh Sandpiper results discussed in a later section.

METHODS

Members of the Hunter Bird Observers Club (HBOC) carried out 81 monthly surveys out of a possible 85 from September 2000 to September 2007 as part of the regular high tide wader survey of the Lower Hunter Estuary. The surveys of Deep Pond took place as close to high tide as possible. The time taken for each survey was between 20 and 120 minutes. The number of observers fluctuated with a minimum of one and a maximum of eight. Due to inclement weather, the months missed were October 2000, November 2003, May 2005 and June 2007. The data included in the graphs and discussions relate to HBOC surveys. I have

not included graphs for species which have occurred fewer than three times during these surveys. However, species reported in the Hunter Region of NSW Annual Bird Reports (Stuart 1994-2008) and observed outside the HBOC survey dates have been discussed in the text where appropriate. For the first four years surveys were undertaken from the western side of the wetland with an incomplete view across the industrial railway line and this resulted in accurate counts of only the larger species. Since June 2005 the site has been surveyed from the eastern and southern sides which afford an unimpeded view of the wetland. The total of 104 species listed in **Appendix 1** was recorded from 1993 to 2007 and includes those seen outside the survey dates. The rainfall figures were supplied by the Kooragang Wetland Rehabilitation Project.

Figure 1. Oblique aerial photo of Deep Pond, which is separated from Area E by the industrial rail line (photo courtesy of Kooragang Wetland Rehabilitation Project).

RESULTS AND DISCUSSION

Waterfowl

The survey results of fifteen species of waterfowl recorded in this study are discussed below, drawing comparisons with their accepted status in the Hunter Region (Stuart 1994-2008).

Magpie Goose *Anseranas semipalmata*

The once abundant Magpie Goose vanished from NSW in the 1920s and was not seen again in NSW until 1984 at the Macquarie Marshes. In 1985 four appeared at Seaham Swamp, Seaham and in February 1986, probably the same four birds and a gosling appeared at the Hunter Wetlands Centre at Shortland. From 1987 a program of reintroduction commenced at the Centre (van der Sijs 1993).

Since that time the species has not spread but continues to survive and breed in small numbers mainly around Shortland and Hexham Swamp (M. Newman pers. comm.). It is therefore interesting to note that seven and nine birds appeared on Deep Pond in February and March 2007 respectively in the very late afternoon (F. van Gessel pers. comm.). This species is listed as Vulnerable under the NSW Threatened Species Conservation Act 1995 (TSC Act).

Wandering Whistling-Duck *Dendrocygna arcuata*

The Wandering Whistling-Duck is a common bird in the wetlands of northern Australia. It occurs in small numbers in the Hunter Region where it is a breeding resident. It was present on Deep Pond on two occasions. Two adults and two ducklings were seen in February 2005 and two adults and three ducklings in March 2005.

Musk Duck *Biziura lobata*

The Musk Duck is found in the southern half of Australia both inland and on the coast and is a breeding resident in the Hunter Region. It occurs in small numbers when the water levels are sufficiently deep to sustain feeding requirements (**Figure 2**). On Grahamstown Dam this species occurs in numbers of 20 or more but as elsewhere this species usually occurs only in ones and twos on smaller wetlands; the peak counts of 12 in March 2005 and 8 in December 2006 (Stuart 2007) are noteworthy.

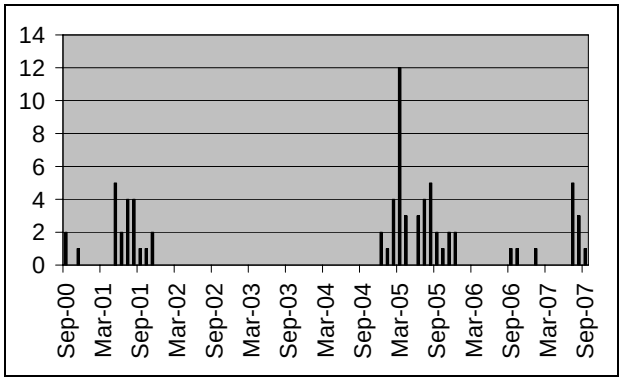

Figure 2. Musk Duck.

Freckled Duck *Stictonetta naevosa*

The Freckled Duck is a bird of inland wetlands and seldom comes to eastern NSW and is rare in the Hunter Region. It has occurred four times on Deep Pond: three birds in February 1999 (Stuart 2000), five in February and March 2000 (Stuart 2001), three in January 2006, and six birds in December 2006. This species is known to disperse during times of drought and its presence in the Hunter Region reflects the severe drought conditions in NSW in 2005 and 2006. This species is listed as Vulnerable under the TSC Act.

Black Swan *Cygnus atratus*

The Black Swan is a common breeding resident in the Hunter Region and has been present in most months on Deep Pond with peak counts of 330 and 338 in September and October 2002 respectively. Counts of over a hundred are not uncommon. It bred successfully in 2005 with a maximum of three cygnets, twice in 2006 with three and five cygnets observed, and in September 2007 when five cygnets were present. There is no consistent seasonal trend in the variation of Black Swan numbers (**Figure 3**).

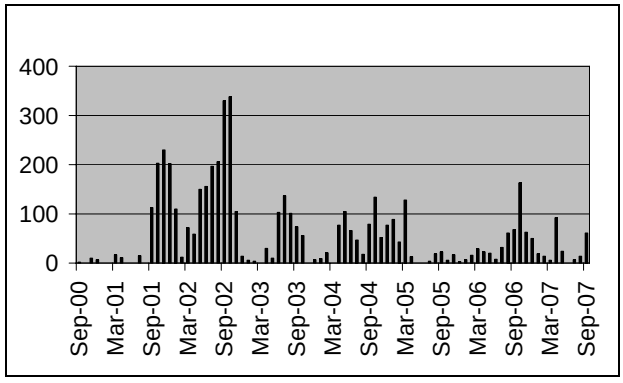

Figure 3. Black Swan.

Australian Shelduck *Tadorna tadornoides*

This species is rare in the Lower Hunter Estuary and has been seen only once on Deep Pond when two were recorded in December 2001 (Stuart 2002).

Pink-eared Duck *Malacorhynchus membranaceus*

The Pink-eared Duck, which inhabits the wetlands of inland Australia, is highly responsive to weather conditions and moves onto and away from wetlands according to rainfall (Marchant & Higgins 1990, p. 1249). Since 2003 drought conditions have persisted throughout inland Australia and this species has been seen intermittently at Deep Pond in small numbers. However, in April 2005, 143 birds were recorded after several weeks of heavy rain on the coast (**Figure 4**). In February and March of that year 135mm and 185mm respectively of rain were

recorded on Kooragang Island. Numbers peaked again at 214 in May 2007 after rainfalls of 120.5mm, 191.5mm and 153mm in February, March and April respectively.

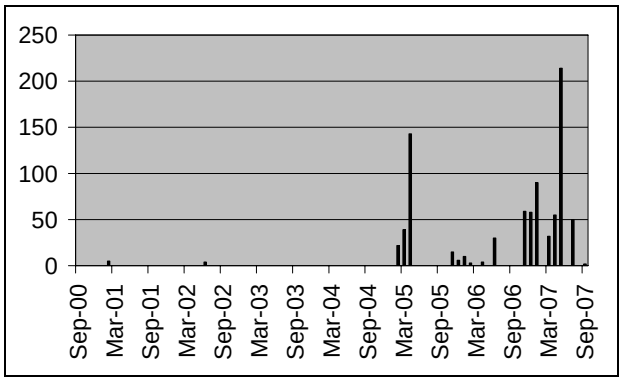

Figure 4. Pink-eared Duck.

Australasian Shoveler *Anas rhynchotis*

Numbers of Australasian Shoveler have increased in the Hunter Region in recent years and it is currently considered to be a breeding resident though breeding records remain scarce. Numbers on Deep Pond build up in autumn and winter with smaller numbers present in the summer months (**Figure 5**).

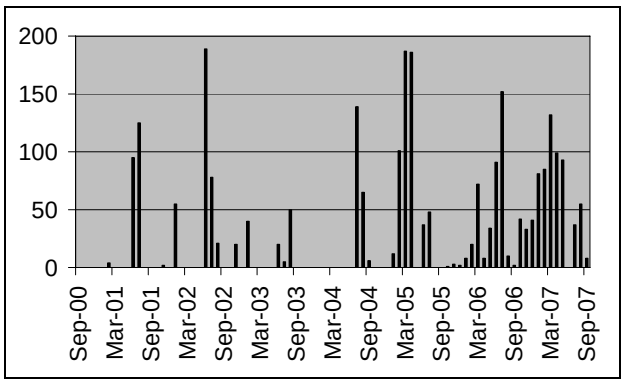

Figure 5. Australasian Shoveler.

The highest number of 189 was recorded in June 2002. In 2005 large numbers occurred in February (101), March (187) and April (186) after heavy rain over several weeks. Smaller than expected numbers in winter 2005 may have been due to the majority of the population being at the nearby Hunter Wetlands Centre (HWC), 207 in June and 100+ in July. This apparent relocation reflects the importance of a choice of wetlands being available. The numbers at HWC in the winter of 2005 are comparable to the peak numbers seen at Deep Pond in most years.

Northern Shoveler *Anas clypeata*

This species occurs in the northern hemisphere and is vagrant to Australia. It occurred once on Deep Pond in July 2002 (Stuart 2003). It is listed under the intergovernmental treaty with China for the protection of migratory birds and their habitat (CAMBA).

Grey Teal *Anas gracilis*

The wide-spread Grey Teal responds rapidly to rainfall and in times of drought it leaves drying wetlands, often coming to coastal areas (Marchant & Higgins 1990, p. 1269). It is a breeding resident in the Hunter Region and appears on Deep Pond in large numbers after good rain (**Figure 6**). The highest number recorded was 997 in April 2007 after heavy rain in March (191.5mm) and in April (153mm). A steadily increasing trend is evident since summer 2003/2004.

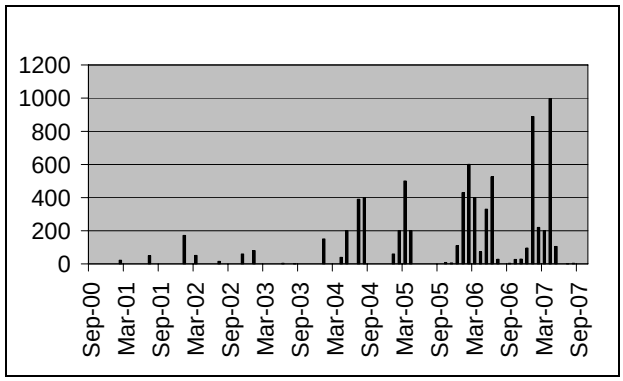

Figure 6. Grey Teal.

Chestnut Teal *Anas castanea*

The Chestnut Teal is most common on the coastal wetlands of southern and eastern Australia. It tolerates saline conditions better than other duck species. The Chestnut Teal is a breeding resident in the Hunter Region and on Deep Pond it outnumbers other species of ducks. In general numbers increase over the summer months when other wetlands become unsuitable (**Figure 7**). Numbers peaked in February 2004 at 1010 birds. This is 1% of the estimated South Eastern Australian population of 100,000 birds (Wetlands International 2006, p. 89). Deep Pond is clearly an important site for both Chestnut Teal and the previously discussed Grey Teal.

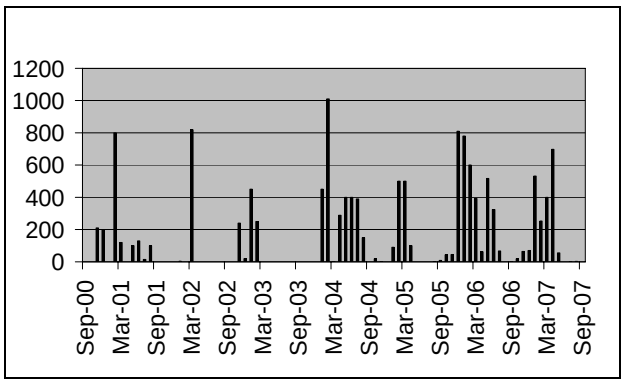

Figure 7. Chestnut Teal.

Northern Mallard *Anas platyrhynchos*

This introduced species has occurred only once on Deep Pond where one bird was present in August 2007.

Pacific Black Duck *Anas superciliosa*

The Pacific Black Duck prefers permanent wetlands with low salinity (Marchant & Higgins 1990, p. 1321) and is a common, breeding resident in the Hunter Region. The exceptionally high peak number of 350 in April 2005 was more than six times higher than the maximum number in any other year (**Figure 8**). This occurred after rains in February (135mm) and March (185mm) filled Deep Pond. Three ducklings were present in December 2005.

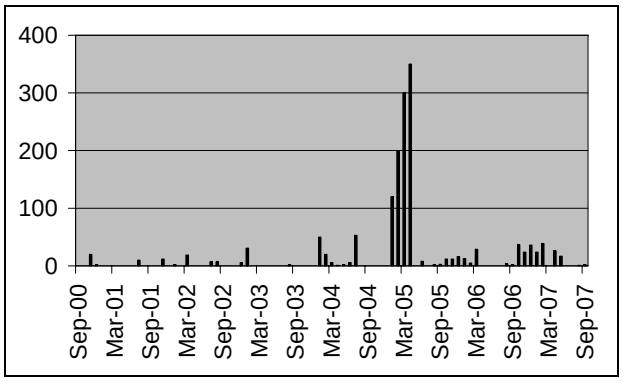

Figure 8. Pacific Black Duck.

Hardhead *Aythya australis*

The Hardhead prefers deep, freshwater wetlands which it leaves before they become shallow. It is known to disperse over long distances in search of suitable wetlands (Blakers *et al.*1984). This species is resident in the Hunter Region and visits Deep Pond only during or after heavy rain. It was present in every month of 2005 with the peak count of 600 in April (**Figure 9**). Numbers rose again to 550 in October 2006 after storms filled the wetland. Heavy autumnal rains in 2007 kept Deep Pond full and the highest number ever recorded was 823 in May of that year.

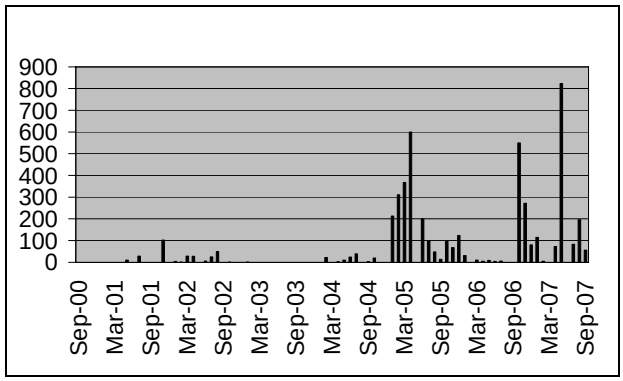

Figure 9. Hardhead.

Blue-billed Duck *Oxyura australis*

In NSW this species is usually found west of the Great Dividing Range where it prefers deep, permanent wetlands and is regarded as rare in the Hunter Estuary. It appeared on Deep Pond in July, August and September 2005 with two, four and three birds respectively and in July and August 2007 with three and two birds respectively. On both occasions heavy rains had filled the wetland. This species is listed as Vulnerable under the TSC Act.

Grebes

The grebes are widespread in Australia and three species are common in the Hunter Region. All are known to breed in the area (Stuart 2008). The low numbers until mid 2005 may be partly due to the distance from the western survey point used until that time. The absence of both species in 2003 may be attributed to the exceptionally dry conditions of that year.

Australasian Grebe *Tachybaptus novaehollandiae*

This species occurred on 49 surveys. Good rainfall maintained a high level of water in Deep Pond during the earlier months of 2005 and the highest number recorded was 76 in July 2005 (**Figure 10**).

Hoary-headed Grebe *Poliocephalus poliocephalus*

Grahamstown Dam, a deep water reservoir, is the most important site for this species in the Hunter

Region where counts of over 300 occur regularly (Stuart 1994-2008). On Deep Pond the highest number of 146 occurred in May 2007 (**Figure 11**).

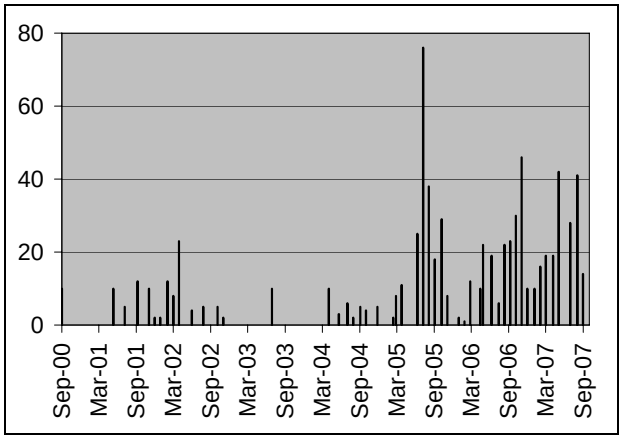

Figure 10. Australasian Grebe.

Great Crested Grebe *Podiceps cristatus*

This species occurred only once in September 2007 when two birds were present.

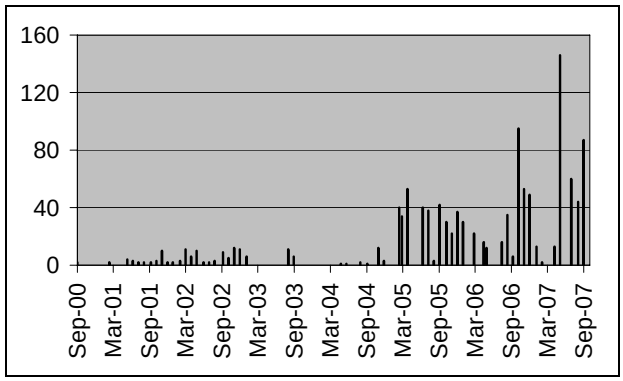

Figure 11. Hoary-headed Grebe.

Migratory Shorebirds

With one exception, migratory shorebirds occurring on Deep Pond breed in the Northern Hemisphere and are usual summer migrants to the Hunter Estuary. The exception is the Double-banded Plover *Charadrius bicinctus* which breeds in New Zealand and flies to Australia for the winter months. Some species of shorebirds make long distance flights of up to 29,000 kilometres a year and return to the same areas year after year. This migratory habit and their site faithfulness make them vulnerable to habitat variability. Migratory shorebird numbers in the Hunter Estuary have been in a serious state of decline over the past thirty years due to many factors but in part, at least, due to loss of suitable habitat in the area (Herbert 2007). Remaining habitat, however small, is therefore extremely valuable. Deep Pond supported an increasing number of shorebirds as drought conditions spread across NSW and eleven species of migratory shorebirds have occurred on this wetland to date. All migratory shorebirds and their habitats are protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and respective international conservation agreements with Japan, China and South Korea (JAMBA, CAMBA, ROKAMBA).

Some species such as Double-banded Plover, Latham's Snipe *Gallinago hardwickii*, Black-tailed Godwit *Limosa limosa*, Bar-tailed Godwit *Limosa lapponica*, Pectoral Sandpiper *Calidris melanotos* and Ruff *Philomachus pugnax* occurred irregularly in small numbers. Significant numbers of the remaining five migratory shorebirds have been recorded.

Table 1 summarises the survey results for the most numerous species of migratory shorebirds occurring on Deep Pond.

Table 1. Summary of migratory shorebird data for Deep Pond.

Species	Reporting Rate (%)*	Average Number Per Survey	Maximum Number	Minimum Number	Total Surveys Seen
Marsh Sandpiper	29	70	150	4	14
Common Greenshank	15	7	21	1	7
Red-necked Stint	6	3	4	2	3
Sharp-tailed Sandpiper	31	96	496	1	15
Curlew Sandpiper	15	84	450	1	7

*The reporting rate was calculated based on the frequency of presence between September and March involving 48 surveys.

Double-banded Plover *Charadrius bicinctus*

Two birds were seen in July 2004 and two in March 2007.

Latham's Snipe *Gallinago hardwickii*

A single bird was seen in February 2006.

Black-tailed Godwit *Limosa limosa*

A single bird was seen in September 2000. This species is listed as Vulnerable under the TSC Act.

Bar-tailed Godwit *Limosa lapponica*

A single bird was seen in February 2007.

Ruff *Philomachus pugnax*

A single bird was seen in March 2007.

Common Greenshank *Tringa nebularia*

This extremely wary shorebird prefers estuarine and inland wetlands in its non-breeding range and in the Hunter Estuary is seen most often on the Kooragang Dykes where up to 315 birds have been observed. Since the beginning of monthly wader surveys by HBOC in April 1999 this species has shown an overall decline in the estuary of 50% (Herbert 2007, p. 115). It occurred in small numbers on Deep Pond during five seasons, the highest number being 21 in March 2001 (**Figure 12**).

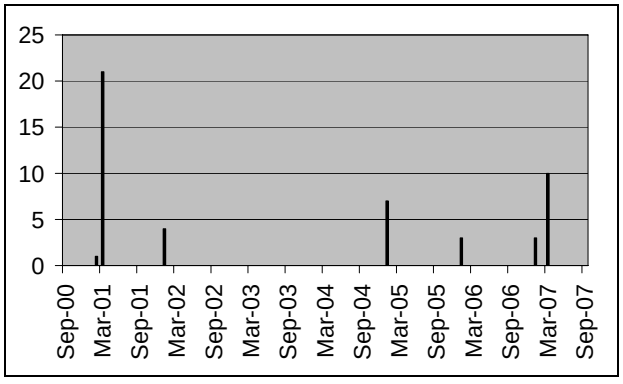

Figure 12. Common Greenshank.

Marsh Sandpiper *Tringa stagnatilis*

In its non-breeding range the Marsh Sandpiper prefers fresh or brackish wetlands. In the Hunter Estuary it occurred commonly on Fullerton Cove Beach until 2003 but is seldom seen there now because of the severe beach erosion. It is most commonly seen on Area E and Deep Pond. This species exemplifies the use of different wetlands by birds. The water in Area E is mostly saline and in Deep Pond the water is fresh. **Figure 13** shows that the majority of the birds are often on one or the other area. The Marsh Sandpiper has been present on Deep Pond every summer except 2000/2001. The highest number recorded on HBOC survey days was 150 in January 2002. However, I recorded the peak number of 270 in February 2007 outside the survey date.

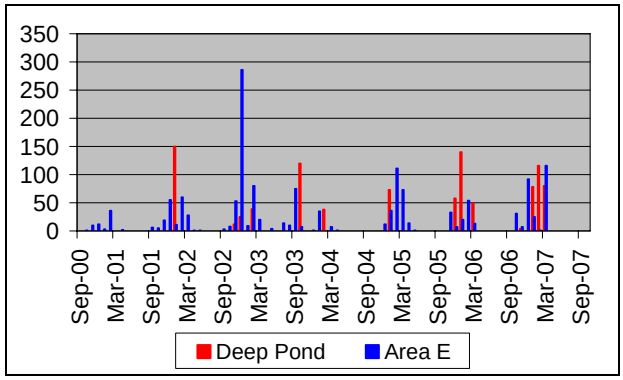

Figure 13. Marsh Sandpipers use both saline (Area E) and freshwater (Deep Pond) wetlands and the majority of birds in the Hunter Estuary are on either one or the other.

Red-necked Stint *Calidris ruficollis*

Red-necked Stints, one of the smaller species considered to be in decline in the Hunter Estuary (Herbert 2007, p. 134), have been recorded only occasionally and usually in small numbers, four or fewer. Prior to the change in survey points in 2005 there were no records. This was possibly due to the difficulty in identifying this very small species at long distance. The only record of a substantial number of 120 was seen outside the survey date in February 2007 when the birds were roosting on the row of rocks running east-west.

Pectoral Sandpiper *Calidris melanotus*

Unless good viewing conditions prevail, this species is difficult to separate from the Sharp-tailed Sandpiper and therefore may often go unidentified. One was observed in February and again in March 2007 (Stuart 2008).

Sharp-tailed Sandpiper *Calidris acuminata*

As other wetlands dry out this species is seen sporadically on Deep Pond where muddy margins are still present (**Figure 14**). It often roosts on the rocks on the eastern side. In the summer of

2006/2007 large numbers occurred; the highest HBOC count was 496 birds in January and in February 600 birds were present (F. van Gessel pers. comm.).

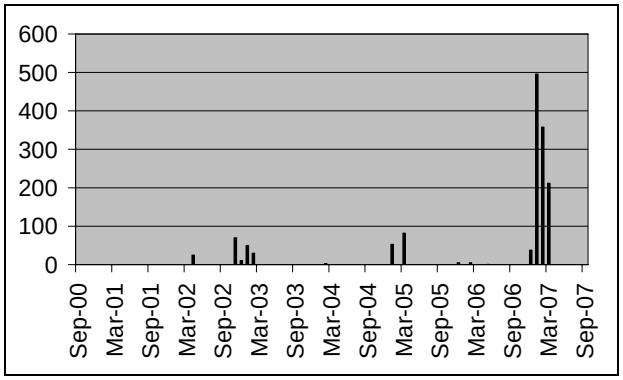

Figure 14. Sharp-tailed Sandpiper.

Curlew Sandpiper *Calidris ferruginea*

In its non-breeding areas the Curlew Sandpiper prefers the muddy edges of both coastal and inland wetlands (Higgins & Davies 1996, p. 315). In the Hunter Estuary loss of suitable habitat, such as the sewage ponds at Stockton and Big Pond on Kooragang Island, has contributed to a serious decline in numbers. When conditions are suitable, Deep Pond compensates to some extent for the loss of those sites. The species was seen on 50% of the summer surveys. The highest number on Deep Pond of 450 was recorded in January 2003 at the height of the drought and small numbers occurred in 2005, 2006 and 2007 (**Figure 15**).

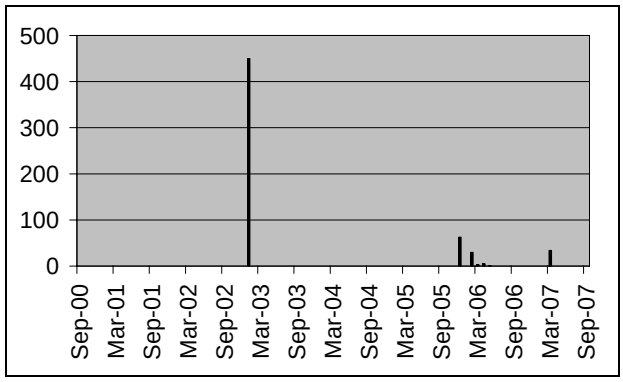

Figure 15. Curlew Sandpiper.

Australian Resident Shorebirds

Australian resident shorebirds occurring at Deep Pond are protected only under the most general legislation which applies to all fauna in Australia.

In general these species are not well studied. Survey results for the six species of resident shorebirds recorded on Deep Pond, all of which occur frequently in the Hunter Estuary, are summarised in **Table 2**.

Table 2. Summary of survey results for resident shorebirds at Deep Pond

Species	**Reporting Rate (%) ***	**Average per Survey**	**Maximum Number**	**Minimum Number**	**Total Surveys Seen**
Black-winged Stilt	47	97	525	1	38
Red-necked Avocet	28	296	2000	2	23
Red-capped Plover	4	20	53	1	3
Black-fronted Dotterel	22	8	48	1	18
Red-kneed Dotterel	4	3	4	2	3
Masked Lapwing	31	5	33	1	25

* The reporting rate was calculated based on the frequency of presence throughout the year involving 81 surveys.

Black-winged Stilt *Himantopus himantopus*

This species lives on shallow fresh or saline water and was seen at Deep Pond on 38 surveys. Over 200 birds commonly occur in February with a maximum of 525 in 2001(**Figure 16**).

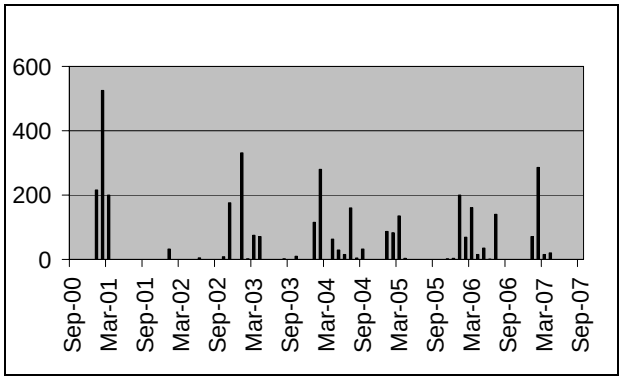

Figure 16. Black-winged Stilt.

Red-necked Avocet *Recurvirostra novaehollandiae*

Since the 1980s this inland species has taken up residence in the Hunter Estuary, probably as a result of drought conditions at that time. In some years up to 7,000 birds are present over the winter months. In response to rain in the central and western regions of Australia, they leave the Hunter Estuary to breed on the newly formed ephemeral wetlands. On Deep Pond the highest numbers regularly occur in January (**Figure 17**), and Deep Pond becomes important for any birds remaining over the summer months. The maximum number of 2000 was seen in January 2006, an exceptionally dry period throughout NSW. This count is more than 1% of the estimated Australian population of 107,000 birds (Wetlands International 2006, p. 150).

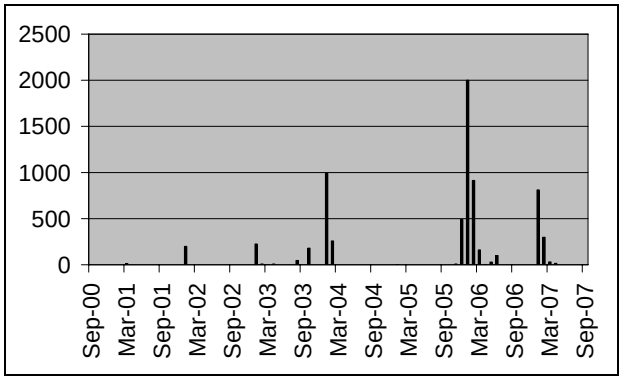

Figure 17. Red-necked Avocet

Red-capped Plover *Charadrius ruficapillus*

This species has been seen only on three surveys at Deep Pond. The maximum number of 53 was seen in June 2003. Interestingly, this species has taken advantage of changes in habitat and moved into areas fairly near Deep Pond where the habitat has been improved through the removal of weeds, e.g. Stockton Sandspit at Stockton, and where saltmarsh has been created, e.g. Phoenix Flats on Ash Island.

Black-fronted Dotterel *Elseyornis melanops*

The Black-fronted Dotterel occupies mainly freshwater shorelines and occurs in small numbers on Deep Pond when the wetland is drying out (**Figure 18**). Over 48 were present in July 2004. In October 2006 a nest with 3 eggs was found.

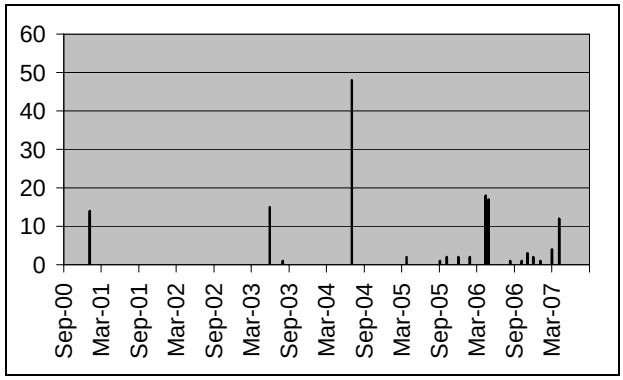

Figure 18. Black-fronted Dotterel**.**

Red-kneed Dotterel *Erythrogonys cinctus*

This species was observed on Deep Pond on only three surveys. The highest number was four in February 2006.

Masked Lapwing *Vanellus miles*

This common species occurs in small numbers around the muddy edges during any month of the year (**Figure 19**). The maximum number seen was 33 in March 2005.

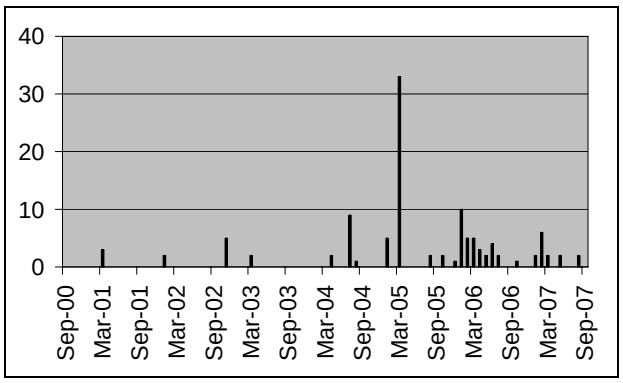

Figure 19. Masked Lapwing.

Other Species

Many other species of birds use the grasslands bordering Deep Pond. They include passerines such as the Golden-headed Cisticola *Cisticola exilis*, Australian Reed-Warbler *Acrocephalus australis*, Tawny Grassbird *Megalurus timoriensis*, Little Grassbird *Megalurus gramineus* and Australasian Pipit *Anthus novaeseelandiae*, all of which occur in large numbers. The uncommon Chestnut-breasted Mannikin *Lonchura castaneothorax* is often recorded. Stubble Quail *Coturnix pectoralis*, Brown Quail *Coturnix ypsilophora* and the rare Red-backed Button-quail *Turnix maculosus* are seen in the thick grass and weeds. Two Red-backed Button-quail were seen in February 2006 and three in February 2007 (Stuart 2007 & 2008). It is listed under the TSC Act as Vulnerable. Of particular interest is the large number of birds of prey or raptors (see **Appendix 1**), with White-bellied Sea-Eagles and Swamp Harriers being seen regularly. Twelve species, 50% of Australia's breeding raptors, have been recorded, including the Eastern Osprey *Pandion cristatus*, which is rare in the Hunter Estuary and is listed as Vulnerable under the TSC Act and the Spotted Harrier *Circus assimilis*, an uncommon bird near the NSW coast. The presence of so many raptors indicates a varied and abundant food supply as items in their diet include insects, fish, birds and small mammals. All raptors are protected under the EPBC Act.

CONCLUSIONS

The importance of Deep Pond lies in its large size and the varying water depths after heavy rainfall. It is a freshwater wetland rather than saline and its water levels fluctuate thus providing a variety of habitats suitable for different species at different times of the year. It seldom completely dries out. A rare advantage of the site is that it is secluded and closed to the public thus free from major disturbance. Most disturbances are caused by the large number of raptors which visit the area. The shorebirds utilise it when water levels are low and muddy edges are exposed particularly in late summer when other wetlands may dry out completely. It supports a large variety of waterbirds both shallow water species, such as the dabbling ducks, and deep water species, including Hardhead, Musk and Freckled Ducks as well as the three species of grebes. The timing of the occurrence of peak numbers of waterfowl is complex and differs between species. The data suggest that Deep Pond provides a refuge for birds leaving drought-affected areas and that it is capable at times of supporting some of the highest numbers of birds recorded for the wetlands in the Lower Hunter Estuary.

Of the birds recorded on Deep Pond six species are listed under the TSC Act and eleven species of shorebirds are listed under the EPBC Act. Two species, the Chestnut Teal and the Red-necked Avocet, have occurred in numbers fulfilling one of the criteria required for listing in the Directory of Important Wetlands Australia and the intergovernmental treaty, The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (otherwise known as the Ramsar Convention). The criterion is that a wetland support 1% of the population of a species. The estimated total populations of the Chestnut Teal in South Eastern Australia and the Red-necked Avocet are 100,000 and 107,000 birds respectively (Wetlands International 2006, pp. 89 & 150). However, another dimension of this criterion is the question of regularity. Although it cannot be established at present that Deep Pond "regularly" supports 1% of the population of these species, continued monitoring will clarify this issue. In three of the seven years of HBOC surveys, 2001, 2002, and 2005, Chestnut Teal numbers have exceeded 800 and in 2004 reached the 1% threshold of 1000 birds. Red-necked Avocet numbers exceeded the threshold of 1100 in January 2006 with 2000 birds being present. Data show that Deep Pond clearly provides important habitat for waterfowl and shorebirds and requires some measure of protection, especially in view of its location on industrial land. It is an integral component in the network of wetlands in the Hunter Estuary.

ACKNOWLEDGEMENTS

I gratefully acknowledge the many members of the Hunter Bird Observers Club who collected the data used in this article by participating in the monthly surveys of Deep Pond; the Regional Land Management Corporation who facilitated access to the site; Alan Stuart and Mike Newman who read the initial drafts; Chris Herbert and Liz Crawford who helped prepare the graphs; Kooragang Wetland Rehabilitation Project who supplied rainfall figures and the aerial photo; Nathan Juchau for calculating the area of the wetland; and Fred van Gessel for bird observations.

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Appendix 1. Total list of species recorded at Deep Pond 1993 – 2007.

Stubble Quail *Coturnix pectoralis*	Australian Spotted Crake *Porzana fluminea*
Brown Quail *Coturnix ypsilophora*	Eurasian Coot *Fulica atra*
Magpie Goose *Anseranas semipalmata*	Black-winged Stilt *Himantopus himantopus*
Wandering Whistling-Duck *Dendrocygna arcuata*	Red-necked Avocet *Recurvirostra novaehollandiae*
Musk Duck *Biziura lobata*	Red-capped Plover *Charadrius ruficapillus*
Freckled Duck *Stictonetta naevosa*	Double-banded Plover *Charadrius bicinctus*
Black Swan *Cygnus atratus*	Black-fronted Dotterel *Elseyornis melanops*
Australian Shelduck *Tadorna tadornoides*	Red-kneed Dotterel *Erythrogonys cinctus*
Pink-eared Duck *Malacorhynchus membranaceus*	Masked Lapwing *Vanellus miles*
Australasian Shoveler *Anas rhynchotis*	Latham's Snipe *Gallinago hardwickii*
Northern Shoveler *Anas clypeata*	Black-tailed Godwit *Limosa limosa*
Grey Teal *Anas gracilis*	Bar-tailed Godwit *Limosa lapponica*
Chestnut Teal *Anas castanea*	Common Greenshank *Tringa nebularia*
Northern Mallard *Anas platyrhynchos*	Marsh Sandpiper *Tringa stagnatilis*
Pacific Black Duck *Anas superciliosa*	Red-necked Stint *Calidris ruficollis*
Hardhead *Aythya australis*	Pectoral Sandpiper *Calidris melanotos*
Blue-billed Duck *Oxyura australis*	Sharp-tailed Sandpiper *Calidris acuminata*
Australasian Grebe *Tachybaptus novaehollandiae*	Curlew Sandpiper *Calidris ferruginea*
Hoary-headed Grebe *Poliocephalus poliocephalus*	Ruff *Philomachus pugnax*
Great Crested Grebe *Podiceps cristatus*	Red-backed Button-quail *Turnix maculosus*
Australasian Darter *Anhinga novaehollandiae*	Caspian Tern *Hydroprogne caspia*
Little Pied Cormorant *Microcarbo melanoleucos*	Whiskered Tern *Chlidonias hybrida*
Great Cormorant *Phalacrocorax carbo*	Crested Tern *Thalasseus bergii*
Little Black Cormorant *Phalacrocorax sulcirostris*	Silver Gull *Chroicocephalus novaehollandiae*
Pied Cormorant *Phalacrocorax varius*	Horsfield's Bronze-Cuckoo *Chalcites basalis*
Australian Pelican *Pelecanus conspicillatus*	Shining Bronze-Cuckoo *Chalcites lucidus*
Black-necked Stork *Ephippiorhynchus asiaticus**	Eastern Barn Owl *Tyto javanica*
White-necked Heron *Ardea pacifica*	Superb Fairy-wren *Malurus cyaneus*
Eastern Great Egret *Ardea modesta*	Yellow Thornbill *Acanthiza nana*
Intermediate Egret *Ardea intermedia*	Yellow-faced Honeyeater *Lichonostomus chrysops*
Cattle Egret *Ardea ibis*	White-fronted Chat *Epthianura albifrons*
White-faced Heron *Egretta novaehollandiae*	White-breasted Woodswallow *Artamus leucorynchus*
Little Egret *Egretta garzetta*	Grey Butcherbird *Cracticus torquatus*
Australian White Ibis *Threskiornis molucca*	Australian Magpie *Cracticus tibicen*
Straw-necked Ibis *Threskiornis spinicollis*	Willie Wagtail *Rhipidura leucophrys*
Royal Spoonbill *Platalea regia*	Australian Raven *Corvus coronoides*
Yellow-billed Spoonbill *Platalea flavipes*	Magpie-lark *Grallina cyanoleuca*
Eastern Osprey *Pandion cristatus*	Eurasian Skylark *Alauda arvensis*
Black-shouldered Kite *Elanus axillaris*	Golden-headed Cisticola *Cisticola exilis*
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Australian Reed-Warbler *Acrocephalus australis*
Whistling Kite *Haliastur sphenurus*	Tawny Grassbird *Megalurus timoriensis*
Brown Goshawk *Accipter fasciatus*	Little Grassbird *Megalurus gramineus*
Spotted Harrier *Circus assimilis*	Brown Songlark *Cincloramphus cruralis*
Swamp Harrier *Circus approximans*	Silvereye *Zosterops lateralis*
Wedge-tailed Eagle *Aquila audax*	Welcome Swallow *Hirundo neoxena*
Nankeen Kestrel *Falco cenchroides*	Fairy Martin *Petrochelidon ariel*
Brown Falcon *Falco berigora*	Tree Martin *Petrochelidon nigricans*
Australian Hobby *Falco longipennis*	Common Starling *Sturnus vulgaris*
Peregrine Falcon *Falco peregrinus* **	Red-browed Finch *Neochmia temporalis*
Purple Swamphen *Porphyrio porphyrio*	Chestnut-breasted Mannikin *Lonchura castaneothorax*
Lewin's Rail *Lewinia pectoralis* ***	Australasian Pipit *Anthus novaeseelandiae*
Buff-banded Rail *Gallirallus philippensis*	European Goldfinch *Carduelis carduelis*

* 1 in August 2002 (Stuart 2003). Listed as Endangered under the TSC Act.
** 1 in February 2007 (F. van Gessel pers. comm.).
*** 1 in February 2007 (Stuart 2008).

A preliminary assessment of the importance of the Manning River for shorebirds and other waterbirds

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In 2008, the author conducted monthly high tide surveys at Harrington and Mudbishops Point, the two known shorebird high-tide roost sites within the Manning River. The data obtained suggest that the Manning River is important for several migratory shorebirds, such as Red-necked Stint *Calidris ruficollis*, Pacific Golden Plover *Pluvialis fulva*, Bar-tailed Godwit *Limosa lapponica* and Double-banded Plover *Charadrius bicinctus*. High numbers of some other waterbirds were sometimes recorded, including more than 1,600 terns in November 2008 and 150-200 Little Tern *Sternula albifrons* in several other months. Beach Stone-curlews *Esacus magnirostris* were recorded on most of the surveys.

INTRODUCTION

Birdwatchers sometimes visit locations around the two mouths of the Manning River in New South Wales to look for waterbird species, especially shorebirds. The area is well known as a source of unusual bird records. The Annual Bird Reports for the Hunter Region regularly contain records for Manning River locations, especially for Mudbishops Point (also known as Farquhar Inlet) and to a lesser extent, Harrington. There are also some pre-2008 records for Mudbishops Point in the Birds Australia (BA) Shorebirds 2020 database. These prior records will be discussed in more detail later.

For several years, I have harboured the thought that our knowledge about the importance of the Manning River for waterbirds in general and shorebirds in particular, was very limited. Most birdwatchers, myself included, have historically only visited the area in the summer months, and there are almost no winter records for Manning River in the Annual Bird Reports. Also, most visitors to the area have not been collecting data systematically i.e. the records are essentially opportunistic - these can be quite interesting in their own right but they do not convey the full picture of what the area is like.

Consequently, I decided to undertake regular monthly surveys of the Manning River for 12 months. This paper describes my findings, and I hope will encourage others to do similar assessments of other locations and/or to supplement this initial set of data for Manning River.

Prior Records

Hunter Region Annual Bird Reports

Over a 15 year period since 1993, 26 shorebird species have been recorded in the Manning River area (Stuart 1994-2008). Many of the records are of relatively low numbers of birds, but notably there have been several records of 100+ Bar-tailed Godwit *Limosa lapponica* and also records of 100+ Pacific Golden Plover *Pluvialis fulva*, Red-necked Stint *Calidris ruficollis* and Eastern Curlew. The Australian Pied Oystercatcher *Haematopus longirostris* counts often have exceeded 20 birds, and in recent years there are also records of >20 Sanderling *Calidris alba*, which is a rare species elsewhere in the Hunter Region.

The Manning River area also has a pair of resident Beach Stone-curlews *Esacus magnirostris*, which have been recorded every year since 1998. Mudbishops Point hosts the only confirmed Australian record for Kentish Plover *Charadrius alexandrinus*; a single bird was present over February-April 2002 (Stuart 2003) and it is possible that the bird may have been present much earlier in the 2001/2002 season.

It is well documented (Stuart 1994-2008) that there are breeding colonies of Little Tern *Sternula albifrons* at both locations and there have been several records of large numbers of Crested Tern *Thalasseus bergii* and Common Tern *Sterna hirundo*.

Shorebirds 2020 Database

The BA Shorebirds 2020 project, which commenced in 2008, has established a national database of historical shorebird records. This source contained a small number of Manning River records which were made available by BA (Oldland 2008) and are summarised in **Table 1**, which shows the average counts for ten shorebird species recorded at Mudbishops Point. There were no other records of shorebirds for Mudbishops Point and none at all for Harrington in the Shorebirds 2020 database. An anomaly that is immediately apparent is that species such as Australian Pied Oystercatcher and Sanderling, which are known to occur regularly, do not even feature and thus it is clear that the database does not provide a comprehensive historical record. Conversely, the data in **Table 1** for Greater Sand Plover *Charadrius leschenaultii* (which is generally considered to be rare in the Hunter Region) could imply this species is present quite frequently if all records concern one or two birds.

Table 1. Average shorebird counts at Mudbishops Point from the Shorebirds 2020 database.

Shorebird Species	Average No. of Birds
Pacific Golden Plover	32.0
Red-capped Plover	28.5
Double-banded Plover	15.2
Greater Sand Plover	0.5
Bar-tailed Godwit	52.5
Whimbrel	3.3
Eastern Curlew	14.5
Common Greenshank	0.3
Red-necked Stint	87.8
Curlew Sandpiper	0.5

SURVEY AREAS AND METHODOLOGY

General Comments

My first challenge was to work out which areas to survey, with the focus being to identify where to do high-tide surveys, taking advantage of the tendency of shorebirds to roost communally at favoured locations. The Manning River has a large delta system with, sometimes, two river mouths - one at the village of Harrington north-east of Taree and the other some 10km to the south, at Mudbishops Point near the village of Old Bar. At low tides, the river delta with its many islands, seemingly offers plentiful potential habitat for foraging shorebirds, although in many places there is heavy vegetation all the way down to the high water line. At high tides, the two known roosting sites for shorebirds are at Harrington (31º 52.53'S 152 º 41.40'E) and Mudbishops Point (31º 56.95'S 152º 36.41'E).

I carefully considered if there might be any other significant roosting sites. None were apparent from inspection of cartographic and satellite maps of the area, or from visual inspections where I could obtain road access down to the river. Although an investigation by boat might reveal some additional roosting sites, their existence seems unlikely. Therefore, I decided that high-tide surveys at Harrington and Mudbishops Point, both of which are conveniently accessible by land, would allow me to monitor the total shorebird population in the Manning River area. From casual observations, these locations also hosted good numbers of other waterbird species, although such species have less tendency to congregate near roosts and presumably are scattered more widely through the area.

It was not feasible to survey both sites during the same high tide event, as the distance between Harrington and Mudbishops Point, by road, is some 40-50km and both surveys required ~ 2 hours to complete. Also, for much of the year, only one of the two daily high tides occurred during daylight hours. For these reasons, the logistics required that the surveys at the two locations be made on consecutive days. This clearly is sub-optimal, in that it creates the possibilities of either double counting or else under-counting, because of movements of birds between the two sites. However, the inadequacy can only be completely eliminated by simultaneous surveys of the two sites, which was not possible. Also, shorebirds tend to be site faithful, unless disturbed, and so I decided to proceed with my plan.

All bar one of the surveys were done during morning high tide events. One reason for this choice is that in the late afternoon, some of the roosting sites at Mudbishops Point are difficult to survey due to glare from the sun. Another factor is that later in the day the amount of human activity increases, leading to more frequent disturbance of/relocation by birds, thus making it more difficult to obtain a reliable count. For similar reasons, it was preferable to survey on weekdays rather than weekends, but this was not always possible.

Harrington

The area surveyed at Harrington is shown in **Figure 1**. The surveys commenced 30-40 minutes before the high tide time and typically required 1.5-2 hours. The procedure was to walk along the breakwater that lies between the main arm of the river and a broad body of water that fronts the village, viewing by telescope the birds roosting and feeding on sandbanks within the river and on the opposite shoreline. The position and number of sandbanks varied somewhat. The shoreline opposite the breakwater and within the survey area is sand and sand-dunes; immediately beyond the survey area coastal forest closely abuts the shoreline which therefore would

make these areas unsuitable for shorebirds to roost at (except possibly for Whimbrels *Numenius phaeopus*).

In summer, there is a breeding colony of Little Terns within the Harrington survey area; however, birds on the ground within the colony are not visible from the breakwater. The counts of Little Tern are based on birds seen flying in the area or roosting on sandbanks in the river. Closer access to the Little Tern colony is possible from the village of Manning Point (involving a return walk of approximately 4km) but cannot be achieved within the same high tide event.

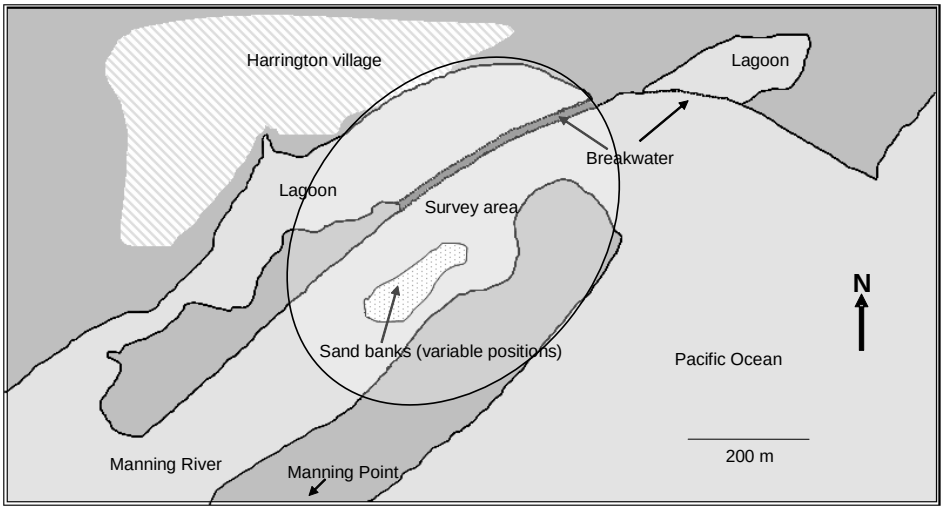

Figure 1. Survey area at Harrington.

Mudbishops Point

The area surveyed at Mudbishops Point is shown in **Figure 2**. The surveys commenced ~30 minutes before the high tide time and typically required ~2 hours. The procedure was to walk in a clockwise direction around Mudbishops Point, first along the edge of the lagoon and then back along the ocean shoreline to the starting point, viewing by telescope the birds roosting and feeding on sandbanks within the river and on the shorelines. The position and number of sandbanks varied somewhat. Conducting the survey in a clockwise direction is important as it lessens the chances of double-counting of birds along the beach, because birds *tend* to flush back towards the Point.

For the first four monthly surveys, the river mouth was completely closed off by a sandbar. The sandbar was removed by dredging in late April i.e. between the dates of the April and May surveys, and the channel for the river outlet became some 20-30m wide. By November it was visibly silting up, and in the December survey it had completely closed over again.

In summer, the Mudbishops Point survey route circumnavigates a breeding colony of Little Terns and the counts include birds seen within the colony as well as birds flying or roosting on sandbanks or shorelines.

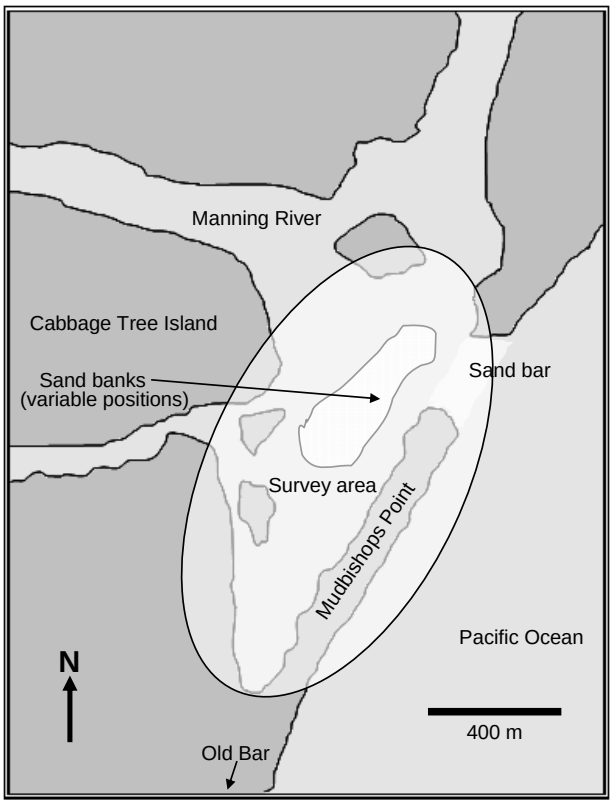

Figure 2. Survey area at Mudbishops Point**.**

RESULTS

Table 2 summarises all the data from my surveys (for space reasons, the monthly overall totals for individual species are not presented) in which 35 waterbird species were recorded, including 16 shorebird species. Some species were recorded only once: Australian Wood Duck *Chenonetta jubata*, Red-necked Avocet *Recurvirostra novaehollandiae* (3 birds flying rapidly through Harrington), Grey-tailed Tattler *Tringa brevipes* and Ruddy Turnstone *Arenaria interpres*; and four other species just twice, in low numbers: Eastern Reef Egret *Egretta sacra*, Lesser Sand Plover *Charadrius mongolus*, Sharp-tailed Sandpiper *Calidris acuminata* and Curlew Sandpiper *Calidris ferruginea* (with one notable winter record for the latter). All other species were recorded much more frequently and many of them in large numbers for the Hunter Region and in some instances significant in a wider regional context. Particularly interesting records included:

- 180 Bar-tailed Godwit in March and 100+ birds in four other months with 25-30+ birds over-wintering.
- 121 Double-banded Plover *Charadrius bicinctus* in June and >110 birds present over April-June.
- 331 Red-necked Stint in March and 179-268 birds in January and November with many winter records mostly of 50+ birds.
- 10+ Australian Pied Oystercatcher almost every month and 20+ birds in February and March.
- Peak count of 147 Pacific Golden Plover in March and many other records of 40+ birds over spring/summer.
- Peak count of 48 Eastern Curlew in March and many other records of 10-30+ birds over spring/summer.
- Peak count of 40 Sanderling in December and several other records of 18-30 birds over spring/summer.
- 20+ Red-capped Plover *Charadrius ruficapillus* regularly present and peak count of 46 birds in March.
- Large influx of both Little Tern and Common Tern in November (~1,000 birds were present) and 100-200 Little Tern present over January-March and October-December.
- 100+ Little Black Cormorant *Phalacrocorax sulcirostris* recorded over October-December, but very few birds in other months.
- 22 Caspian Tern *Hydroprogne caspia* in March and 22 White-fronted Tern *Sterna striata* in July.

DISCUSSION

For space reasons, and because surveys over several years are needed before real trends can be discerned, I have limited the following discussion to just some of the species (including some migratory shorebirds and Threatened Species in NSW) where the data from the 12 months of surveying suggest an interesting result.

The Manning River has the southernmost resident pair of Beach Stone-curlews in NSW (Morris 2008) and I recorded birds in 8 of the 12 months, usually as a pair. However, on three occasions I found a single bird in the survey areas, and in September, a single bird at Saltwater National Park some 10-15km south of Mudbishops Point outside the regular survey areas. In May, I saw a pair close together at Harrington at dusk and the next day at Mudbishops Point a single bird (which I watched for ~10 minutes - it clearly was alone). I strongly suspect that there were three birds present in 2008, but this would only be provable from simultaneous surveys at both locations (or by banding).

The winter counts of >110 Double-banded Plover are well below 1% of the migrating population of some 30,000 birds (Delany & Scott 2006). However, the counts are notable ones for New South Wales - they compare favourably with records of 212 birds at Lake Bathurst in 2003, 126 birds at Botany Bay in 1992 and 200-300 birds some years at Comerong Island near Wollongong (Morris 2008). In the Hunter Bird Observers Club's database, the previous highest count at Mudbishops Point is of 11 birds in March 2003 (Stuart 1994-2008); thus, the 2008 assessment of the area has increased the maximum count by more than an order of magnitude. There have not been many previous winter visits by birdwatchers to the area.

Most of the Double-banded Plover were at Mudbishops Point, where they used two preferred roosts: i) amidst shingly beach/foredunes from immediately south of the river mouth extending some 100m along the ocean side of the Point; ii) on large sand banks within the lagoon. Occasionally

birds were present in low numbers at the shoreline on the lagoon side of the Point, where they were usually foraging. At Harrington, Double-banded Plover were recorded mainly at a large sand bank within the main channel.

Although many of the Red-capped Plovers and Red-necked Stints at Mudbishops Point roosted at the same locations as the Double-banded Plovers, a greater proportion of both of these species were scattered around other sections of the shoreline, particularly the Red-capped Plovers which appeared to have territorial areas all along the foredunes of the beach.

Within the Hunter Region and probably therefore within New South Wales, the count of 331 Red-necked Stints at Mudbishops Point in March 2008 is exceptionally high, only exceeded in recent years by counts of 350 birds at Ash Island in March 2005 and 400 birds in the Hunter Estuary in December 1995 (Stuart 1994-2008). Counts of more than 100 birds in the Hunter Estuary and at Port Stephens, both of which are surveyed frequently, are uncommon. Possibly, many of the birds at Mudbishops Point in March were on migration passage. However, at the time the habitat appeared to be ideal for small shorebirds - the river mouth was closed off by a sandbar and the lagoon was heavily silted, causing it to be very shallow with many sand banks, on all of which Red-necked Stints were present.

Possibly, many of the 147 Pacific Golden Plover recorded in March were on migration passage as there were only 96 birds present the previous month. However, other waterbirds (such as Black Swan *Cygnus atratus*, Australian Pied Oystercatcher, Red-necked Stint, Eastern Curlew and Caspian Tern) also had peak counts in March, so it may have been that conditions locally were very favourable around that time.

A small number of Little Terns had returned to Mudbishops Point by 19 July, but numbers remained low until October when an estimated 160 birds were present. (NB it was not always easy to get an accurate count of any of the tern species as birds tended to fly about, dispersing and regrouping frequently). In November, there was a very large influx of tern species at Mudbishops Point - around 400 Little Tern and 600 Common Tern were roosting at the time of the survey, together with 75 Crested Tern (which were present in very high numbers at Harrington that month). In December, although conditions were difficult for observing (high winds), I was only able to find 3 Common Terns, and the counts for the two other species were much lower than for November. Do these changes reflect short term favourable conditions or were many birds on migration passage in November? Presumably, it will require several more years of data before such questions can be answered.

I suspect that both Striated Herons *Butorides striata* and Eastern Reef Egrets sometimes roost on the Harrington breakwater at night, since my sightings of them mainly occurred during those surveys that started soon after dawn. The birds all flushed from rocks near to the waterline as I approached. Possibly it is a daily event for them to be flushed by an early morning walker?

Unfortunately, disturbance from human activity was a regular occurrence at all the roost sites, especially at Mudbishops Point, particularly in the warmer months. At Harrington, birds roosting on sandbanks mostly were left alone (occasionally a boat would disgorge passengers to fish or cavort on a sandbank). Birds attempting to roost on the shoreline opposite the breakwater were more liable to disturbance from 4WD traffic and boat landings. At Mudbishops Point, there was nearly always a regular procession of 4WD vehicles and walkers - sometimes with dogs, despite the signs forbidding this. Birds roosting along these shorelines were rarely able to stay in one spot for very long. Happily, there were far fewer occurrences of disturbance to birds roosting on the sandbanks at Mudbishops Point - possibly, the water near them is too shallow for boats to approach closely.

CONCLUSIONS

All of the species recorded in the 12 months of surveys at Harrington and Mudbishops Point were present at levels well below 1% of their Australian populations. Therefore, the Manning River seems to be of lesser importance for waterbirds than either the Hunter Estuary or Port Stephens, since both those locations are known to host many species at >1% population levels. Nevertheless, several species were found to be present at Manning River in numbers that are significant for the Hunter Region.

The initial 12 month assessment has shown that the Manning River warrants ongoing surveying, and I will be endeavouring to continue to make trips there as often as I can manage. The peak counts for Red-capped Plover, Double-banded Plover, Bar-tailed Godwit, Red-necked Stint, Grey-tailed

Tattler and five species of terns (Little, Caspian, White-fronted, Common and Crested) all exceeded the previous highest recorded counts for Harrington and Mudbishops Point (Stuart 1994-2008), and it will be very interesting over time to see what is "normal" for the area.

I hope that this article will inspire others to contribute to the systematic surveys at the Manning River area using a similar methodology to mine, so that the amount of data about the locality can grow from its currently very limited state, and we can start to see answers to some of the questions that a preliminary study invariably throws up. I also hope that this article might spur others into selecting some favourite site for a systematic study.

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Table 2. Shorebird and other waterbird numbers at Manning River locations in 2008.

Month	**Jan**		**Feb**		**Mar**		**Apr**		**May**		**Jun**		**Jul**		**Aug**		**Sep**		**Oct**		**Nov**		**Dec**	
Location**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
Black Swan *Cygnus atratus*	4	22		23		35		11		2			4	1				5		6	1		9	26
Australian Wood Duck *Chenonetta jubata*							6																	
Little Pied Cormorant *Microcarbo melanoleucos*	1		1	1				1	2		2	1	12	1			1	1			3			
Great Cormorant *Phalacrocorax carbo*	1		5	1					1				1				2	1	2	1	6	2	2	10
Little Black Cormorant *Phalacrocorax sulcirostris*	10		1	2			2						4		3		34		21	95	143		150	
Pied Cormorant *Phalacrocorax varius*	76	8	28	13		10			1		1	1	6		2	1	17	10	18	7	46	7	12	19
Australian Pelican *Pelecanus conspicillatus*	32		40		32	10	49	2	18	9	38	2	31	3	17	1	23	1	27	1	22	11	51	10
Striated Heron *Butorides striata*							3						3										1	
White-faced Heron *Egretta novaehollandiae*	2			1	6	4	1	1	1	1		1	2	3			1	1		1	1			
Eastern Reef Egret *Egretta sacra*			1				1																	
Beach Stone-curlew *Esacus magnirostris*				2		2		2	2	1				1	2							1		2
Aust. Pied Oystercatcher *Haematopus longirostris*	12	3	17	3	14	8	11	6	9	2	9	4	7	4	4	8	6	2	8	6	4	7	4	9
Red-necked Avocet *Recurvirostra novaehollandiae*									3															
Pacific Golden Plover *Pluvialis fulva*		1	42	54	53	94											24	17	10	43	21	8	40*	
Red-capped Plover *Charadrius ruficapillus*	4	18		44		46		42		30	1	9	7	23	2	19	15	18	4	20		35	6	30
Double-banded Plover *Charadrius bicinctus*						55		111	2	113	48	73	26	61		73	1*							
Lesser Sand Plover *Charadrius mongolus*				1																				2
Masked Lapwing *Vanellus miles*	2		2		6	10	9	4	4		2		2	4			6		10	3		2	1	2
Bar-tailed Godwit *Limosa lapponica*	53	5	47	54	124	56	39		18	14	14	11	11	20	3	46	13	26	19	130	24	109	42	129
Whimbrel *Numenius phaeopus*				1	2			1									4	2		2		3		2
Eastern Curlew *Numenius madagascariensis*	10	2	11	11	43	5		2		1	2		1		5	5	9	4	6	11	12	12	11	21
Grey-tailed Tattler *Tringa brevipes*																						8		
Ruddy Turnstone *Arenaria interpres*		1																						
Sanderling *Calidris alba*		18				24											3*			18		30		40
Red-necked Stint *Calidris ruficollis*		179		80		331		57		3		18		55		51	22	34	2	30	1	267		94
Sharp-tailed Sandpiper *Calidris acuminata*																	1	1						
Curlew Sandpiper *Calidris ferruginea*												1					1							
Little Tern *Sternula albifrons*	18	189	130	20	120	25		26						5		10		11		160	21	400	80	50
Gull-billed Tern *Gelochelidon nilotica*												1	1	5								1		
Caspian Tern *Hydroprogne caspia*				12	1	21		1	3				2	1	1	2	1	3	1			2		
White-fronted Tern *Sterna striata*									2					22		11		4						
Common Tern *Sterna hirundo*		343	8	167	47	140		2										1	2	2		600		3
Crested Tern *Thalasseus bergii*	48		74	4	109	6	78	63	73	16	5	12	113	85	17	20	114	82	122	13	563	75	226	23
Silver Gull *Larus novaehollandiae*	42	20	27	82	127	21	52	5	258	18	47	42	17	14	33	2	34	10	56	3	42	59	160	198

**H = Harrington, M = Mudbishops Point *Records from within the survey area but outside the main survey time

Smaller bird species in decline in the south-west Hunter? The lessons of ten years of atlas data

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Doyles Creek and Martindale to the west of Jerrys Plains support a wide variety of bird species including birds which are Vulnerable and at the edge of their distribution in the Hunter Region. While the first ten years of atlassing data for 4 sites in this area by no means reveal a bleak picture overall, some smaller species, such as fairy-wrens and grass finches have been in sharp decline at some sites. A major factor that must here be considered is the depth of the 2006 drought, though declines are not even across all sites and other factors must also be involved, some more local. Fortunately the typical woodland bird species may be more resilient; for instance the Diamond Firetail *Stagonopleura guttata* is now the most regularly recorded finch at these sites. The repeated surveys also reflect some of the changes that have been affecting the Hunter more generally, including the spread of species like the Spiny-cheeked Honeyeater *Acanthagenys rufogularis* from the west. While many of the trends were intuitively appreciated during the study, the analysis of ten years of data involved in preparing this paper reinforced my impressions in some cases, and drew my attention to other important facts that had previously not been noticed at all. I append information concerning increases and decreases in reporting rates at two Doyles Creek sites.

INTRODUCTION

When approached for an article about the changes that were evident in my bird survey results for four sites in the south-west of the Hunter Region, two each at Martindale and Doyles Creek, I thought that it ought not to be a problem—as long as I could recover data that I had lost since putting in my Birds Australia (BA) Atlas reports. I was particularly interested in establishing what changes had taken place over the years, and had no doubts that there had indeed been many changes over the wider area, particularly regarding the appearance of new species. Supporting such changes from my survey data, based on four small areas, seemed a genuine challenge, though as it turned out less difficult than explaining the changes.

METHODS

Surveys were conducted at a number of sites west of Jerrys Plains using the BA Atlas protocols (Barrett *et al*. 2003). Most surveys involved the 2ha 20 min search approach. However in some instances a larger area was surveyed for a slightly extended period of time. Both methods involved compiling a list of all bird species present. Except where reports were made also to the Hunter Bird Observers Club (HBOC), numbers were not noted. Where possible I made seasonal visits over a ten-year period commencing in December 1998. Emphasis was placed on achieving continuity at four sites, the results of which are the subject of this paper. However, other sites were monitored less frequently in order to increase coverage of the area. Of the four primary sites the Doyles Creek locations (DC1, DC2) are both open woodland, with good habitat connections to the Wollemi National Park on the south, but bordering partially cleared woodland to the north; they are about two km apart, approximately one km either site of Doyles Creek itself. The Martindale sites (MD1, MD2) are at road bridges for easy access. Both include a section of creek and riparian vegetation, with the better site (MD2) having acacia scrub on one corner, open land on another, and fields with scattered trees up to the Wollemi National Park on the east side.

Surveys were almost always carried out alone, between the hours of 7.00am and 10.00am for consistency. I have avoided days that promised to give a poor indication of the species present, whether through wind, rain, or excessive heat. If I saw reason not to expect the survey to be useful because of adverse conditions at the site, I have not done a survey at that time. I was absent for five months of 2006, but there has been better coverage since, particularly at Doyles Creek, and my main focus will be on post-2006 changes. The total number of surveys conducted is shown in **Table 1**.

Table 1. Surveys conducted in the south-west Hunter Region

Site	1998-2005	late 2006	2007 to Aug 08
DC1	46	4	12
DC2	37	2	12
MD1	31	1	5
MD2	41	4	7

RESULTS AND DISCUSSION

General

As will be observed from the data discussed, Doyles Creek and Martindale have substantial and very interesting bird populations. For instance I regularly recorded some 14 & 18 species during the surveys at Doyles Creek, with some 15 & 20 at Martindale. These included several species that are listed on the NSW Threatened Species Conservation Act as Vulnerable, such as Diamond Firetail *Stagonopleura guttata*, Hooded Robin *Melanodryas cucullata*, and Painted Honeyeater *Grantiella picta* or at the edge of their range such as White-browed Babbler *Pomatostomus superciliosus* and Spiny-cheeked Honeyeater *Acanthagenys rufogularis*. It may be worth noting that Red-capped Robin *Petroica goodenovii* and Chestnut-rumped Heathwren *Hylacola pyrrhopygia* were also recorded once each at DC2 and either MD2 or DC1, while Turquoise Parrot *Neophema pulchella* was once recorded at DC1. On another occasion I saw a *Neophema* that did not appear to me compatible with this species—rather it resembled a female Blue-winged Parrot *Neophema chrysostoma*, perhaps an escaped bird but in the company of other unidentified *Neophemas*. Glossy Black-Cockatoo *Calyptorhynchus lathami* and Gang-gang Cockatoo *Callocephalon fimbriatum* were recorded once at DC2 and MD2 respectively. A wide variety of raptor species included a Spotted Harrier *Circus assimilis* at MD1, where a Black-tailed Native-hen *Tribonyx ventralis* was also recorded once.

The primary focus of what now follows will be on the changes that the data can support. However, the **Appendix** contains, for Doyles Creek, lists of all species recorded *at least twice* prior to 2006 and *all* birds recorded since, together with an analysis of changes in their reporting rates since 2006, which was a year of very low rainfall. As there are no previous detailed studies for this area the **Appendix** provides an important record of the birds occurring in that area. It is intended to present similar data for the Martindale area in a subsequent paper.

Difficulties in Interpretation of Trends

First, I had never envisaged using the data to write a paper on changes in bird populations. The original motivation for the work was to provide surveys for the BA Atlas project, and I have usually tried to undertake and submit a 20-minute survey of each site every season as requested by the Atlas organisers. However, I have occasionally missed a survey, particularly from December 05 to May 06 when I was overseas. Surveys at one Doyles Creek site (DC2) started slightly after the others, in September 1999 as opposed to December 1998. All sites were surveyed in August 2008, this being the final survey used for the preparation of this article. Sometimes I have done surveys more frequently, particularly in the spring; some but not all extra surveys have been reported, thus maintaining a fairly constant monitoring effort. Occasional minor deviations in survey methods are unlikely to have introduced the kind of bias that would invalidate the general conclusions drawn, given the pronounced nature of many of the trends.

Second, one must allow for some 'human error'. For instance I may have become more effective as time has gone on. This would pertain particularly to calls that I have become more familiar with, and perhaps with species that could be easily confused visually, such as Buff-rumped Thornbill *Acanthiza reguloides* and Yellow-rumped Thornbill *Acanthiza chrysorrhoa*. However, although ensuring correct identification of species like the thornbills (which I discuss below) is important, I place greater emphasis on ensuring that a comprehensive species list is obtained for the site (i.e. that elusive species are located and recorded, which is facilitated by knowledge of their calls, behaviour and habitat preferences). In the case of the thornbills there is no doubt that Buff-rumped are very uncommon at all four of the regularly monitored sites, while there is a another site near Jerrys Plains at which I have recorded them much more regularly. In general, even if I had been less skilled in visual recognition of dry-country species at first, new birds for a given site have most often drawn my initial attention by their relatively unfamiliar call, so that it is likely that they have indeed been new birds rather than previously overlooked species.

One is even less inclined to suspect oneself of overlooking birds that are now disappearing from one's list. In my two Martindale sites, one by the road bridge just after the school (32^{o} 27' 56" S, 150^{o} 40' 00" E) (MD1), and the other further up the valley at the Medhurst Bridge (32^{o} 30' 51" S, 150^{o} 41' 36" E) (MD2), there has been a notable fall-off of some of the smaller species, and above all of certain finch species. I was quite sure that I have been finding far fewer finches and missing out on them far more often, and I was attributing this above all to the difficulties these species experienced at the height of the drought, and to the habitat degradation that still affects these sites.

A greater challenge is that of correctly identifying the causes of change. When one notices changes in the patterns of one's results that cannot easily be attributed to one's methods of data-collection, does one simply point to underlying trends towards expansion or diminution of range, or should one look for immediate hostile conditions, such as habitat loss, drought, and absence of food on the one hand, or profuse flowering of eucalypts, abundance of mistletoe-berries, or insect plagues on the other. A range of causes may be involved because the optimal ecological requirements of each species are unique. These changes may actually relate to changing conditions in alternative habitat elsewhere rather than to anything happening at the site concerned.

Drought and other Varying Conditions

The major habitat-change visible at the sites has been due to the drought, with Martindale Creek and Doyles Creek dry for long periods. Lack of food and drought are often, though not always, closely connected, with lack of food continuing to be a problem both for nectar-feeders and for insect-eaters for some time after the drought has broken. For some species, however, the sites may seem preferable to their customary habitat, while for others the thinning of low vegetation may present an opportunity. Drought-induced movements need to be distinguished from longer-term changes in the distribution. The extent of the recent droughts in 2002 and 2006 is evident from the Bureau of Meteorology's rainfall figures. These are found at http://www.bom.gov.au/index.shtml, last consulted by myself on 10 January 2009. Some figures are available for Doyles Creek, but with several missing months in the figures which I have consulted they have been less helpful than those for nearby Jerrys Plains, which go back over 100 years, and include only three gaps in years relevant to this study (November 1999, July 2000, and December 2006). I am unsure of the reason for this, since my notes made from the Bureau's site at an earlier stage gave 91.1, 37.0, and 33.1 mm for these months. Assuming these figures to be correct, 2006 saw as little as 370.9mm fall in this area, with only 1888, 1939, 1944, 1957 and 1980 yielding lower rainfall. The published annual median rainfall for this weather station is 644.1 and the mean 640.4 mm. The second lowest figure during the ten years over which I collected data was 557.2mm in 2002, when April to October was especially dry, but in the eighteen months from December 2005 to May 2007 only July and September 2006 and March 2007 reached or exceeded the mean. In this period it was the two summer periods (December to February) that were particularly dry, a fact that must have proved particularly difficult for many birds. Apart from 2002 and 2006, only 2005, with 641.2mm, came close to falling below mean and median annual rainfall.

It seems reasonable to suggest that the 2006 rainfall figures were severe enough to have an adverse impact upon some of the species in the area. This appears to have been the case, for the absence of some species has followed these disastrous conditions. However, this absence could in some cases have other explanations. If it has been merely a matter of drought, then losses will hopefully be only a temporary phenomenon. Certainly the rainfall figures do not point to a long-term drying out of the area, since the annual average for the period 1999–2007 was around 677mm, while it had been around 637mm for 1990-98. In fact 2007 produced the best rains since 1962, while 2008 was also a moderately good year for rain in the area.

Temporary factors impacting on a site can be unrelated to rainfall and quite brief, as exemplified by experience at a Doyles Creek site where some over-enthusiastic pruning of the roadside shrubs resulted in a noticeable reduction of species recorded. Furthermore, at one of my Martindale sites (MD1) I have tended to see fewer small species after grass has been slashed in areas close to the road. At the other site a temporary influx may occur when there is a good crop of mistletoe in the area. Substantial numbers of Mistletoebirds *Dicaeum hirundinaceum* may be present, followed if one is lucky by the appearance of Painted Honeyeaters. Given such fluctuations of conditions ten years of data is actually less than I should like.

Drought and other deteriorating conditions must not be blamed for every obvious change in reporting rates. My records show a period of considerable loyalty of a pair of Restless Flycatchers *Myiagra inquieta* to my MD1 site. After being recorded 17 times in 22 surveys between March 2000 and November 2004, they have been recorded only twice there since. However, since August 2004 a pair of Restless Flycatchers has been recorded on 23 out of 28 visits to DC2. A single Restless Flycatcher was once similarly loyal to Bolwarra Sewage Treatment Works during the winter only. In 2000, for instance, it was recorded every month from April to August. Its failure to return one year marked the end of my records in this regularly surveyed area. With a *site-loyal species* such as this, and with each site being only 2ha in area, the

loss of one resident pair cannot be taken as a valid indication of a species in decline regionally. There may be other sites locally where it continues to thrive.

To take a much rarer species, I have often, since 2001, been able to find White-browed Babbler at my DC1 site, generally between four and six birds. They once also appeared at DC2 (Stuart 2001). These records might have given the impression that this species is commoner in the general area than Grey-crowned Babbler *Pomatostomus temporalis*, but I have recorded the latter species at five widely separated sites between Jerrys Plains and Yarrawa, and the White-browed at only two sites two kilometres apart. This might be the only colony for some distance, and if it had disappeared at Doyles Creek in 2006 (fortunately it did not) this might have led to the drying up of Hunter records east of about Giants Creek to judge from records this century (Stuart 2000-06), arousing the suspicion that a regularly recorded species had succumbed to devastating drought. In fact something similar, but less dramatic, did happen in the case of Bell Miners. A colony used to be at the edge of the DC1 survey area, and so the species was usually recorded there, but I last heard them there in June 2006; now my trips to the south-west of the Hunter Region no longer record this species. However, as it is said that this species is 'subject to sudden short-range re-locations' (Pizzey & Doyle 1980, p. 323), there is no need to think that the birds are either dead or far away. Their absence can be explained in terms of the regular behaviour of this species.

Expansions and Contractions

In recent years reports to HBOC have strongly suggested changes in the range of various species, usually involving a spread east towards the coast or south down the coast. In most cases the species concerned have not appeared at my sites. However, there has, this decade, been a sharp increase in the reporting of Spiny-cheeked Honeyeaters, initially in the Giants Creek area, but moving east (Stuart 2000-06). For several years this bird failed to appear in my survey area, though by about 2004 I was receiving suspected glimpses of it near the Goulburn River at Yarrawa. Recently, however, the bird was encountered for two surveys running at my DC2 survey area during the winter of 2008, and it has since occurred at MD1. Given the agreement of this fact with a clear trend in recent reporting, one must assume that this bird is adapting well to the Hunter, and while drought further west may at times be a catalyst to its movements there seems to be a steady underlying drift east. The related Striped Honeyeater *Plectorhyncha lanceolata*, likewise missing from coastal east Victoria and the NSW South Coast in the published Atlas (Barrett *et al*. 2003), is also a bird that seems to be spreading in the west and central districts of the Hunter. In this case I note from my records that it was first recorded at the DC2 site in 2000, at DC1 and MD2 in 2002, and at MD1 in 2005, and it is still being frequently recorded. It is most unlikely that unusual weather conditions or abundance of food can explain its steady spread.

A word might be said about the appearance of White-browed Woodswallows *Artamus superciliosus* in November 2003. Birds were recorded over the spring/summer period at both my DC sites, and in Martindale by another observer, with breeding behaviours noted (Stuart 2003-04). Since then I have seen birds at DC1 in December 2006 and February 2007, and at both Doyles Creek sites during September to December 2007, when the feeding of fledged young was again noted (Stuart 2008). They did not reappear in spring 2008. However, more analysis of surveys for the spring/summer of 2008/09 is needed to clarify what the post-drought position will be in these cases. I see no patterns here, and would not question the bird's current published Hunter status as 'uncommon irruptive visitor'.

Small Species: Worrying Trends

I have far fewer qualms about drawing some preliminary conclusions about species that are both residents and reasonably common when looked at across the Region as a whole. If a single unusual bird appears once at a single site in a given year it cannot he held to be evidence of a pattern of movement into the Hunter, and could rather be evidence of habitat-loss elsewhere. Again one should not postulate population-movements if a small sedentary population has established itself at a given site, when there are no nearby sites at which it may be found. Yet if records for the Superb Fairy-wren *Malurus cyaneus* fall by half across a number of sites in the same area over time, say from a 60% reporting rate for quarterly surveys to a 30% rate, then one has cause for concern that the bird may be under pressure. Since birdwatchers may pay less attention to familiar species, the data may alert them to meaningful increases and decreases. What do my figures for Superb Fairy-wren show? Take Doyles Creek for instance (**Table 2**):

Table 2. Superb Fairy-wrens at Doyles Creek (*data in parentheses are the values for individual sites).

Survey periods	1998-2005	Late 2006	2007-2008
No. of surveys, Doyles Creek [DC1, DC2]	83 [46, 37]*	6 [4, 2]*	24 [12, 12]*
Superb Fairy-wren records [DC1, DC2]	59 [35, 24]*	2 [2, 0]*	6 [0, 6]*
Reporting Rate	71%	33%	25%

Here the rate of reporting is now only just over a third of what it previously was. This decline would surely be a serious worry if it could not plausibly be attributed to the drought with potential for future recovery as conditions improve. But as **Table 3** will show, these results have certainly not been duplicated at Martindale:

Table 3. Superb Fairy-wrens at Martindale

Survey periods	1998-2005	Late 2006	2007-2008
No. of surveys, Martindale [MD1, MD2]	72 [31, 41]	5 [1, 4]	12 [5, 7]
Superb Fairy-wren records [MD1, MD2]	48 [15, 33]	3 [1, 2]	8 [4, 4]
Reporting Rate	67%	60%	67%

The Martindale surveys point to an almost surprisingly constant rate of reporting. I have difficulty in explaining the increased resilience of Superb Fairy-wrens at the Martindale sites. There seems to be no corresponding increase of other small species competing for the same ecological slot at the Doyles Creek sites, though one may point to the fact that the DC1 site at which the change has been more marked is rather higher, raised up from creek level, so that (a) water shortages are probably more acute than at other sites, and (b) it is natural for the birds to move slightly down the slope towards creek level. Recent investigation has encountered birds some 500-800 metres down the slope, at a site for which I have few historical records. One might also suspect that the decline at Doyles Creek sites has been accelerated by the activity of the smaller cuckoo-species, since the Shining Bronze-Cuckoo *Chalcites lucidus* and Horsfield's Bronze-Cuckoo *Chalcites basalis* have experienced a higher rate of reporting in recent years at the drier DC1 site. In **Table 4** I include figures for Martindale and the DC 2 site (which only had Shining Bronze-Cuckoo). Note that the first numeric column is for a *five*-year period:

Table 4. Number of records of bronze-cuckoos.

Species	**Site**	**98-02**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Shining	DC 1	1	1	1	0	0	1	1
Shining	DC2	0	0	0	1	0	1	0
Shining	M'dale	2	0	2	2	0	1	0
Horsfield's	DC 1	1	0	0	1	1	2	1
Horsfield's	M'dale	1	0	1	1	0	0	0
TOTAL	ALL	5	1	4	5	1	5	2

It would seem that there has been a spike in the activities of the bronze-cuckoo species from 2004 to spring 2005. This may have lasted until spring 2007, since 2006 figures are based on a reduced number of surveys. The spike beginning in spring 2004 might conceivably have contributed to the reduction of species used as hosts, such as fairy-wrens and thornbills. In the case of fairy-wrens, however, it is obvious that one might have expected a similar fall-off at Martindale if this were the case, but no such decline eventuated. The cuckoo theory thus remains unproven, and cuckoo activity can scarcely be the only factor involved.

The overall rate of thornbill reporting has dropped more evenly in the two locations since 2006: at

Doyles Creek from 0.29 species recorded per survey to 0.21, down 28%; and from 1.04 species per survey in Martindale to 0.67, down 36%. This means that recording rates have fallen by over a quarter at the former, and over a third at the latter. At Doyles Creek my figures show a decline of Yellow-rumped Thornbills as early as 2002, which was a drought year. Another species that has been recorded less frequently from this earlier date is the Grey Fantail *Rhipidura albiscapa*. Pre-2006 records for this species at MD1 and MD2 (5 in each instance) are confined to 2002-03 and 1999-2002, and at DC1 and DC2 they are confined to 2000-01 (10) and 2000-02 (4). There was a single record at DC1 in December 2006, but otherwise the species has not been recorded since in any survey up to the end of 2008. However, since the species was recorded only once for any site prior to 2000 (i.e. once in twenty surveys altogether), it seems that they are only found at such sites under favourable conditions. In contrast reporting rates for the related, but larger, Willie Wagtail *Rhipidura leucophrys* have shown only minor variation. A decrease from 73% reporting rate to 46% was noted in Martindale during the 2006 to August 2008 period, but the rate since then has risen again to 80%. Rates for pardalotes, though they have shown interesting local variation, establish no overall trend.

Finches have been a matter of serious concern to me of late. The declining rate of reporting is dramatic enough in Martindale, my previous 'finch-haven', to be obvious without any data, but let us see what all the data show (**Table 5**):

Table 5. Records of finches over all four sites [DC1, DC2, MD1, MD2]

Survey periods		1998-2005	Late 2006	2007-08
No. of surveys		**155**[46,37,31,41]	**11**[4,2,1,4]	**36**[12,12,5,7]
Zebra Finch	*Taeniopygia guttata*	**35**[0,0,4,31]	**1**[0,0,0,1]	**1**[0,0,0,1]
Double-barred Finch	*Taeniopygia bichenovii*	**80**[27,10,11,32]	**3**[1,0,0,2]	**7**[1,0,1,5]
Red-browed Finch	*Neochmia temporalis*	**12**[4,3,1,4]	**1**[1,0,0,0]	**0**
Diamond Firetail	*Stagonopleura guttata*	**27**[14,9,0,4]	**3**[2,0,0,1]	**11**[5,4,0,2]
Plum-headed Finch	*Neochmia modesta*	**2**[0,0,0,2]	**0**	**0**

The reporting rate for the Vulnerable woodland species (Diamond Firetail) has *increased* from 17% to 30% by August 2008; the species commonest near the coast, the Red-browed Finch, has virtually disappeared (though in Doyles Creek it may still be found at sites close by); the Zebra Finch is faring nearly as badly, down from 23% to 4%; and the Double-barred Finch has suffered a significant decline, down from 52% to 21%. Amazingly, from winter 2006 I have been recording Diamond Firetail more frequently overall at these regular survey sites than all the other finches combined! This agrees with my overall impression that the more specialist dry woodland species have not declined in numbers at these sites as much as the more adaptable species.

One danger to finch populations that several other species do not have to contend with is trapping. A location at which seed was being provided, presumably in conjunction with trapping, for Double-barred Finches (and perhaps others) has been observed at DC1, and this may be linked to the disappearance of that species there. It is also tempting to speculate that the decline may, in the case of the Double-barred Finch (which is 'mostly sedentary, but nomadic in response to dry conditi-ons' (Pizzey & Doyle 1980, p. 372)), and some other species, be due to their becoming *nomadic when conditions deteriorate*, but I have no insights as to their likely destination. In fact over the relevant period I have found fewer finches at other sites west of Maitland where I could once record flocks of around twenty birds.

In the case of the Zebra Finch the Hunter Region Annual Bird Report (Stuart 1999-2007) suggests that around two thirds of the reports of flocks of 20 or more have come from the general area of Jerrys Plains and Denman. Even ignoring the large flocks often reported at Arrowfield in 1999-2000, twelve reports from this area were noted over this period, five of which came from Apple Tree Flat and four from Martindale. None of these came from the drought years 2002 and 2006, while in the year that followed there was a single report of a large (50+) flock from the area. Curiously the August 2007 report was from Medhurst Bridge Martindale,

the site here known as MD2. This might suggest that while conditions remained poor, birds that remained in the area were forming flocks that were larger and more nomadic, but it would require further verification.

I have concentrated on the post-2006 disappearance of smaller species, but some larger species are also affected. One example of a much larger bird that I had not recorded at Martindale sites from 2006 to August 2008 [13 surveys], but recorded 11 times from 2000 to 2005 [71 surveys], is the Black-shouldered Kite *Elanus axillaris*; possibly its prey had become much rarer near these sites as a consequence of the dry conditions. My impression is that it had become much scarcer also along Jones Reserve Road in the Bureen area, where raptors had tended to congregate in the past. However, this species had returned to MD1 by the end of 2008. By comparison Nankeen Kestrels *Falco cenchroides*, were recorded in Martindale in August 2007 and August 2008—this is not a significant drop from pre-2006 recording levels.

I hope this selection of data will convince others of the desirability of collecting and retaining regular data on sites for a considerable period. There remains much work to be done in order to assess whether the impact of the 2006 drought has long-lasting effects on the bird population, and which species will fully recover. While some trends are already beginning to emerge, I hope to be able to offer further thoughts on these matters (and with a particular focus on Martindale) after the collection of another year or two of data—which I shall now be collecting with a much greater awareness of what my surveys can reveal. I hope also to be able to improve my coverage of Doyles Creek by quarterly surveys of other selected sites.

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Appendix: Rates of Decrease or Increase at the two Doyles Creek Sites

While recent data for Martindale sites has complicated the picture too much for me to be ready yet to present similar data, I should like to show how the 2006 to August 2008 reporting rates at the Doyles Creek sites differ from the 1998-2005 rates. All species recorded in the surveys between 2006 and August 2008 are listed, as are any recorded *at least twice* before. Species experiencing the biggest fall in reporting rate appear at the top. A negative figure in the column headed '% fall' indicates an increase in reporting rates. The final column labelled 'comment' is a partially subjective status summary often not wholly supported by the data offered, but this is because it also takes into full account monthly surveys September-December 2008. Wherever the term 'disappeared' has been used it means that the species has failed to be recorded in all four of these surveys and the term 'recovered' indicates that the downwards trend has now begun to reverse.

While readers will form their own view of what falls or increases are significant, the results of Chi-squared calculations kindly carried out by Mike Newman yield a very high probability of significance at DC1 only in the case of species marked with an asterisk. I applied the test to the less dramatic results for DC2, but there appear to be no comparable falls or increases at that site.

Doyles Creek Site DC1: 32° 30' 31" S, 150° 47' 44" E

Species name	***Scientific Name***	**1998 to 2005**	**% rate**	**2006 to Aug 08**	**% rate**	**% fall**	**Comment**
Bell Miner	*Manorina melanophrys*	31	69	1	06	63*	disappeared
Superb Fairy-wren	*Malurus cyaneus*	33	73	3	19	54*	disappeared
Double-barred Finch	*Taeniopygia bichenovii*	26	58	1	07	51*	disappeared
Jacky Winter	*Microeca fascinans*	34	76	8	50	26	recovered
Grey Fantail	*Rhipidura albiscapa*	10	22	1	07	15	disappeared
Pied Butcherbird	*Cracticus nigrogularis*	13	29	2	14	15	disappeared
Eastern Yellow Robin	*Eopsaltria australis*	15	33	3	19	14	reduced
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	6	13	0	00	13	uncertain
Speckled Warbler	*Chthonicola sagittata*	9	20	1	07	13	uncertain
Olive-backed Oriole	*Oriolus sagittatus*	12	27	2	14	13	recovered
Laughing Kookaburra	*Dacelo novaeguineae*	11	24	2	14	10	recovered
Bar-shouldered Dove	*Geopelia humeralis*	13	29	3	19	10	uncertain
Rufous Whistler	*Pachycephala rufiventris*	27	60	8	50	10	recovered
Brown Quail	*Coturnix ypsilophora*	4	09	0	00	09	uncertain
Australian King-Parrot	*Alisterus scapularis*	7	16	1	07	09	disappeared
Dusky Woodswallow	*Artamus cyanopterus*	23	51	7	44	07	reduced
Welcome Swallow	*Hirundo neoxena*	3	07	0	00	07	uncertain
White-throated Gerygone	*Gerygone albogularis*	3	07	0	00	07	uncertain
Scarlet Honeyeater	*Myzomela sanguinolenta*	3	07	0	00	07	uncertain
White-winged Chough	*Corcorax melanorhamphos*	14	31	4	25	06	steady
Eastern Rosella	*Platycercus eximius*	22	49	7	44	05	reduced
Crested Pigeon	*Ocyphaps lophotes*	2	04	0	00	04	—
Black-shouldered Kite	*Elanus axilleris*	2	04	0	00	04	—
Nankeen Kestrel	*Falco cenchroides*	2	04	0	00	04	—
Crimson Rosella	*Platycercus elegans*	2	04	0	00	04	—
Red-backed Kingfisher	*Todiramphus pyrrhopygius*	2	04	0	00	04	—
Pallid Cuckoo	*Cacomantis pallidus*	2	04	0	00	04	—
Magpie-Lark	*Grallina cyanoleuca*	2	04	0	00	04	—
White-browed Scrubwren	*Sericornis frontalis*	2	04	0	00	04	—
Chestnut-rumped Heathwren	*Hylacola pyrrhopygia*	2	04	0	00	04	—
Yellow-faced Honeyeater	*Lichenostomus chrysops*	13	29	4	25	04	—
White-plumed Honeyeater	*Lichenostomus penicillatus*	38	84	13	81	03	steady
Red-browed Finch	*Neochmia temporalis*	4	09	1	07	02	uncertain
Rufous Songlark	*Cincloramphus mathewsi*	7	16	2	14	02	steady
Noisy Miner	*Manorina melanocephala*	7	16	2	14	02	steady
Mistletoebird	*Dicaeum hirundinaceum*	23	51	8	50	01	steady
Galah	*Colophus roseicapilla*	3	07	1	07	00	steady
Common Koel	*Eudynamis orientalis*	3	07	1	07	00	steady
Yellow Thornbill	*Acanthiza nana*	3	07	1	07	00	steady
Little Lorikeet	*Glossopsitta pusilla*	6	13	2	14	- 01	steady
Tree Martin	*Petrochelidon nigricans*	6	13	2	14	- 01	steady
Golden Whistler	*Pachycephala pectoralis*	6	13	2	14	- 01	steady
Weebill	*Smicrornis brevirostris*	6	13	2	14	- 01	steady
Eastern Spinebill	*Acanthorhynchus tenuirostris*	6	13	2	14	- 01	steady
Diamond Firetail	*Stagonopleura guttata*	13	29	5	31	- 02	steady
Dollarbird	*Eurystomus orientalis*	2	04	1	07	- 03	—

Doyles Creek Site DC1: 32° 30' 31" S, 150° 47' 44" E (cont.)

Species name	***Scientific Name***	**1998 to 2005**	**% rate**	**2006 to Aug 08**	**% rate**	**% fall**	**Comment**
Varied Sittella	*Daphoenositta chrysoptera*	2	04	1	07	- 03	—
Yellow-tufted Honeyeater	*Lichenostomus melanops*	10	22	4	25	- 03	steady
Common Bronzewing	*Phaps chalcoptera*	5	11	2	14	- 03	steady
Australian Wood Duck	*Chenonetta jubata*	5	11	2	14	- 03	steady
Rainbow Bee-eater	*Merops ornatus*	1	02	1	06	- 04	steady
Striated Thornbill	*Acanthiza lineata*	1	02	1	07	- 05	—
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	1	02	1	07	- 05	—
Masked Woodswallow	*Artamus personatus*	1	02	1	07	- 05	—
Wedge-tailed Eagle	*Aquila audax*	4	09	2	14	- 05	steady
Eastern Whipbird	*Psophodes olivaceus*	4	09	2	14	- 05	steady
Spotted Pardalote	*Pardalotus punctatus*	6	13	3	19	- 06	steady
Australian Magpie	*Cracticus tibicen*	17	38	7	44	- 06	steady
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	0	0	1	07	- 07	—
Leaden Flycatcher	*Myiagra rubecula*	0	0	1	07	- 07	—
Hooded Robin	*Melanodryas cucullata*	0	0	1	07	- 07	—
Australasian Figbird	*Sphecotheres vieilloti*	0	0	1	07	- 07	—
Shining Bronze-Cuckoo	*Chalcites lucidus*	3	07	2	14	- 07	increased
Noisy Friarbird	*Philemon corniculatus*	16	36	7	44	- 08	steady
Crested Shrike-tit	*Falcunculus frontatus*	7	16	4	25	- 09	steady
Willie Wagtail	*Rhipidura leucophrys*	21	47	9	56	- 09	steady
Peaceful Dove	*Geopelia striata*	24	53	10	63	- 10	increased
Channel-billed Cuckoo	*Scythrops novaehollandiae*	2	04	2	14	- 10	—
Pied Currawong	*Strepera graculina*	12	27	6	38	- 11	increased
Brown Thornbill	*Acanthiza pusilla*	1	02	2	14	- 12	—
Brown-headed Honeyeater	*Melithreptus brevirostris*	1	02	2	14	- 12	—
Sulphur-crested Cockatoo	*Cacatua galerita*	3	07	3	19	- 12	steady
Brown Treecreeper	*Climacteris picumnus*	5	11	4	25	- 14	increased
Restless Flycatcher	*Myiagra inquieta*	7	16	5	31	- 15	slipped back
Black-faced Cuckoo-Shrike	*Coracina novaehollandiae*	4	09	4	25	- 16	increased
White-throated Treecreeper	*Cormobates leucophaea*	1	02	3	19	- 17	increased
Australian Raven	*Corvus coronoides*	26	58	12	75	- 17	increased
White-browed Babbler	*Pomatostomus superciliosus*	14	31	8	50	- 19	increased
Grey Butcherbird	*Cracticus torquatus*	1	02	3	21	- 19	increased
Horsfield's Bronze-Cuckoo	*Chalicites basalis*	2	04	4	25	- 21	slipped back
White-browed Woodswallow	*Artamus superciliosus*	0	0	3	21	- 21	irruptive
Striated Pardalote	*Pardalotus striatus*	14	31	9	56	- 25	increased
Grey Shrike-thrush	*Colluricincla harmonica*	14	31	10	63	- 32	increased
Striped Honeyeater	*Plectorhyncha lanceolata*	6	13	9	56	- 43*	increased

Doyles Creek Site DC2: 32° 30' 33" S, 150° 48' 22" E

Species name	***Scientific name***	**1998 to 2005**	**% rate**	**2006 to Aug 08**	**% rate**	**% fall**	**Comment**
Striated Pardalote	*Pardalotus striatus*	13	35	2	13	22	reduced
Superb Fairy-wren	*Malurus cyaneus*	24	65	7	44	21	reduced
Eastern Rosella	*Platycercus eximius*	17	46	4	25	21	recovering
Yellow-faced Honeyeater	*Lichenostomus chrysops*	10	27	1	06	21	reduced
Double-barred Finch	*Taeniopygia bichenovii*	10	27	1	06	21	reduced
Grey Shrike-thrush	*Colluricincla harmonica*	12	32	2	13	19	reduced
Yellow Thornbill	*Acanthiza nana*	7	19	0	00	19	disappeared
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	7	19	0	00	19	disappeared
Rufous Whistler	*Pachycephala rufiventris*	20	54	6	38	16	recovered
Wonga Pigeon	*Leucosarcia melanoleuca*	6	16	0	00	16	disappeared
Australian Raven	*Corvus coronoides*	36	97	13	81	16	reduced
Speckled Warbler	*Chthonicola sagittata*	5	14	0	00	14	disappeared
Eastern Spinebill	*Acanthorhynchus tenuirostris*	5	14	0	00	14	disappeared
White-winged Chough	*Corcorax melanorhamphos*	9	24	2	13	11	steady
Jacky Winter	*Microeca fascinaris*	32	86	12	75	11	steady
Eastern Koel	*Eudynamis orientalis*	4	11	0	00	11	—
Grey Fantail	*Rhipidura aliscapa*	4	11	0	00	11	disappeared
Weebill	*Smicrornis brevirostris*	6	16	1	06	10	reduced
Olive-backed Oriole	*Oriolus sagittatus*	6	16	1	06	10	steady
Channel-billed Cuckoo	*Scythrops novaehollandiae*	3	08	0	00	08	—
Tree Martin	*Petrochelidon nigricans*	3	08	0	00	08	steady
Golden Whistler	*Pachycephala pectoralis*	3	08	0	00	08	reduced
Silvereye	*Zosterops lateralis*	3	08	0	00	08	reduced
Red-browed Finch	*Neochmia temporalis*	3	08	0	00	08	reduced
Spotted Dove	*Streptopelia chinensis*	3	08	0	00	08	reduced
Mistletoebird	*Dicaeum hirundinaceum*	14	38	5	31	07	steady
Black-faced Cuckoo-Shrike	*Coracina novaehollandiae*	7	19	2	13	06	reduced
Intermediate Egret	*Ardea intermedia*	2	05	0	00	05	—
Peregrine Falcon	*Falco peregrinus*	2	05	0	00	05	—
Leaden Flycatcher	*Myiagra rubecula*	2	05	0	00	05	—
White-throated Gerygone	*Gerygone albogularis*	2	05	0	00	05	reduced
Western Gerygone	*Gerygone fusca*	2	05	0	00	05	reduced
Brown Thornbill	*Acanthiza pusilla*	2	05	0	00	05	reduced
Brown Treecreeper	*Climacteris picumnus*	2	05	0	00	05	recovered
Crested Shrike-tit	*Falcunculus frontatus*	4	11	1	06	05	reduced
Willie Wagtail	*Rhipidura leucophrys*	27	73	11	69	04	recovered
Pied Butcherbird	*Cracticus nigrogularis*	13	35	5	31	04	steady
Hooded Robin	*Melanodryas cucullata*	8	22	3	19	03	reduced
Magpie-Lark	*Grallina cyanoleuca*	3	08	1	06	02	reduced
Spotted Pardalote	*Pardalotus punctatus*	3	08	1	06	02	reduced
Australian Wood Duck	*Chenonetta jubata*	5	14	2	13	01	steady
Grey Butcherbird	*Cracticus torquatus*	5	14	2	13	01	steady
Noisy Miner	*Manorina melanocephala*	2	05	1	06	- 01	steady
Eastern Yellow Robin	*Eopsaltria australis*	8	22	4	25	- 03	steady
White-necked Heron	*Ardea pacifica*	1	03	1	06	- 03	steady
Grey Goshawk	*Accipiter novaehollandiae*	1	03	1	06	- 03	—
Wedge-tailed Eagle	*Aquila audax*	1	03	1	06	- 03	—
Little Lorikeet	*Glossopsitta pusilla*	1	03	1	06	- 03	—
Crimson Rosella	*Platycercus elegans*	1	03	1	06	- 03	—
Sulphur-crested Cockatoo	*Cacatua galerita*	24	65	11	69	- 04	steady

Doyles Creek Site DC2: 32 ° 30' 33" S, 150° 48' 22" E (cont.)

Species name	***Scientific name***	**1998 to 2005**	**% rate**	**2006 to Aug 08**	**% rate**	**% fall**	**Comment**
White-browed Woodswallow	*Artamus superciliosus*	3	08	2	13	- 05	irruptive
Welcome Swallow	*Hirundo neoxena*	5	14	3	19	- 05	steady
Brown Quail	*Coturnix ypsilophora*	0	00	1	06	- 06	—
Australasian Figbird	*Sphecotheres vieilloti*	0	00	1	06	- 06	—
Brown-headed Honeyeater	*Melithreptus brevirostris*	0	00	1	06	- 06	—
Noisy Friarbird	*Philemon corniculatus*	9	24	5	31	- 07	steady
Crested Pigeon	*Ocyphaps lophotes*	4	11	3	19	- 08	steady
Galah	*Colophus roseicapilla*	4	11	3	19	- 08	steady
Striped Honeyeater	*Plectorhyncha lanceolata*	20	54	10	63	- 09	increased
Shining Bronze-Cuckoo	*Cacomantis lucidus*	1	03	2	13	- 10	—
Grey-crowned Babbler	*Pomatostmus temporalis*	1	03	2	13	- 10	increased
White-throated Treecreeper	*Cormobates leucophaeus*	1	03	2	13	- 10	—
Little Eagle	*Hieraaetus morphnoides*	0	00	2	13	- 13	—
Spiny-Cheeked Honeyeater	*Acanthagenys rufogularis*	0	00	2	13	- 13	—
Pallid Cuckoo	*Cacomantis pallidus*	2	05	3	19	- 14	increased
Australian Magpie	*Cracticus tibicen*	18	49	10	63	- 15	steady
White-plumed Honeyeater	*Lichenostomus penicillatus*	29	78	15	94	- 16	increased
Laughing Kookaburra	*Dacelo novaeguineae*	3	08	4	25	- 17	increased
Rainbow Bee-eater	*Merops ornatus*	3	08	4	25	- 17	increased
White-winged Triller	*Lalage sueurii*	7	19	6	38	- 19	increased
Diamond Firetail	*Stagonopleura guttata*	9	24	7	44	- 20	increased
Australian King-Parrot	*Alisterus scapularis*	2	05	4	25	- 20	increased
Rufous Songlark	*Cincloramphus mathewsi*	2	05	4	25	- 20	increased
Pied Currawong	*Strepera graculina*	5	14	6	38	- 24	increased
Peaceful Dove	*Geopelia striata*	21	57	13	81	- 24	increased
Dusky Woodswallow	*Artamus cyanopterus*	11	30	9	56	- 26	slipped back
Bar-shouldered Dove	*Geopelia humeralis*	5	14	7	44	- 30	increased
Restless Flycatcher	*Myiagra inquieta*	14	38	11	69	- 31	increased
Red-rumped Parrot	*Psephotus haematonotus*	0	00	5	31	- 31	increased

Bird population of Warakeila, a cattle property in the Allyn River Valley, NSW – a twelve year study

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Warakeila is a cattle property with about 15% remnant vegetation located in the Allyn Valley of the Hunter Region of NSW. Between 1996 and 2008 bird surveys were made at three-monthly intervals using the Birds Australia "Birds on Farms" methods. During these surveys 117 bird species were recorded.

Twenty five species were recorded on more than eighty percent of the surveys and are considered to be normally resident. An additional twelve species were regularly recorded as summer visitors. Other species recorded less frequently because of their elusive character may also be resident, notably the Red-backed Fairy-wren *Malurus melanocephalus* and Southern Emu-wren *Stipiturus malachurus*.

The second half of the study coincided with a prolonged period of drought which affected most of NSW. Preliminary analysis of the data suggests that a number of species declined during the drought period, examples being the Buff-rumped Thornbill *Acanthiza reguloides*, Dusky Woodswallow *Artamus cyanopterus*, Tree Martin *Petrochelidon nigricans*, Double-barred Finch *Taeniopygia bichenovii* and Red-browed Finch *Neochmia temporalis*. These species were seen less frequently and in smaller numbers during the second half of the study. As Warakeila is located in a landscape where vegetation is highly fragmented and lacking extensive tracts of woodland it is possible that some species may suffer local extinction. For instance, in the second half of the study the Double-barred Finch was not seen.

The survey results at Warakeila exemplify the importance of farms with remnant vegetation to local bird populations.

INTRODUCTION

This study ran in parallel with an identical investigation on a cattle property at Butterwick near Paterson in the NSW Hunter Valley (Newman 2007a). Both studies commenced as part of the "Birds on Farms" project run by Birds Australia. The studies were continued during the "New Atlas of Australian Birds" (Barrett *et al.* 2003) and the "Ongoing Atlas" projects which used compatible survey techniques. The lower boundary of Warakeila 32°15'S 151º31'E is the Allyn River at Eccleston. The property is run for cattle.

As with the previous paper the intention is to demonstrate the importance of farms with remnant vegetation to the conservation of bird populations. The study also provides baseline data against which future population trends can be gauged. Discussion of changes in bird population during this study and comparison with the Butterwick property is limited to examples where trends are obvious. A more detailed evaluation of these aspects will be the subject of a subsequent paper as will differences in the sub-populations of different habitats sampled at the 2ha sites.

METHODS

Surveys were at approximately three-monthly intervals, usually involving two observers. The timing of the surveys was close to the 15th day of January, April, July and October. Only two surveys were conducted outside 22 days of the target date. Surveys typically took between four and five hours to complete and commenced approximately two hours after sunrise. A constant survey-effort strategy was adopted in which each survey followed the same route (**Figure 1**). Separate records were kept for the four 2ha sites at which 20 minute counts were conducted as well as for the total survey.

The study involved 49 surveys at approximately three-monthly intervals between April 1996 and January 2008. The one exception to this routine was in 1999 when two surveys, one in September and the other in November, took place. The earlier of these surveys was

more than 22 days before the October target date and was excluded from the comparison of the two survey periods 1996 – 2001 and 2002 - 2007. The number of species recorded in November was 58 compared to 51 in September. This difference underscores the importance of the timing of the spring season count as a number of migrant species were absent in the earlier September survey.

In the following sections species have been classified according to the frequency and season in which they were recorded. The tabulated data includes a change ratio which is the ratio of the number of surveys a species was present in the first half (i.e. the first 24 surveys, 1996-2001) compared to the second half (i.e. the second 24 surveys, 2002-2007) of the study. Change ratio values greater than 1 suggest the possibility that a species may have decreased during the study. For instance, a change ratio of 1.2 indicates that a species was present on 20% more surveys in the first half of the study. Conversely, a change ratio of 0.8 indicates that a species increased, being present during 20% fewer surveys in the first half of the study.

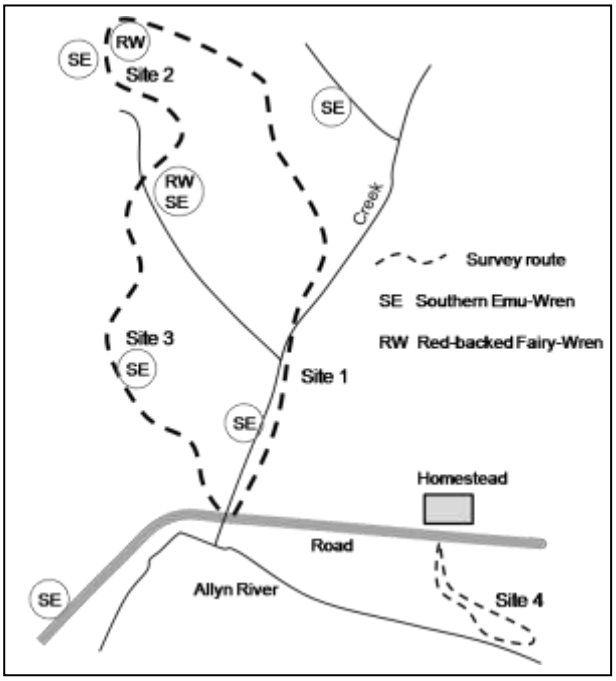

Figure 1. Warakeila – Survey route and location of key sightings.

HABITAT OVERVIEW

The following habitat description follows guidelines set out in Cooper (1999). The survey route initially ascended alongside a creek flowing into the Allyn River (**Figure 1**). Initially the vegetation was dominated by a narrow belt of River Oaks alongside the creek and the habitat was specified as 302 - River Oak (Cooper 1999, p. 42). At and beyond the 2ha site 1 there was an increasing influence of rainforest vegetation with vines and creepers. At site 1 were several isolated eucalypts one of which had extensive mistletoe growths. The mistletoe attracted a number of bird species when flowering. Away from the immediate creek bank clumps of blackberry provided ground cover and food for a variety of species. The adjacent hillsides had been extensively cleared, with little vegetation other than a few isolated trees. Occasional dams and boggy areas provided some habitat for water birds.

Above site 1 the survey route ascended more steeply through cleared pasture to a ridge line which was followed to the summit of the property above site 2. Gullies on either side of the ridge were heavily vegetated. On the right hand side of the ridge the northerly facing aspect of the gully favoured rainforest vegetation and has been tentatively assigned 404 - Warm Temperate Rainforest (Cooper 1999, p. 58). Vegetation on the other side of the ridge is predominantly 531 – Wet Sclerophyll (rough-barked) Forest (Cooper 1999, p.76) with a fairly sparse understorey. Site 2 is located at the top of this gully and while the vegetation predominantly contained wet sclerophyll species there was some rainforest type vegetation.

From site 2 the survey route descended through a cleared hillside with very little remnant vegetation. The view looking down from this point showed a mosaic of cleared hillside slopes segmented by numerous timbered creeks and gullies. Approximately 15 % of the land was vegetated.

Site 3 was situated on the route descending down the hillside and consisted of an isolated copse of rough-barked wet sclerophyll surrounding a dry creek. This site was chosen as an example of a small remnant of highly degraded woodland with no connectivity to other areas of remnant vegetation. There was some understorey including blackberry, which was periodically cleared.

The final section of the survey involved a descent from cattle sheds adjacent to the Warakeila homestead to site 4 on the banks of the Allyn River. At site 4 the vegetation was predominantly River Oak partially cleared for grazing. On the far bank of the Allyn River the narrow belt of vegetation has a rainforest influence, particularly at the southern end where a substantial cliff face provided shelter. At site 4 the understorey which contained a number of weeds was periodically

cleared. During the second half of the study a severe storm damaged a number of trees on the far bank of the river.

FACTORS IMPACTING ON THE SURVEY DATA

The primary purpose of the study was to determine the presence of species both at the four 2ha sites and for the total survey route. In addition, an estimate was made of the number of each species present. The four sites are separated by several hundred metres and there is typically an interval of at least 20 minutes between making each 2ha count. This minimizes the probability of the same birds being sampled at more than one of the 2ha sites, although it does not completely eliminate the possibility because outside the breeding season woodland birds often form a mobile mixed foraging group. However, at Warakeila the risk of double counting is thought to be negligible.

Conducting surveys at Warakeila involves considerable travel time to the site followed by a survey of approximately four hours duration. Consequently, despite aiming for an early start, most surveys were finished between noon and 1.00pm. Under hot conditions, particularly in summer, the surveys were completed when the birds were less active. However, as most of the areas containing dense vegetation where birds are difficult to detect were covered during the early stages of the survey, this problem was alleviated as the birds tended to still be active. Surveys were usually conducted under favourable weather conditions, in that extremely hot, windy and rainy days were avoided, because these conditions make the location and identification of birds by call difficult. During the study the observers' call identification skills improved as did their intuitive knowledge of where to expect individual species. Consequently surveys probably became more comprehensive as the study progressed. The regular detection of Southern Emu-wrens *Stipiturus malachurus* is an example of this effect and is discussed later. The presence of two observers was beneficial with respect to the identification of birds by call. In the case of larger species like waterbirds and birds frequenting open areas, the numbers counted provide an accurate measure of abundance. For the smaller woodland birds, particularly those of thornbill and pardalote size which forage in the crowns of tall trees, the numbers are only an indication and represent the minimum numbers present, particularly where records are based on call.

RESULTS

Summary Statistics

The results are summarized in **Table 1** which provides a comparison of species and individual bird numbers between seasons. A total of 117 species were positively identified and another two tentatively identified (excluded from the data analysis) during the surveys. An additional species was recorded during a night visit making a total species list of 120. The greatest number of species, 102, was recorded in spring compared with 92 in summer. Although the greatest number of species recorded during a survey, 67, occurred in summer, species diversity and abundance were higher in spring with 55.3 species/survey and 339.9 individual birds/survey. Diversity was appreciably lower in autumn and winter with 45.3 and 44.1 species/survey respectively. Bird abundance was greatest in autumn with an average of 360.8 but is biased by the inclusion of migrating birds (e.g. flocks of Yellow-faced Honeyeaters *Lichenostomus chrysops* accounted for 42.7% of the maximum autumn count of 597 birds).

Three of the four areas selected for the 20 minute 2ha counts were chosen because they were expected to be attractive bird habitat. Consequently it is surprising that only 25% of the total numbers of individual birds/survey were recorded at the 2ha sites for which the survey effort involved 33% of the survey time. This 25% value was extremely constant between seasons (**Table 1**).

Table 1. Summary of survey statistics.

	All Surveys	**Summer**	**Autumn**	**Winter**	**Spring**
Species Recorded	119	92	88	81	102
Average/survey	49.5	52.9	45.3	44.1	55.3
Maximum	67	67	54	51	64
Minimum	34	37	34	37	42
Number of Birds	16476	3723	4329	4005	4419
Average/survey	336.2	310.3	360.8	333.8	339.9
Maximum	597	409	597	391	448
Minimum	225	240	258	233	225
Birds counted 2ha surveys	4123 (25%)	900 (24%)	1120 (26%)	963 (24%)	1140 (26%)

Species Regularly Recorded Year Round

The 25 species falling in this category as listed in **Table 2** are best described as very common on the property and many are resident. Indeed, nine species were seen on every survey. Inclusion in this category is based on the species being seen on at least 40 surveys (i.e. more than 80% of the surveys).

Table 2. Species recorded regularly in all seasons (present on at least 40 i.e. >80% of surveys).

Common Name	**Scientific Name**	**Average Number Present**[1]	**Maximum Number Present**	**Number of Surveys Present**	**Change Ratio**[2]
Australian Wood Duck	*Chenonetta jubata*	12.1	33	41	0.74
Crimson Rosella	*Platycercus elegans*	9.5	32	46	0.96
Laughing Kookaburra	*Dacelo novaeguineae*	5.5	12	48	0.96
White-throated Treecreeper	*Cormobates leucophaea*	3.4	9	47	0.92
Superb Fairy-wren	*Malurus cyaneus*	39.6	70	49	1.00
White-browed Scrubwren	*Sericornis frontalis*	6.9	16	49	1.00
Brown Gerygone	*Gerygone mouki*	6.8	20	44	1.15
Striated Thornbill	*Acanthiza lineata*	10.2	30	40	1.11
Yellow Thornbill	*Acanthiza nana*	7.1	19	48	1.04
Brown Thornbill	*Acanthiza pusilla*	8.6	14	49	1.00
Spotted Pardalote	*Pardalotus punctatus*	6.7	16	47	0.92
Lewin's Honeyeater	*Meliphaga lewinii*	10.8	16	49	1.00
Yellow-faced Honeyeater	*Lichenostomus chrysops*	24.1	255	49	1.00
Bell Miner	*Manorina melanophrys*	23.5	30	49	1.00
White-naped Honeyeater	*Melithreptus lunatus*	5.0	21	42	0.95
Golden Whistler	*Pachycephala pectoralis*	4.0	8	43	1.00
Grey Shrike-thrush	*Colluricincla harmonica*	6.5	15	49	1.00
Australian Magpie	*Cracticus tibicen*	8.4	16	49	1.00
Pied Currawong	*Strepera graculina*	3.0	9	42	1.05
Grey Fantail	*Rhipidura albiscapa*	12.4	25	49	1.00
Willie Wagtail	*Rhipidura leucophrys*	2.5	5	43	1.00
Australian Raven	*Corvus coronoides*	4.9	13	48	1.04
Jacky Winter	*Microeca fascinans*	4.2	12	47	1.09
Eastern Yellow Robin	*Eopsaltria australis*	4.6	11	48	1.04
Red-browed Finch	*Neochmia temporalis*	25.0	90	46	1.05

[1] Average number seen on surveys when present.

[2] Ratio of numbers of surveys in which species were present during first half of the study (1996-2001) compared to the second half (2002-2007).

Species favouring woodland and creek margin vegetation dominate the list in **Table 2**. The composition of the list also reflects the absence of wetland habitat on Warakeila and surrounding properties other than the Allyn River habitat at and adjacent to the 2ha site 4. Only the Superb Fairy-wren, Bell Miner, Yellow-faced Honeyeater and Red-browed Finch were consistently seen in appreciable numbers (e.g. average number of the species >20/survey). The Crimson Rosella, Brown Gerygone, three species of thornbill, Lewin's Honeyeater and the Grey Fantail at around 10/survey were consistently recorded in modest numbers.

During the 1996-2001 surveys the Bell Miner was always present as a single large colony, estimated to contain 30 birds, located in a dense wet sclerophyll vegetated gully near the top of the property immediately adjacent to the survey route. During the 2002-2007 surveys Bell Miners were heard from two new locations each about 1km distant from the main colony. Towards the end of the study the original colony was completely abandoned. As the new colonies, which are assumed to have derived from a split of the original colony, were not directly on the survey route it was not possible to make reliable estimates of their size but the impression was that we were hearing fewer birds.

As mentioned previously, Yellow-faced Honey-eater numbers were biased by the results of one autumn survey when a large number of migrating birds estimated at 255 passed through Warakeila. This resulted in a maximum autumn survey count of 597 birds. If this value is discounted by the 230 Yellow-faced Honeyeaters in excess of the average count/survey, the adjusted number of 367 birds is close to the average autumn bird total of 361/survey.

The Australian Wood Duck, Australian Magpie, Australian Raven and Pied Currawong were typically recorded in the cleared, but lightly-timbered areas. The low value of the change ratio for the Australian Wood Duck suggests that this species increased during the second half of the study. Initially, this is a surprising result as drought conditions prevailed during the 2002-2006 period and a decline in this species was found in the Butterwick study (Newman 2007). The increase at Warakeila may be a consequence of the establishment of a number of new dams during the study period which provide the best drought refuge for the local area. Population trends and the change ratio based on presence, which is of limited value for frequently observed species, are discussed in more detail in a later section of this paper.

Species Regularly Recorded in Summer

Twelve species fall in the regular summer visitor category based on presence during at least four (33%) of the summer surveys and being recorded at least five times more frequently in summer than during winter surveys (**Table 3)**. The threshold for inclusion was deliberately set low at 33% because summer survey conditions are difficult with some species relatively inactive and non vocal because temperatures are high and most species have completed breeding. This point is emphasized by the data in **Table 3** which show that for most of the summer visitors less than half the records were during summer surveys (i.e. summer visitors are usually present and more active during spring surveys). Two species which met the criteria were excluded for reasons discussed in the next section. No species were classified as winter visitors by meeting the converse criteria to that defining a summer visitor.

None of the summer visitors were abundant with average numbers typically in the range 2 to 3 birds/survey and maximum numbers of 6 to 8. The Black-faced Monarch was the only species recorded on every summer survey.

The Rainbow Bee-eater is classed as a summer migrant to the Hunter Region (Stuart 2007). Although it was recorded during only 4 (33%) of the summer surveys (**Table 3**) it was recorded on 9 (75%) of the spring surveys indicating that it is a more frequent visitor than indicated by the summer survey data. The high change ratio value of 2.00 indicates a decline during the second half of the study (2002-2007). During the initial phase of the study a pair was present every spring, apparently nesting in a creek bank near the start of the survey route. This pair was not seen during the second half of the study but, after a number of years with no records, small flocks were observed in the summers of 2005/06 and 2006/07 near 2ha site 4. These data indicate the ease with which a species for which the local population depends on isolated pairs could become locally extinct.

Table 3. Frequently observed summer visitors
(species recorded on at least 4 summer surveys and at least 5 times more frequently in summer than winter).

Common Name	Scientific Name	Average No. Present[1]	Maximum No. Present	No. Surveys Present	No. Summer Records	No. Winter Records	Change Ratio[2]
Sacred Kingfisher	*Todiramphus sanctus*	2.2	3	13	5	0	0.63
Rainbow Bee-eater	*Merops ornatus*	2.7	6	13	4	0	2.00
Dollarbird	*Eurystomus orientalis*	2.6	6	19	11	0	1.11
White-throated Gerygone	*Gerygone albogularis*	2.6	7	22	8	0	1.00
Scarlet Honeyeater	*Myzomela sanguinolenta*	3.6	9	9	5	0	0.50
Noisy Friarbird	*Philemon corniculatus*	3.5	6	19	8	0	1.71
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	3.1	10	32	11	2	1.07
Rufous Whistler	*Pachycephala rufiventris*	3.2	12	24	10	0	1.56
Olive-backed Oriole	*Oriolus sagittatus*	1.5	4	16	6	1	1.00
Rufous Fantail	*Rhipidura rufifrons*	3.1	10	14	10	0	1.80
Leaden Flycatcher	*Myiagra rubecula*	3.0	7	16	7	0	1.29
Black-faced Monarch	*Monarcha melanopsis*	3.4	8	24	12	0	1.09

[1]Average number seen on surveys when the species was recorded.
[2]Ratio of numbers of surveys in which species were present during first half of study (1996-2001) compared with second half (2002-2007).

In contrast the Sacred Kingfisher and Scarlet Honeyeater are examples of species with very low change ratios, 0.63 and 0.50 respectively, indicating that these species were recorded more frequently in the second half (2002-2007) of the study.

The Black-faced Cuckoo-shrike and the Olive-backed Oriole are included as summer visitors in **Table 3** on the basis that they are at least 5 times more frequently observed in summer than in winter. Both species are classed as resident in the Hunter Region (Stuart 2007). The results of this study suggest that there are local movements outside the breeding season, possibly indicating changes in habitat preference after the breeding season. For instance the authors have noted congregations of Olive-backed Orioles attracted to white cedar trees during winter.

Species Often Recorded

The 37 species in this category (**Table 4**) were recorded during 20% to 80% of the surveys. A broad range of species are involved, many of which are vocal and conspicuous (e.g. Galah present on 61% of surveys) suggesting that they are only intermittently present in the study area. Skulking species like the Eastern Whipbird (recorded on 67% of surveys) were primarily detected by call. Seasonal variations in vocal activity would impact adversely on the detection of this species which is assumed to be resident in small numbers at Warakeila.

The Pheasant Coucal was recorded on 16 (33%) surveys, and 6 times more frequently in summer than winter. Strictly speaking this species meets the criteria for inclusion in **Table 3** as a summer visitor. However, the Pheasant Coucal is considered to be a resident which exhibits seasonal variations in conspicuousness, particularly vocal, as claimed in explanation of other investigations where variations in seasonal reporting rates were found (Higgins 1999, p. 796).

The Warakeila study unexpectedly established the presence of a population of the Southern Emu-wren (**Figure 1**) which was recorded on 13 (27%) of the surveys (Newman 2007). Most of the records were in the second half of the study (2002-2007). Although the very low change ratio 0.20 suggests a population increase or even colonisation of the Warakeila property during the study it is probable that the observers were sensitized to the presence of this elusive species subsequent to its initial discovery in 1999. Although there are no winter records, the Southern Emu-wren is considered to be a widespread breeding resident at Warakeila, with immature birds noted in a family foraging group during autumn.

Other species with low change ratios indicating a possible population increase include the

Mistletoebird *Dicaeum hirundinaceum* 0.22 and the Torresian Crow *Corvus orru* 0.42. In the case of the Mistletoebird the number of records was low. However, if the result is meaningful a possible explanation is that the vigorous flowering of mistletoe provided an important food source for this species during the drought-dominated period (2002-2007). The apparent increase in the Torresian Crow may be a consequence of the authors' lack of familiarity with the calls of this species at the start of the study. This species appears to have expanded its range in the Lower Hunter recently (Stuart 2007).

In contrast, high change ratio values for the Buff-rumped Thornbill *Acanthiza reguloides*, 1.71, and the Double-barred Finch *Taeniopygia bichenovii*, which was not recorded during 2002-2007, suggest that these ground-feeding species have undergone a population decline. The conspicuous Tree Martin *Petrochelidon nigricans*, with a change ratio of 1.83, is another species which appears to have declined. The evidence for these claims will be discussed in more detail in a later section.

Table 4. Species often observed and present in all seasons (recorded on 10 (20%) to 39 (80%) of the 49 surveys).

Common Name	Scientific Name	Average Number Present[1]	Maximum Number Present	Number Surveys Present	Change Ratio[2]
Pacific Black Duck	*Anas superciliosa*	3.5	13	39	0.95
Brown Cuckoo-Dove	*Macropygia amboinensis*	1.8	6	13	1.17
Crested Pigeon	*Ocyphaps lophotes*	2.7	10	10	0.43
Bar-shouldered Dove	*Geopelia humeralis*	2.9	13	28	0.56
Wonga Pigeon	*Leucosarcia picata*	1.4	3	30	0.67
Little Pied Cormorant	*Microcarbo melanoleucos*	1.2	2	17	1.00
White-faced Heron	*Egretta novaehollandiae*	1.6	6	22	1.33
Wedge-tailed Eagle	*Aquila audax*	1.5	3	19	1.11
Dusky Moorhen	*Gallinula tenebrosa*	2.6	8	12	1.75
Masked Lapwing	*Vanellus miles*	2.4	5	14	0.27
Galah	*Eolophus roseicapillus*	3.6	13	30	0.80
Australian King-Parrot	*Alisterus scapularis*	2.5	9	15	1.80
Eastern Rosella	*Platycercus eximius*	5.0	18	35	0.55
Pheasant Coucal	*Centropus phasianinus*	1.6	3	16	0.88
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	2.5	10	27	1.00
Satin Bowerbird	*Ptilonorhynchus violaceus*	3.2	12	32	1.07
Variegated Fairy-wren	*Malurus lamberti*	5.3	11	37	1.12
Southern Emu-wren	*Stipiturus malachurus*	3.4	8	13	0.20
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	6.3	21	25	1.00
Buff-rumped Thornbill	*Acanthiza reguloides*	4.8	10	20	1.71
Striated Pardalote	*Pardalotus striatus*	2.4	7	31	1.50
Eastern Spinebill	*Acanthorhynchus tenuirostris*	3.1	9	34	0.79
Noisy Miner	*Manorina melanocephala*	4.1	11	15	0.88
Red Wattlebird	*Anthochaera carunculata*	2.9	6	36	0.57
Noisy Friarbird	*Philemon corniculatus*	3.5	6	19	1.71
Eastern Whipbird	*Psophodes olivaceus*	2.5	6	33	0.57
Varied Sittella	*Daphoenositta chrysoptera*	7.9	23	10	0.80
Grey Butcherbird	*Cracticus torquatus*	1.8	4	31	0.48
Pied Butcherbird	*Cracticus nigrogularis*	2.8	6	39	0.73
Torresian Crow	*Corvus orru*	2.8	7	27	0.42
Magpie-lark	*Grallina cyanoleuca*	2.6	8	38	1.00
White-winged Chough	*Corcorax melanorhamphos*	9.3	20	28	1.00

Table 4. Species often observed and present in all seasons (recorded on 10 (20%) to 39 (80%) of the 49 surveys) (cont.).

Common Name	*Scientific Name*	Average Number Present[1]	Maximum Number Present	Number Surveys Present	Change Ratio[2]
Silvereye	*Zosterops lateralis*	9.4	24	34	1.38
Tree Martin	*Petrochelidon nigricans*	6.4	28	18	1.83
Common Myna	*Sturnus tristis*	2.7	9	12	0.71
Mistletoebird	*Dicaeum hirundinaceum*	1.2	2	11	0.22
Double-barred Finch	*Taeniopygia bichenovii*	10.0	25	10	(NR2)

[1] Average number seen on surveys when species recorded.
[2] Ratio of number of surveys in which species was recorded during first half of study (1996-2001) compared with second half (2002-2007).
(NR2) Species not recorded during 2002-2007 surveys.

Species Recorded Occasionally

The 44 species recorded occasionally (**Table 5)** occurred in less than 20% of the surveys. The change ratios in **Table 5** should be interpreted with caution because of the small number of sightings. However, as will be discussed below, a number of species denoted NR2 in **Table 5** were recorded only in the first half of the study which, in some instances, may be indicative of a change in distribution, at least at the local scale.

Of the 10 raptor species recorded at Warakeila nine are in the **Table 5** category, the Wedge-tailed Eagle being the only species recorded regularly (19 surveys). The Brown Goshawk and Collared Sparrowhawk which were present on 5 surveys were the most regularly recorded of the remaining raptor species.

Of the seven species of cuckoo found at Warakeila, only two were recorded on ten or more surveys. Surprisingly there were no records of the Pallid Cuckoo, a vocal and conspicuous species, which is considered to be a moderately common breeding summer visitor to the Hunter Region (Stuart 2007).

Table 5. Species seen infrequently and classed as either uncommon or rare (recorded on less than 10 surveys).

Common Name	Scientific Name	Average Number Present[1]	Maximum Number Present	No. of Surveys Present	Change Ratio[2]
Stubble Quail	*Coturnix pectoralis*	1.0	1	1	(NR1)
Brown Quail	*Coturnix ypsilophora*	1.3	2	3	2.00
Grey Teal	*Anas gracilis*	2.0	2	1	(NR1)
Chestnut Teal	*Anas castanea*	1.0	1	1	(NR1)
Australasian Grebe	*Tachybaptus novaehollandiae*	1.0	1	1	(NR2)
Great Cormorant	*Phalacrocorax carbo*	1.0	1	2	(NR2)
Little Black Cormorant	*Phalacrocorax sulcirostris*	1.0	1	1	(NR2)
White-necked Heron	*Ardea pacifica*	1.0	1	4	1.00
Cattle Egret	*Ardea ibis*	3.0	3	1	(NR1)
Straw-necked Ibis	*Threskiornis spinicollis*	6.7	21	6	0.50
Black-shouldered Kite	*Elanus axillaris*	1.0	1	2	(NR2)
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	1.0	1	1	(NR1)
Brown Goshawk	*Accipter fasciatus*	1.4	2	5	1.50
Collared Sparrowhawk	*Accipter cirrocephalus*	1.2	2	5	3.00
Grey Goshawk	*Accipter novaehollandiae*	1.0	1	3	2.00
Nankeen Kestrel	*Falco cenchroides*	2.0	2	4	0.50
Brown Falcon	*Falco berigora*	1.0	1	4	(NR2)

Table 5. Species seen infrequently and classed as either uncommon or rare (recorded on less than 10 surveys) (cont.).

Common Name	***Scientific Name***	**Average Number Present**[1]	**Maximum Number Present**	**No. of Surveys Present**	**Change Ratio**[2]
Australian Hobby	*Falco longipennis*	1.3	2	3	2.00
Peregrine Falcon	*Falco peregrinus*	1.0	1	4	1.00
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	1.8	2	4	0.33
Sulphur-crested Cockatoo	*Cacatua galerita*	2.0	2	1	0.00
Eastern Koel	*Eudynamis orientalis*	1.8	2	8	1.00
Channel-billed Cuckoo	*Scythrops novaehollandiae*	1.0	1	3	2.00
Horsfield's Bronze-Cuckoo	*Chalcites basalis*	1.5	2	2	(NR2)
Shining Bronze-Cuckoo	*Chalcites lucidus*	1.4	3	9	1.00
Brush Cuckoo	*Cacomantis variolosus*	1.5	2	2	(NR2)
Southern Boobook	*Ninox novaeseelandiae*	1.0	1	2	(NR1)
Azure Kingfisher	*Ceyx azureus*	1.2	2	5	1.50
Green Catbird	*Ailuroedus crassirostris*	1.7	2	6	1.00
Regent Bowerbird	*Sericulus chrysocephalus*	1.0	1	1	(NR2)
Red-backed Fairy-wren	*Malurus melanocephalus*	3.0	5	7	0.75
Large-billed Scrubwren	*Sericornis magnirostra*	1.0	1	3	0.50
Speckled Warbler	*Chthonicola sagittata*	1.0	1	1	(NR2)
Scarlet Honeyeater	*Myzomela sanguinolenta*	3.6	9	9	0.50
White-winged Triller	*Lalage sueurii*	1.0	1	1	(NR2)
Crested Shrike-tit	*Falcunculus frontatus*	1.3	2	3	0.50
Dusky Woodswallow	*Artamus cyanopterus*	2.0	4	4	(NR2)
Restless Flycatcher	*Myiagra inquieta*	1.4	3	5	1.00
Spectacled Monarch	*Symposiarchus trivirgatus*	1.0	1	1	(NR2)
Rose Robin	*Petroica rosea*	1.5	2	4	0.33
Australian Reed-Warbler	*Acrocephalus australis*	2.0	2	1	(NR1)
Bassian Thrush	*Zoothera lunulata*	1.4	2	5	1.5
Common Starling	*Sturnus vulgaris*	4.5	12	4	3.00
Australasian Pipit	*Anthus novaeseelandiae*	1.5	2	4	3.00

[1]Average number seen on surveys when species recorded.

[2]Ratio of number of surveys in which species was present during first half of study (1996-2001), compared with second half (2002-2007).

(NR1) Species not recorded during 1996-2001 surveys.

(NR2) Species not recorded during 2002-2007 surveys.

The Red-backed Fairy-Wren was recorded on 7 surveys and appears to be a scarce resident with, as indicated by **Figure 1,** a limited distribution on the property (Newman 2007b). The Warakeila population is a slight southern extension to the previously known range of the Red-backed Fairy-wren.

The four records of the White-necked Heron were all in summer, but because the number of observations was small and this species is considered a resident in the Hunter Region (Stuart 2007) it was not included as a summer visitor in **Table 4**.

Given the absence of suitable reed habitat the occurrence of two Australian Reed-Warblers along the edge of the Allyn River was an unexpected record during one survey.

Five records of the Bassian Thrush were made including two in a patch of creek-side rainforest immediately above site 1. Two birds were present on the second occasion which was eleven years after the first record. This cryptically coloured and elusive species is probably an under-recorded sparse resident.

The three records of the Large-billed Scrubwren were all made at the upper end of the 2ha site 2 which suggests that the species may be resident in the gully below this point which contains rainforest type vegetation. This species is common in the rainforest of the Upper Allyn Valley as are the Rose Robin and the Spectacled Monarch, both of which were only recorded on 4 and 1 surveys respectively. It is suggested that these species only occur on passage, in the case of the Rose Robin during an altitudinal movement to the coastal region where it winters (Newman 2007a).

Seven (16%) of the 44 species in **Table 5** were not recorded in the first six years (NR1) of the study. In contrast nearly twice as many 12 (27%) of the **Table 5** species were not recorded in the last six years (NR2). This may indicate that conditions were more favourable to bird populations in the first six years of the investigation and will be discussed further in the next section.

Two species, the Painted Button-quail *Turnix varius* and the Musk Lorikeet *Glossopsitta concinna* were tentatively identified during the surveys but have been excluded from the analysis because of a slight doubt concerning their identification. A further species, the Masked Owl *Tyto novaehollandiae*, was recorded while driving at night along the public road which passes through the property near the start of the survey route.

Examples of Population Change

In the previous tables and discussion the change ratio involved a comparison of the number of surveys a species was present in the first 24 surveys (1996-2001) with the second 24 surveys (2002-2007). This ratio based on presence was used as an indication of population change and a number of examples of change were highlighted in previous sections. However, this measure has limitations particularly for species which are either infrequently recorded (small sample size) or resident (always present giving a ratio of 1.0 which indicates no change). In the case of resident species, comparison of the average number of birds (i.e. abundance) seen on a survey when a species is present provides a more helpful indicator of population change. In **Table 6** the change ratios based on presence and abundance are compared for a few species which were suggested in the previous sections to warrant further evaluation.

Table 6. Comparison of change ratios based on presence and abundance.

Common Name	**Scientific Name**	**Surveys Present First Half**[1]	**Surveys Present Second Half**	**Change Ratio**[3] **Presence**	**Average Number First Half**[5]	**Average Number Second Half**	**Change Ratio**[4] **Average Number**
Australian Wood Duck	*Chenonetta jubata*	17	23	0.74	9.2	14.4	0.64
Australian King-Parrot	*Alisterus scapularis*	9	5	1.80	2.9	1.8	1.61
Superb Fairy-wren	*Malurus cyaneus*	24	24	1.00	43.1	35.9	1.20
Variegated Fairy-wren	*Malurus lamberti*	19	17	1.12	5.5	5.1	1.08
Buff-rumped Thornbill	*Acanthiza reguloides*	12	7	1.71	5.5	3.4	1.59
Scarlet Honeyeater	*Myzomela sanguinolenta*	3	6	0.50	2.3	4.2	0.56
Dusky Woodswallow	*Artamus cyanopterus*	3	0	NR[2]	2.0	0	NR[2]
Rufous Fantail	*Rhipidura rufifrons*	9	5	1.80	3.4	2.6	1.32
Grey Fantail	*Rhipidura albiscapa*	24	24	1.00	13.4	11.3	1.19
Jacky Winter	*Microeca fascinans*	24	22	1.09	4.8	3.5	1.34
Tree Martin	*Petrochelidon nigricans*	11	6	1.83	8.3	2.7	3.09
Mistletoebird	*Dicaeum hirundinaceum*	2	9	0.22	1.0	1.2	0.82
Double-barred Finch	*Taeniopygia bichenovii*	10	0	NR[2]	10.0	0	NR[2]
Red-browed Finch	*Neochmia temporalis*	23	22	1.05	32.3	17.0	1.90

[1] Based on 24 seasonal surveys in each half.

[2] Not recorded in second half surveys.

[3] Ratios greater than 1 indicate that a species was less frequently present during second half surveys.

[4] Ratios greater than 1 indicate that a species was less abundant during second half surveys.

[5] Average numbers reported for surveys when species present.

The two finch species provide an excellent example of the use of the change ratios. The Double-barred Finch was seen on 10 surveys (42%) during the period 1996-2001 and averaged 10.0 birds/survey. It was not recorded during the second half of the study 2002-2007 indicating probable local extinction of the species. In contrast the Red-browed Finch was recorded on 45 out of 48 surveys and the change ratio of 1.05 indicates a 5% variation in frequency of presence which is too small to draw any conclusion. Examination of the abundance ratio 1.90 suggests that although this species remains numerous it has undergone a substantial population decline the average number/survey having fallen from 32.3 to 17.0 as shown in **Figure 2**.

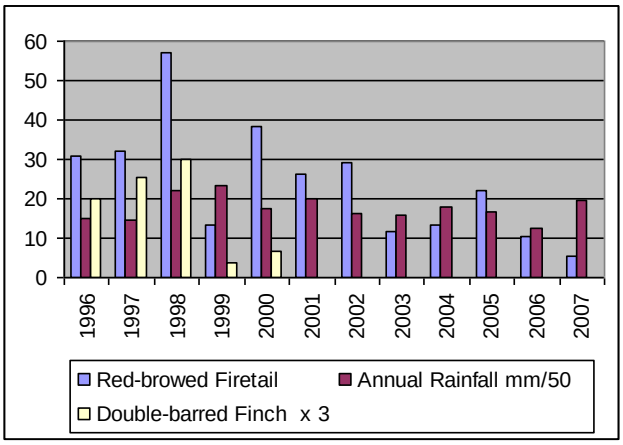

Figure 2. Variation of finch numbers at Warakeila and annual rainfall measured at Tocal.

Other species for which the evidence for decline appears strong as indicated by change ratios greater than 1.4 include Australian King-Parrot, Buff-rumped Thornbill and Tree Martin. In each case the change ratios indicate that not only were these species seen less frequently in the second period but they were present in lower numbers during the latter half of the study. Similarly the Dusky Woodswallow, which is occasionally but widely recorded in the Hunter Region (Stuart 2007), is scarce at Warakeila and was not recorded during 2002-2007. The Rufous Fantail, a summer migrant, also exhibits strong evidence of decline but, in this case, the evidence based on abundance is less compelling than for presence. It is interesting to note that in every case in which the change ratio for presence exceeded 1 suggesting a possible decline this conclusion was supported by a correspondingly high value of ratio based on abundance. In **Figure 3,** which is based on **Table 6,** the two ratios are presented as a scatter diagram. A feature of the correlation between the two change ratios is the grouping of the three increasing species in the lower left hand quadrant with the eight decreasing exclusively occupying the upper right hand quadrant. At face value this suggests the ratios are a useful tool for detecting changes in local bird populations which warrants evaluation for an extended species set.

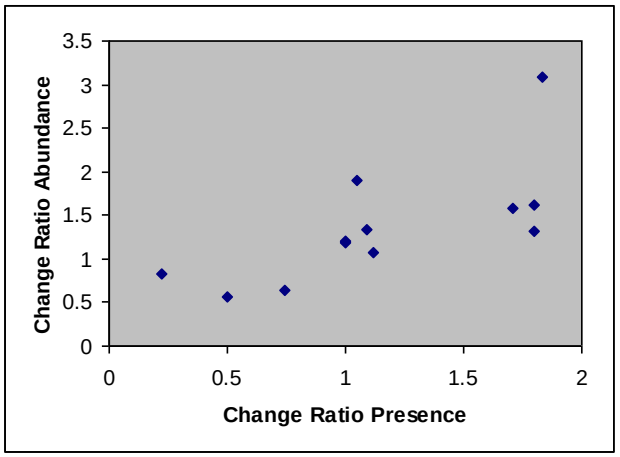

Figure 3. Correlation between change ratios based on presence and abundance.

The Speckled Warbler which was recorded on only one survey was also seen at site 3 on a visit to Warakeila several years before the study commenced. This is another of a cohort of small ground-feeding species for which there is evidence of widespread decline.

The Superb Fairy-wren is a resident species recorded on every survey and in greater numbers, 39.6/survey, than any other species. However, even this species appears to have declined during the study with average numbers falling from 43.1 to 35.9/survey. Similar conclusions hold for the Grey Fantail although this species is less numerous and subject to fluctuations caused by passage birds on migration. The Jacky Winter which is even less numerous demonstrates a similar trend with the small drop in abundance being a more compelling indicator of possible decline than the change in presence.

Variations in rainfall are an obvious factor influencing changes in bird populations by impacting on the availability of food. Low food availability can adversely impact on the breeding success of resident species as well as making an area less attractive to nomadic and migratory species which may be experiencing broad scale decline under extensive drought conditions. Comprehensive rainfall data is available for Tocal near Paterson (Gillespie 2007) which is about 50 km from Warakeila. This data indicates that for the

second half of the study until mid 2007 conditions were 19.7% dryer than in the first half (**Figure 2**). In June 2007 the rainfall increased dramatically ending one of the most prolonged and widespread droughts experienced throughout much of NSW in recent years. It is, however, too early to assess the impact of a return to higher than average rainfall conditions on the recovery of the bird population at Warakeila. The ongoing degradation of remnant vegetation by clearing is another factor expected to cause a decline in bird numbers and diversity. In 2003 track upgrades resulted in limited habitat loss at site 1 and more substantial habitat alteration at site 2 including the felling of a number of trees. By the end of 2003 the copse at site 3 was half its original size and the understorey had been removed. At site 4 a storm caused substantial damage taking out the tops of much of the thin belt of trees on the far bank of the river.

As indicated previously the Australian Wood Duck is a species which appears to have increased, being recorded both more frequently and in greater numbers during 2002-2007. Two other species which appear to have increased are the Scarlet Honeyeater and the Mistletoebird but in these cases the sample sizes are small. For the Mistletoebird the change ratio of 0.22 based on presence is more convincing than the abundance ratio of 0.82.

CONCLUSIONS

One hundred and seventeen species were positively identified on the surveys with one additional species identified outside the surveys. A further 2 species were recorded on the surveys, but only tentatively identified, giving a probable species list of 120 for Warakeila. These numbers are comparable but slightly fewer than those found at the Butterwick property where 126 species were recorded on the surveys. Both these studies demonstrate the important contribution which working cattle properties with remnant vegetation make to sustaining bird diversity. At both properties the composition of the species list is consistent with the status of birds listed in the Annual Bird Reports for the Hunter Region of New South Wales (Stuart 2007). Differences between the bird populations on the two properties include the occurrence of more waterbird species (e.g. Baillon's Crake *Porzana pusilla* and Latham's Snipe *Gallinago hardwickii*) at Butterwick which has marshy habitat at times and is adjacent to a floodplain. In contrast Warakeila provides hillside habitat for the Southern Emu-wren and the Red-backed Fairy-wren as well as a niche for the Azure Kingfisher along the Allyn River. In both studies the limited extent of continuous woodland and the lack of cereal crops explain the absence of the Common Bronzewing *Phaps chalcoptera* (Barrett *et al.* 2002).

As in the Butterwick study, counting the numbers of birds proved beneficial in assessing change and complemented an analysis based on the presence of species. For a sub-set of species a correlation between the change ratios based on presence and abundance was established which provides intuitive support to the efficacy of these empirical factors as indicators of population change. As in the previous study January is not the optimal month for assessing the summer population. For instance summer migrants were recorded more frequently during the October than in the January surveys because the peak of breeding season is past and survey conditions are sub-optimal.

Intensive survey methods where it is important to adhere to a constant effort routine are not conducive to obtaining comprehensive information on breeding. While dependent young were seen for some species very few nests were found.

There are clear indications of the local decline of a number of species, the most dramatic being the Double-barred Finch which was not recorded in the second half of the study. The more numerous Red-browed Finch was present throughout the study but declined in abundance.

The apparent decline of woodland species like the Buff-rumped Thornbill, Tree Martin and Dusky Woodswallow is consistent with the conclusions of other studies.

Drought and ongoing clearing of trees and understorey probably contributed to the population decline. The re-establishment of species like the Double-barred Finch on Warakeila may be difficult in view of the highly fragmented nature of the remnant vegetation.

The increase in the Australian Wood Duck was unexpected given the drought conditions prevalent during the latter half of the investigation. Dams on Warakeila may provide a local drought refuge for this species.

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Margaret and Hilton Hipwell are thanked for their interest in the project and for access to their property.

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Bird surveys of the Timor Caves area 2005-2006

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During 2005-2006, Hunter Bird Observers Club collaborated with the Newcastle and Hunter Valley Speleological Society in a study of the Timor Caves and surrounding area. The Timor Caves are situated towards the north-west corner of the Hunter Region, some 30km north of the locality of Timor. 107 species were recorded in a series of surveys over 10 months including breeding evidence for 33 species. The presence of some NSW Threatened Species, and the absence of some other Threatened Species that might reasonably have been expected to have been recorded, is discussed.

INTRODUCTION

In mid 2005, Hunter Bird Observers Club (HBOC) was approached by the Newcastle and Hunter Valley Speleological Society (NHVSS) to join in a study that they were undertaking of the Timor Caves. The main focus of the NHVSS study was to locate and map the extensive complex of limestone karst caves in the area, which had not been systematically studied previously. However, they also decided to document other features of the area, including the natural vegetation and the native wildlife including birds. The results of that study have been published (Rutledge 2008), including a brief chapter about the birds identified to be present in the area (Stuart 2008a). This article expands upon that chapter.

The Timor Caves are located within the Hunter Region, approximately 15km north of the locality of Timor, and close to the foot of the Liverpool Ranges (the general coordinates are 31°40-42'S, 151°05-07'E). The area has an altitude ranging from 530-650m. **Figure 1** shows the general location.

The Timor limestone karst comprises five separate outcrops extending north/south on either side of the Isis River valley. Much of the valley floor and some of the slopes are cleared of native vegetation and have been sown with cereal and pasture crops. However, most of the slopes, ridge tops and gully floors retain some native vegetation cover, which has been classified (Dykes 2008) into four main vegetation types: Grass Tree Scrubs, Lomandra Herbland, Eucalyptus Woodland and Rainforest. The Grass Tree Scrubs are the most distinctive vegetation community type, but Eucalyptus Woodland is the most prevalent type and the area of Rainforest is very small (Dykes 2008).

In their surveys NHVSS identified 80 caves, including 27 that were previously unknown (many of those caves are small). Several of the better known caves are in a reserve and publicly accessible via the privately owned Isaacs Creek camping area. Most of the other caves are on private property where public access is limited. By joining with NHVSS on the surveys, HBOC was therefore able to gain access to these areas.

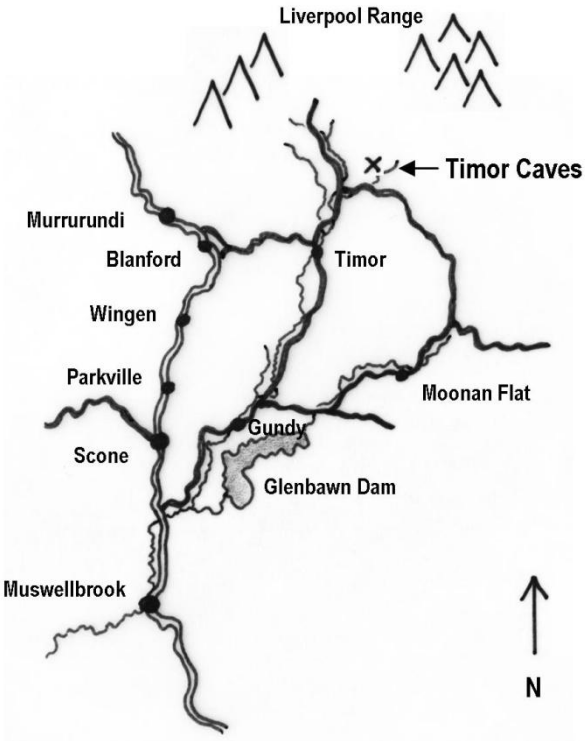

Figure 1. General location of the Timor Caves

SURVEY AREA AND METHODOLOGY

Figure 2 indicates the survey area, which encompasses several private properties and totals around 250-300 hectares (predominantly consisting of dry woodland). There are a number of rough 4WD tracks within the area, permitting convenient access to some remote gullies. HBOC made five visits to the area between November 2005 and September 2006 (NB there was no visit during winter). During most visits, the team camped at the Isaacs Creek camping site but on two occasions, the camp was at the Glen Dhu homestead on the diametrically opposite side of the survey area. Overall, there was very good coverage obtained of the survey area by day. Some night time surveying was also done but the coverage was restricted to areas close to the camp sites.

Several observers participated in the surveys and this contributed to good coverage in terms of both area and season. However, a negative was that this introduced a range of observer skills and observer techniques. Most observers surveyed transects within the area, recording all of the birds found along the transect. However, there were differences in technique by individual observers, and the precise location where any particular species had occurred, was seldom noted.

For the above reasons, the analysis of results in this paper largely has been restricted just to the overall species list since any more sophisticated analysis is not possible (for example, it is pointless to analyse the recording rate for species, because of the variations in observer technique and intensity of surveying). However, the number of surveys in which each species was recorded has been indicated in the bird list that accompanies the paper.

SURVEY RESULTS

Overall 107 bird species were recorded, with 33 found to be breeding. The full species list, with breeding status indicated, is presented in **Table 1**. 37 species were recorded from somewhere within the survey area during every visit, and 19 species were recorded on only one visit.

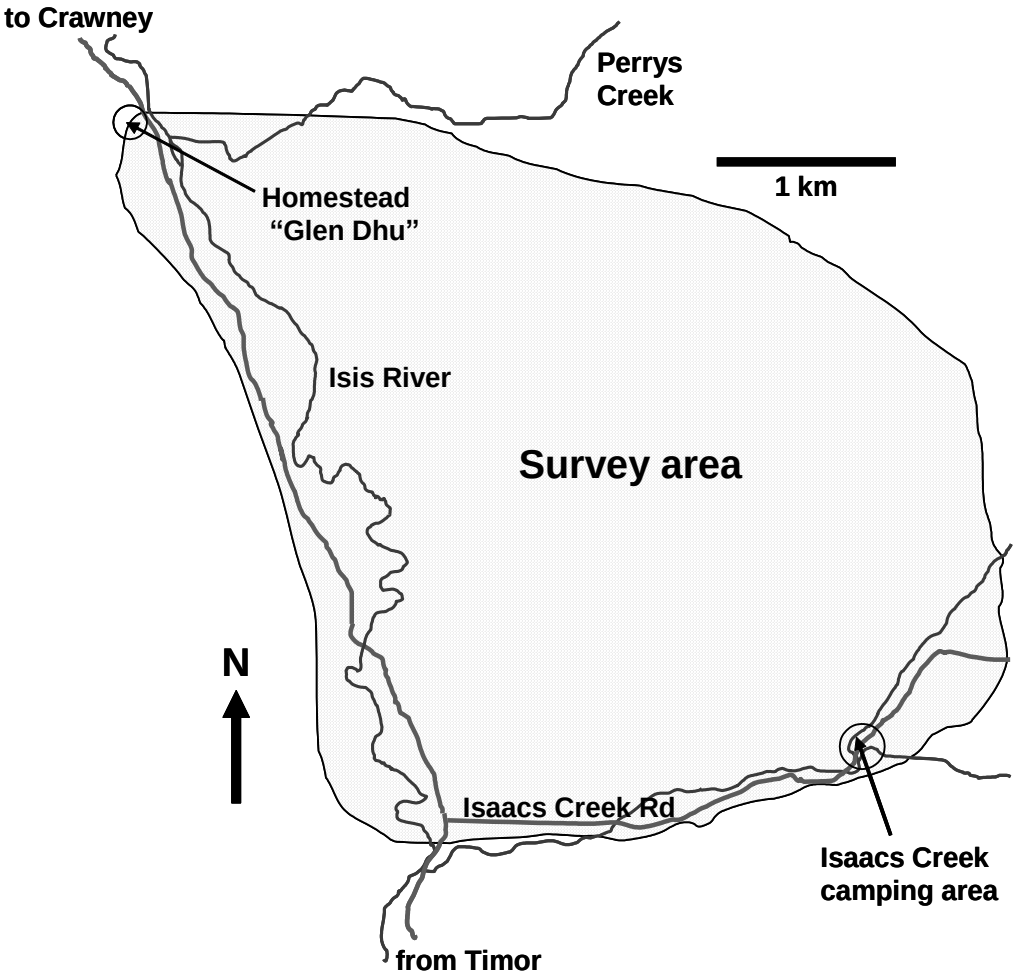

Figure 2. Timor Caves survey area.

DISCUSSION

The only species found to be utilising the caves were Welcome Swallows *Hirundo neoxena*. In the breeding season, many pairs were found to be nesting within the first two or three metres of the entrances of some of the larger caves. The birds were observed to hawk for insects in the area outside the cave, for example, above the open woodland and grassland along Isaacs Creek, then return to the cave to feed their nestlings. The mud nests typically were spaced about one metre apart, and were built utilising ledges and crevices on the roof or else high on the walls of the cave.

Welcome Swallows were plentiful in the Timor Caves area, and were present in all seasons. In summer, their close relatives, Fairy Martins *Petrochelidon ariel*, also were abundant. They built their nests in colonies of 10-20 pairs in the various concrete drainage culverts installed under roads in the area, and hawked for insects in the nearby paddocks. In one cave, a disused nest (with the characteristic bottle shape for Fairy Martin) was located—at least sometimes therefore, this species has utilised the Timor Caves themselves.

The tendency of both Welcome Swallows and Fairy Martins to nest in caves is well known. In the Birds Australia Nest Records Scheme (NRS) database, of 240 natural sites chosen by Welcome Swallows to build nests, 184 (76.7%) of the sites were in caves, cliffs or under rock overhangs (Higgins *et al.* 2006, p. 1532). In contrast though, only 1.5% of Fairy Martin nests in the NRS database were in caves (Higgins *et al.* 2006, p. 1575).

A feature of the area was the large number of Musk Lorikeets *Glossopsitta concinna* present, especially in summer. Sightings of this colourful nectar lover were widespread through the area. In most years, the species only occurs irregularly any further to the east within the Hunter Region although there are occasional years when there is a large influx - for example, in 2007 when 1000+ birds were in the lower Hunter (Stuart 2008b). In summertime, birds were feeding on the plentiful blossom present. In addition, a pair of Musk Lorikeets was found to be nesting near Isaacs Creek in late 2005. Breeding by Musk Lorikeets normally is an uncommon occurrence in the Hunter Region, which further highlights the significance of the Timor Caves area for this species.

Little Lorikeets *Glossopsitta pusilla* also were plentiful in the woodlands around Timor Caves. This is an important observation since the NSW Scientific Committee is considering whether to classify the Little Lorikeet as Vulnerable in New South Wales. The Timor Caves area seems to be a stronghold for the species and this may be an important factor in considering future management strategies for New South Wales.

The general habitat of the area seemed suitable for seven species that are already classified as Vulnerable in New South Wales: Turquoise Parrot *Neophema pulchella*, Brown Treecreeper *Climacteris picumnus*, Grey-crowned Babbler *Pomatostomus temporalis*, Speckled Warbler *Chthonicola sagittata* , Black-chinned Honeyeater *Melithreptus gularis*, Hooded Robin *Melanodryas cucullata* and Diamond Firetail *Stagonopleura guttata*. However, despite extensive searching, the only NSW Vulnerable species that were recorded were Speckled Warbler and Diamond Firetail.

Speckled Warblers mainly were foraging in pairs on the ground and in low shrubs or the lower trunks of taller trees. They were found at four separate locations in the surveys so at least four pairs of them are present in the Timor Caves area. For most of the sightings, the birds were in loose company with thornbills and other small birds. No evidence of breeding was found, however, the species is generally considered to be sedentary and so it very likely does breed locally.

Small groups of Diamond Firetails were recorded at three locations within the survey area, sometimes in company with Red-browed Finches *Neochmia temporalis* and Double-barred Finches *Taeniopygia bichenovii.* Again, no evidence of breeding was found, however, the species is generally considered to be sedentary and so it also probably breeds locally.

It is a matter for conjecture as to the absence of the five other species classified as Vulnerable in NSW. Perhaps they would have been found from a more intensive or longer survey effort. However, the survey effort was reasonably intensive (5 visits, mostly involving 2 days of surveying by 2-4 observers) and it seems unlikely that birds would have been overlooked if they were present. Suitable habitat seemed to be available for all five of the missing species. 2006 was a year of severe drought for the Hunter Region generally, and possibly this had an impact on the local viability of some species. It would be interesting if at some future time, during a normal or a wet year for the

Timor area, follow-up surveys could be carried out.

A notable floral aspect to the Timor Caves area is the forests of large grass trees *(Xanthorrhea glauca angustifolia)* growing in the limestone karst terrain. In most of the surveys, the grass trees were only sparsely used by birds except occasionally as a perch. However, in spring there was extensive utilisation by many species of honeyeaters, which often were observed to be feeding on the rich nectar of the flowering grass tree spike. As well, many Crimson Rosellas *Platycercus elegans* utilised the grass trees in spring. At least one species was also using the grass trees for breeding. In September 2006, a pair of White-eared Honeyeaters *Lichenostomus leucotis* had a nest with eggs deep within the foliage of one of the grass trees.

In all, 33 species were recorded as breeding in the Timor Caves area during the surveys. These are indicated in **Table 1**. However, many other species recorded in the area would be expected to breed locally. More intensive surveying especially in spring would no doubt add to the list of breeding species for the Timor Caves area.

CONCLUSIONS

The value in working with other ecologically focussed organisations was clearly demonstrated by this project. The area around the Timor Caves seems to be only rarely visited by birdwatchers and certainly there are very few data known to exist relating to the birds present in the area. Without the justification of the NHVSS project to survey the caves, it may have been difficult to obtain permission from landowners to access all the private property in the area. Also, the collaboration with the NHVSS team created opportunities to educate - which was definitely a two-way process!

The bird list that has been generated from the study will no doubt prove useful: especially as a reference point for future studies in the area should these occur. The species list and the usefulness of the data would be expected to increase if a more intensive and/or longer duration study had been made. Also, with the wisdom of hindsight, there may have been missed opportunities in the study - for example, to place more emphasis on collecting data on abundance and reporting rates and to select some smaller sub-areas (a series of 2ha Atlas sites covering a number of different habitat types, for example) for more intensive data collection. Readers contemplating similar studies of a relatively large area, especially if it will involve multiple observers, are urged to consider this point.

ACKNOWLEDGEMENTS

The assistance from Newcastle and Hunter Valley Speleological Society in organising the surveys is gratefully acknowledged - in particular, Jodie Rutledge (who also provided Figure 1) and Garry Smith. Eight members of Hunter Bird Observers Club participated in the surveys - Neville McNaughton, Robert McDonald, Tom Clarke, Anthony Gooden, Greg Newling, Liz Crawford, Chris Herbert and Alan Stuart.

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Table 1. Birds of Timor Caves Area.

Brown Quail *Coturnix ypsilophora* (2)
Australian Wood Duck *Chenonetta jubata* (4)
Grey Teal *Anas gracilis* (2)
Pacific Black Duck *Anas superciliosa* (3)
Common Bronzewing *Phaps chalcoptera* (2)
Crested Pigeon *Ocyphaps lophotes* (3)
Peaceful Dove *Geopelia striata* (3)
Tawny Frogmouth *Podargus strigoides* (4)
Australian Owlet-nightjar *Aegotheles cristatus* (3)
White-throated Needletail *Hirundapus caudacutus* (3)
Little Pied Cormorant *Microcarbo melanoleucos* (1)
Great Cormorant *Phalacrocorax carbo* (1)
White-faced Heron *Egretta novaehollandiae* (4)
White-bellied Sea-Eagle *Haliaeetus leucogaster* (1)
Brown Goshawk *Accipiter fasciatus* (3)
Collared Sparrowhawk *Accipiter cirrocephalus* (2)
Wedge-tailed Eagle *Aquila audax* (5)
Nankeen Kestrel *Falco cenchroides* (4)
Australian Hobby *Falco longipennis* (2)
Masked Lapwing *Vanellus miles* (3)
Galah *Eolophus roseicapillus* (5)
Sulphur-crested Cockatoo *Cacatua galerita* (5)
Musk Lorikeet *Glossopsitta concinna* (5)
Little Lorikeet *Glossopsitta pusilla* (4)
Australian King-Parrot *Alisterus scapularis* (5)
Crimson Rosella *Platycercus elegans* (5)
Eastern Rosella *Platycercus eximius* (5)
Red-rumped Parrot *Psephotus haematonotus* (3)
Eastern Koel *Eudynamys orientalis* (2)
Channel-billed Cuckoo *Scythrops novaehollandiae* (2)
Horsfield's Bronze-Cuckoo *Chalcites basalis* (1)
Shining Bronze-Cuckoo *Chalcites lucidus* (2)
Pallid Cuckoo *Cacomantis pallidus* (1)
Fan-tailed Cuckoo *Cacomantis flabelliformis* (2)
Brush Cuckoo *Cacomantis variolosus* (2)
Southern Boobook *Ninox novaeseelandiae* (1)
Eastern Barn Owl *Tyto javanica* (1)
Laughing Kookaburra *Dacelo novaeguineae* (5)
Sacred Kingfisher *Todiramphus sanctus* (3)
Rainbow Bee-eater *Merops ornatus* (4)
Dollarbird *Eurystomus orientalis* (3)
White-throated Treecreeper *Cormobates leucophaea* (5)
Satin Bowerbird *Ptilonorhynchus violaceus* (5)
Superb Fairy-wren *Malurus cyaneus* (5)
Variegated Fairy-wren *Malurus lamberti* (1)
White-browed Scrubwren *Sericornis frontalis* (5)
Speckled Warbler *Chthonicola sagittata* (2)
Weebill *Smicrornis brevirostris* (2)
Brown Gerygone *Gerygone mouki* (1)
Western Gerygone *Gerygone fusca* (1)
White-throated Gerygone *Gerygone albogularis* (4)
Striated Thornbill *Acanthiza lineata* (5)
Yellow Thornbill *Acanthiza nana* (4)
Yellow-rumped Thornbill *Acanthiza chrysorrhoa* (4)
Buff-rumped Thornbill *Acanthiza reguloides* (4)
Brown Thornbill *Acanthiza pusilla* (5)
Spotted Pardalote *Pardalotus punctatus* (5)
Striated Pardalote *Pardalotus striatus* (4)
Eastern Spinebill *Acanthorhynchus tenuirostris* (5)
Yellow-faced Honeyeater *Lichenostomus chrysops* (5)
White-eared Honeyeater *Lichenostomus leucotis* (5)
Fuscous Honeyeater *Lichenostomus fuscus* (1)
White-plumed Honeyeater *Lichenostomus penicillatus* (1)
Noisy Miner *Manorina melanocephala* (5)
Red Wattlebird *Anthochaera carunculata* (4)
Scarlet Honeyeater *Myzomela sanguinolenta* (4)
New Holland Honeyeater *Phylidonyris novaehollandiae* (3)
White-cheeked Honeyeater *Phylidonyris niger* (1)
Brown-headed Honeyeater *Melithreptus brevirostris* (3)
White-naped Honeyeater *Melithreptus lunatus* (4)
Noisy Friarbird *Philemon corniculatus* (5)
Striped Honeyeater *Plectorhyncha lanceolata* (1)
Varied Sittella *Daphoenositta chrysoptera* (4)
Black-faced Cuckoo-shrike *Coracina novaehollandiae* (5)
Cicadabird *Coracina tenuirostris* (1)
White-winged Triller *Lalage sueurii* (2)
Golden Whistler *Pachycephala pectoralis* (1)
Rufous Whistler *Pachycephala rufiventris* (5)
Grey Shrike-thrush *Colluricincla harmonica* (5)
Olive-backed Oriole *Oriolus sagittatus* (3)
Dusky Woodswallow *Artamus cyanopterus* (5)
Grey Butcherbird *Cracticus torquatus* (4)
Pied Butcherbird *Cracticus nigrogularis* (5)
Australian Magpie *Cracticus tibicen* (5)
Pied Currawong *Strepera graculina* (5)
Grey Fantail *Rhipidura albiscapa* (5)
Willie Wagtail *Rhipidura leucophrys* (5)
Australian Raven *Corvus coronoides* (5)
Leaden Flycatcher *Myiagra rubecula* (3)
Restless Flycatcher *Myiagra inquieta* (3)
Magpie-Lark *Grallina cyanoleuca* (5)
Jacky Winter *Microeca fascinans* (5)
Scarlet Robin *Petroica boodang* (1)
Eastern Yellow Robin *Eopsaltria australis* (5)
Rufous Songlark *Cincloramphus mathewsi* (3)
Silvereye *Zosterops lateralis* (5)
White-backed Swallow *Cheramoeca leucosterna* (1)
Welcome Swallow *Hirundo neoxena* (5)
Fairy Martin *Petrochelidon ariel* (2)
Tree Martin *Petrochelidon nigricans* (2)
Common Starling *Sturnus vulgaris* (2)
Common Myna *Sturnus tristis* (4)
Mistletoebird *Dicaeum hirundinaceum* (5)
Double-barred Finch *Taeniopygia bichenovii* (4)
Red-browed Finch *Neochmia temporalis* (5)
Diamond Firetail *Stagonopleura guttata* (3)
Australasian Pipit *Anthus novaeseelandiae* (2)

Bold font shows species recorded breeding
(N) = Number of surveys where recorded

Observations of birds on Moon Island, 17 December 2008

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Moon Island, composed of Late Permian sandstone and conglomerate, lies half a kilometre offshore from Swansea Heads (33°05'14"S, 151°40'23"E). When fully exposed at low tide it is about 400m long by 160m wide. The southern half is mostly submerged during high tide whereas the northern half, which is flat-topped and surrounded by cliffs, rises to a height of about 10m.

Landing on the island is difficult as a boulder strewn sea-floor makes approaching and anchoring hazardous. Consequently, the island is rarely surveyed for birds. However, it is well known as a breeding area for gulls, terns and oystercatchers (Gray & Gwynne 1974). An excursion to the island on 17 December 2008 was intended to be a reconnaissance visit to evaluate the possibility of conducting more regular surveys. Observations were made at rising mid-tide from 9.00am to 10.30am. Counts were carried out only on the less abundant birds as large numbers of gulls and terns precluded accurate counts of these species in the time available.

Twelve species of birds were observed (**Table 1**). Three species were confirmed as breeding: Little Penguin *Eudyptula minor*; Crested Tern *Thalasseus bergii*; and Silver Gull *Chroicocephalus novaehollandiae*. The agitated behavior of a pair of Sooty Oystercatchers *Haematopus fuliginosus* indicated that they had also bred on the island, but the juveniles were hidden from view.

BREEDING BIRDS

Silver Gulls were the most abundant bird with more than 500 estimated. About 100 nests had from one to three eggs or birds sitting on the nest. Some eggs were newly hatched or actually in the process of hatching. Many young were in all stages of growth up to fully fledged juveniles. Nests were widely spaced from one another and generally located on the higher parts of the northern half of the island (a few were only a metre or two above high water). A small number located their nests within Crested Tern nest aggregations. In past years at least 1000 nesting pairs of Silver Gulls have been observed (Gray & Gwynne 1974).

Many hundreds of Crested Terns roosted on the southern part of the island and more than a hundred nests were present on the northern half. Most of the nests were located on grassy patches on the flat-topped summit (**Figure 1**). The nests were often grouped with as many as 70 birds within a 10m diameter area. A complete range of newly hatched to almost fledged juveniles were dispersed over the northern half of the island (**Figure 2**). In the past about 700 nests were observed on the island by Gray and Gwynne (1974) towards the end of October.

Three Little Penguins, advanced juveniles, occupied small, burrow-like, caves under overhanging sandstone ledges on the northwestern side of the island. The caves were located only a few metres above high-tide level. One juvenile was alone in its burrow (**Figure 3**), and another two were side by side in another very wide burrow. From 12 to 15 nests were noted by Gray and Gwynne (1974).

As the middle section of Moon Island was approached a pair of Sooty Oystercatchers suddenly flew in and appeared very agitated (**Figure 4**). Their behavior indicated that they had youngsters hidden in close proximity. A search unfortunately failed to find them. Thus, although breeding could not be confirmed, it is almost certain that they had, in fact, hatched young. Gray and Gwynne (1974, p. 36) stated that … "One pair usually nests each year on the shingle between the plateau and rock platform to the west."

Although not observed during this visit, a pair of Kelp Gulls *Larus dominicanus* were first discovered breeding on Moon Island in 1958 and nested there each year until 1966 when two pairs were recorded (Gwynne & Gray 1959, Gray & Gwynne 1974). The 1958 observation was also the first breeding record for Australia. Morris (1975, p. 58) stated that … "two pairs breed there annually". Kelp Gulls were last recorded on Moon Island in

Figure 1. Nesting Crested Tern.

Figure 2. Juvenile Crested Terns.

Figure 3. Juvenile Little Penguin in burrow.

Figure 4. Agitated Sooty Oystercatcher.

Figure 5. Red-necked Stint roosting.

Figure 6. Pied Cormorants roosting.

1983 when a dead bird was found (Lindsey 1985). Of nine chicks banded between 1959 and 1973 two were later recovered; one at Stockton and one, about four years after banding, at Fremantle, WA (Gray & Gwynne 1974). Occasional sightings indicate that Kelp Gulls still visit the region. One bird was observed at Newcastle Ocean Baths in 1998 (Stuart 1999, p.31), and another was photographed at Stockton as recently as December 2008 (Warren Mayers pers. comm.).

Although a systematic count of nests was not carried out it appears that Moon Island is still an important breeding site for a large number of Silver Gulls and Crested Terns. Only three Little Penguin nests were found as compared to the usual 12-15 nests (Gray & Gwynne 1974) and 10 pairs (Morris 1975). The usual presence of one pair of breeding Sooty Oystercatchers was almost certainly confirmed. The present breeding status of Kelp Gulls and Wedge-tailed Shearwaters *Ardenna pacifica* (the latter occasionally recorded breeding on the island by Morris (1975), with one to two burrows noted in 1958-1960 by Gray and Gwynne (1974)) was not determined.

FORAGING BIRDS

Five species of migratory shorebirds foraged on the southern intertidal part of Moon Island (**Table 1**). Foraging and resting Red-necked Stints *Calidris ruficollis*, numbered about 20 (**Figure 5**). At least 16 Ruddy Turnstones *Arenaria interpres*, two Whimbrel *Numenius phaeopus*, two Bar-tailed Godwits *Limosa lapponica*, and six Grey-tailed Tattlers *Tringa brevipes*, were also foraging and resting, sometimes together. An Eastern Reef Egret *Egretta sacra* was recorded by Gray and Gwynne (1974), but shorebirds were not recorded.

ROOSTING BIRDS

About 20 Pied Cormorants (**Figure 6**), 10 Great Cormorants *Phalacrocorax carbo* and two Little Black Cormorants *Phalacrocorax sulcirostris* roosted on the southern part of the island. Numbers were estimated owing to many arrivals and departures. Little Pied Cormorants *Microcarbo melanoleucos* and White-fronted Terns *Sterna striata* have been recorded in the past by Gray and Gwynne (1974) but were not observed on this visit.

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Table 1. Birds observed on Moon Island, 17 December 2008

Common Name	Scientific Name	No.	Behaviour
Little Penguin	*Eudyptula minor*	3	Nesting on northwestern side
Great Cormorant	*Phalacrocorax carbo*	~10	Roosting at southern end
Little Black Cormorant	*Phalacrocorax sulcirostris*	2	Roosting at southern end
Pied Cormorant	*Phalacrocorax varius*	~20	Roosting at southern end
Bar-tailed Godwit	*Limosa lapponica*	2	Foraging at southern end
Whimbrel	*Numenius phaeopus*	2	Foraging at southern end
Grey-tailed Tattler	*Tringa brevipes*	6	Foraging at southern end
Ruddy Turnstone	*Arenaria interpres*	16	Foraging at southern end
Red-necked Stint	*Calidris ruficollis*	~20	Foraging at southern end
Sooty Oystercatcher	*Haematopus fuliginosus*	2	Foraging at southern end, probably breeding
Silver Gull	*Chroicocephalus novaehollandiae*	100s	Nesting in northern half, roosting northern & southern ends
Crested Tern	*Thalasseus bergii*	100s	Nesting in northern half, roosting northern & southern ends

Miscellaneous observations of the feeding behaviour and plumage of the Latham's Snipe

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Latham's Snipe *Gallinago hardwickii* is considered to feed primarily under crepuscular conditions. Observations recorded in this note describe diurnal feeding and resting behaviour in a range of habitats of anthropogenic origin. When resting, the lid of the closed eye appears to enhance the cryptic pattern of the plumage. These observations provide insights into opportunistic foraging strategies adopted when the preferred wetland feeding areas dry out during summer.

INTRODUCTION

Latham's Snipe *Gallinago hardwickii* is described as a crepuscular species, which while predominantly found in freshwater swamps and water meadows, will, under appropriate conditions, frequent other vegetation types up to 100m from water (Higgins *et al.* 1996). Most people's experience of this species is of a flushed bird flying rapidly away uttering a harsh grunt before dropping and disappearing into dense cover. During the last 16 years I have lived on a 1.6ha property at Woodville (32º 40' S 151º 38' E) which has a large dam, interconnected to three other dams on adjacent properties. Snipe were present during the initial inspection of the property and for each of the subsequent 16 summers, with a maximum count of eight. Co-habiting with Latham's Snipe provides a unique opportunity to obtain new insights into the behaviour of this elusive species.

On several occasions, including two successive nights in November 2008, I noted snipe leaving the dams and flying towards the nearby Butterwick Floodplain. These observations are consistent with the hypothesis that the snipe feeds out on the floodplain under crepuscular conditions and that diurnal use of the dams is for resting in the surrounding cover. However, the observations reported in this note demonstrate that Latham's Snipe under suitable conditions feeds diurnally and is surprisingly opportunistic in exploiting a range of short-term foraging opportunities.

FIELD OBSERVATIONS

While most of the observations of snipe involved birds flushed from the margins of the dam they were also seen well away from the dam in the vegetable patch, mulched shrub beds and in open areas of mown grass where the birds appeared to be feeding by probing with their bill into firm ground. Unfortunately systematic records were not kept. However, it appeared that the exploitation of these more unusual habitats occurred with increasing frequency between January and migration in March, particularly after periods of heavy rain. Consequently I decided to focus on the prevalence of this behaviour during the summer of 2009.

In the early afternoon of 2 January 2009, three Latham's Snipe were flushed from areas of mowed grass up to 75 metres from the dam. During the subsequent four days one or more snipe were flushed, either as a group or individually, from the same area at various times of the day. The ground was firm and there had only been approximately 10mm of rain during the previous two weeks.

The next five-week period until 10 February was dry culminating in a week of uncharacteristically hot weather with maximum temperatures as high as 40ºC. During this period one or two snipe were flushed from the margins of the dam, particularly from an area of mud exposed by the rapidly falling water level. This area could not be observed

without flushing the birds and it was not possible to determine whether foraging was occurring. No sightings were made away from the dam.

After a period of rainfall on 11 February a snipe was observed in a mulched native shrub bed approximately 20 metres from the house and 35 metres from the dam at approximately 1340 hours. Detailed observation using a Leica telescope commenced at 1349 hours when the snipe spent approximately 2 minutes constantly probing with its bill in a manner reminiscent of the stitching action used by Red-necked Stint *Calidris ruficollis*. Most probes involved insertion of about one third of the bill, but occasionally the bill was fully inserted. At least two earth worms were extracted and then swallowed during this period. A piece of vegetation was lodged in the bill during this process and removed using a foot.

The snipe then rested, standing on the mulched ground under a small tree. The head was rotated with the bill positioned down the back of the bird. The snipe then periodically closed its eye by raising its lower eyelid. Initially the periods of closure where quite short, up to 4 seconds at a frequency of around 10 seconds, but the bird appeared to become more relaxed with the eye being closed for up to 26 seconds and open for 8 seconds. The colour of the lower eyelid is buff which enhances the cryptic characteristics of the plumage. With the eye open there is a black stripe from the lores to the front of the eye and two dark stripes extending behind the eye (Higgins *et al*. 1996: see Plate 1 opposite p. 64). When the eye is closed the black line from the lores becomes bifurcated into two continuous dark lines either side of the closed eye. The buff eyelid blends with the feathers on the cheek behind the eye to provide a uniformly coloured triangular patch between the bifurcated dark stripes. It is suggested that this effect, which does not appear to have been described previously, enhances the cryptic pattern of the plumage.

At 1342 hours the snipe walked onto the grass and then flew about 10 metres to another mulched bed close to the house which was being used as the observation post. The snipe left this bed almost immediately and walked about 25metres across an area of short grass to another mulched shrub bed probing occasionally but not appearing to obtain any food or showing any inclination to forage seriously. On reaching the mulched ground the snipe foraged actively using similar tactics to those described above. At least three earthworms were eaten before the snipe commenced an extended period of rest at 1353 hours, standing in the open on the mulched ground at the end of the shrub bed and remaining motionless for in excess of one hour.

Prolonged periods of heavy rain during the subsequent week resulted in over 250 mm of rain, a record February fall for the area. The dams overflowed and areas of the Butterwick Floodplain were inundated. Subsequent to the rain one or two snipe were occasionally flushed from areas adjacent to the dams, which were at capacity, but were not seen in other habitats.

DISCUSSION

The dominant food sources found in the stomach contents of Latham's Snipe sampled at Raymond Terrace, which is about 20 km from the location of these observations, were plants 60.3% and animals 39.7% by volume (Frith *et al.*1977 cited in Higgins *et al.* 1996, p.33). Earthworms constituted 77.8% of the animal component of the diet. At a second location, Cooma-Jindabyne, animals were 56.3% by volume of the diet, 96.9% of which was earthworms. Clearly earthworms are a very important food resource for Latham's Snipe providing 30.9% and 54.6% of the diet respectively at the two locations.

The following explanation is offered for the observed foraging behaviour of Latham's Snipe. When snipe arrive at the end of winter the dams are relatively full and the ground on the Butterwick Floodplain is moist providing the crepuscular feeding opportunities preferred by this species. The dams predominantly provide diurnal shelter for resting. During dry periods in summer foraging on the floodplain becomes more difficult and the snipe seek supplementary diurnal feeding opportunities in the vicinity of the dams. These include foraging on the exposed mud margins as the water level in the dam falls. After heavy rain the mulched shrub beds and the vegetable garden become a lucrative source of earthworms, an important food resource, and are immediately exploited as a foraging option. During dry periods the shrub beds may be unsuitable for foraging as a consequence of the hard ground and the worms being further from the surface. Under relatively dry conditions the grass areas appear to become an option of last resort which is exploited in preference to the mulched shrub beds. In view of the previous comments concerning the hardness of the ground and the depth of worms it is speculated that the snipe are exploiting an alternative food

resource. One possibility is that they are probing into cracks for spiders and insects rather than earthworms. Initially it was thought that diurnal feeding in an extended range of habitat types was associated with the need to obtain supplementary food intake to build up body weight pre-migration. However the observation of this behaviour in January 2009 more than two months before migration is not consistent with this hypothesis.

Latham's Snipe usually occur singly or in small loose groups, occasionally gathering in larger groups of several dozen (Higgins *et al.* 1996, p. 30). The experience related in this note is consistent with this summary and also highlights the ready use of modified or artificial habitats (Higgins *et al.* 1996, pp.30-31; McGarvie *et al.* 1974). On this basis the exceptionally high numbers of Latham's Snipe sometimes observed at the Pambalong Nature Reserve (e.g. 475 recorded 20 December 1997, cited in Stuart 1998) are an abnormal phenomena which can be plausibly explained by the gradual deterioration of some of the many local niches supporting snipe, such as the one described in this note, during very dry summer conditions. Consequently the numbers generated by the Hunter Bird Observers Club's Annual December Snipe Count at Pambalong Nature Reserve are primarily an indication of the suitability of the many local sites which normally support the dispersed population of Latham's Snipe, rather than an indication of population change. However it must be stressed that these occasional large accumulations of snipe highlight the essential need for drought refuges for this species.

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Observation of Grey-crowned Babblers communally roosting, in the evenings

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Grey-crowned Babblers *Pomatostomus temporalis* are engaging social birds whose preferred habitat is open dry sclerophyll woodland. I live on a bushland block at East Seaham, New South Wales, and fairly frequently observe these birds in my area. The birds move around in small groups, chattering much of the time as they seek out insects and spiders with their thin sharp beaks. They frequently cooperate to build elaborate, bag-like dormitory nests (mainly of woven twigs and dead grass stems) for night roosting.

In April 1997, a group of Grey-crowned Babblers was observed building and then abandoning a communal nest in a mandarin tree only 10 metres from our back verandah. However, in mid-October of the same year, a group of nine (9) babblers returned and quickly refurbished the nest. On 14 October, I observed all the babblers go into the nest at 5.57 pm (EST). I then watched their roosting over the next 33 days, noting the time on each occasion that all the birds had settled into the nest. The individual birds arrived at the nest over a 5-10 minute period, each quickly entering, with one bird apparently keeping a lookout as the others arrived and entered. Much loud chattering occurred in this process. The sentinel bird then entered the nest, and all was immediately quiet.

As the daylight lengthened (with the approach of the summer solstice on 22 December), the birds generally arrived and entered the nest a little later each day, though this period varied somewhat, probably according to the weather conditions (mainly length of daylight), but possibly due to other factors, as noted by Gill and Dow (1985).

During these observations, I did not interfere with the nest. However, on 5 November, I had attached a microcassette recorder to a branch near the nest prior to the arrival of the birds and switched it on. After the birds entered the nest and settled, I quietly approached and tried carefully to switch off the recorder, but the birds exploded out of the nest and took over ten minutes to return.

At the time of my observations I was unaware of the paper by Gill and Dow (1985) who had documented detailed waking and roosting times of Grey-crowned Babblers in south-east Queensland during spring. However, the results of my observations over a 33-day period reflect their major finding that the times of roosting depend on changes in light intensity, notably the increasing length of daylight occurring during spring and early summer. There were, of course, fluctuations within this general trend, and these may relate to other factors such as relative humidity, individual foraging success, the existence of a separate breeding nest, and harassment by other birds (see **Table 1**).

Overall, it would seem that the babblers roost on average about 14 minutes prior to the sunset time each day. Certainly my observations support the additional findings by Gill and Dow (1985) that the birds call loudly at roosting time, but are immediately silent on entry of the last “sentinel” bird.

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Table 1. Babbler Roosting Times: 14 October – 15 November 1997 at Balickera (East Seaham) (Eastern Standard Time).

Date	Time into nest	Sunset time	Notes
14.10.97	5.57 pm	6.04 pm	Fine, sunny
15.10.97	6.00 pm	6.05 pm	Fine, sunny
16.10.97	6.00 pm	6.06 pm	Fine, hot, windy (2 in at 5.53 pm; others at 6.00 pm)
17.10.97	5.50 pm	6.07 pm	Fine, hot, windy
18.10.97	5.50 pm	6.08 pm	Fine, sunny, cool
19.10.97	5.52 – 5.58 pm	6.08 pm	Fine, cloudy, very cool. 0nly 8 seen (2+2+1+3)
20.10.97	6.00 pm	6.09 pm	Cold, cloudy, windy; harassed by magpies
21.10.97	6.00 pm	6.10 pm	Cool, windy, cloudy
22.10.97	5.50 pm	6.11 pm	Slight rain shower; cool, cloudy
23.10.97	6.15 pm	6.12 pm	Sunny, hot
24.10.97	6.08 pm	6.12 pm	Sunny, hot
25.10.97	6.07 pm	6.13 pm	Sunny, hot
26.10.97	6.10 pm	6.14 pm	Sunny, hot
27.10.97	5.45 pm	6.15 pm	Very hot, oppressive; thunder heard
28.10.97	5.59 pm	6.16 pm	Cloudy, very warm; extremely dry
29.10.97	No sighting	6.17 pm	Cloudy; late shower
30.10.97	5.54 pm	6.18 pm	Fine, hot
31.10.97	6.05 pm	6.18 pm	Fine, hot, sunny
1.11.97	5.58 pm	6.18 pm	Fine, hot, dry
2.11.97	6.03 pm	6.20 pm	Cloudy, humid, then sunny
3.11.97	6.04 – 6.08 pm	6.21 pm	Cloudy all day; mild
4.11.97	6.10 – 6.12 pm	6.22 pm	Showers, cloudy, mild
5.11.97	6.16 pm	6.23 pm	Fine, sunny
6.11.97	6.19 pm	6.24 pm	Fine, sunny, pleasant
7.11.97	6.13 pm	6.25 pm	Fine, hot, extremely dry; birds around all day; some water baths observed
8.11.97	6.04 pm	6.26 pm	Cloudy all day; cool
9.11.97	5.52 pm	6.26 pm	Cloudy all day; cool
10.11.97	6.10 pm	6.27 pm	Hot, oppressive; birds waited for 10 minutes on nearby tree, and harassed by magpie
11.11.97	6.25 pm	6.28 pm	Hot, windy, humid
12.11.97	6.29 pm	6.29 pm	Very warm, cloudy; mild evening
13.11.97	6.25 pm	6.30 pm	Hot, fine, oppressive
14.11.97	6.05 pm	6.31 pm	Cloudy, humid
15.11.97	6.26 pm	6.32 pm	Light rain overnight; very warm
16.11.97	No birds seen	6.33 pm	Sunny; very warm
17.11.97	No birds entered nest	6.34 pm	Fine, sunny; babblers were seen refurbishing the nest during the day
18.11.97	No birds seen	6.35 pm	Slight shower; babblers were not seen again until 25 November, but they did not go near the nest; thereafter, not seen at all, though sometimes heard

Extended incubation period for the White-throated Nightjar

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During early January 2005 I flushed a White-throated Nightjar *Eurostopodus mystacalis* which was incubating one egg at Green Wattle Creek, Woodville near Maitland in NSW (32º 40´ S 151º 39´ E). Repeated visits were made to determine the date of hatching as summarised in **Table 1**. In each instance an adult was incubating a single egg and flushed only if approached very closely, flying and perching in various trees, usually within 50m of the egg.

Table 1. Hatching observations.

Date	Time	Observations
03/01/05	10:00	1 egg
31/01/05		1 egg; first indications of young chipping out
02/02/05	17:00	No advance in hatching
04/02/05	07:00	Egg shell in nest; 2 adults flushed from a position 10m from the nest

Assuming that incubation had just commenced on the first visit**,** the above data suggests that the incubation period is greater than 30 days, which is substantially longer than a maximum of 27 days previously recorded for this species.

The following information on the breeding of the White-throated Nightjar is summarised from HANZAB (Higgins 1999, p.1004). In NSW eggs have been recorded from August to early February with the clutch size invariably being one. Usually only one brood is successfully raised each year although there is some evidence of two broods for which confirmation is required. Repeat clutches are laid in the event of egg loss with one female laying three clutches within two months. The incubation period is usually 24-26 days with a minimum 22.5 days. The longest period previously recorded of 28 days was considered to be not greater than 27 days following recalculation. The young, which are semi-precocial, can and usually do move within a few hours of hatching. For the first few days the average distance moved is about 8m/day. Following hatching the chick is brooded and attended by both adults, which are usually found close to the chick on the ground.

Although the chick at Green Wattle Creek was not found after hatching the behaviour of the adult birds was consistent with successful hatching (i.e. they flushed from the ground about 10m from the nest site), as was the condition of the remnant shell which was cleanly broken in two, consistent with a chick having chipped out as opposed to the egg being smashed or stolen by a predator. The search for the chick was limited for fear of treading on it. It is normal for White-throated Nightjars to leave the eggshell at the point of hatching until it disintegrates.

The abnormally long incubation period may be associated with the breeding event being at the end of the known breeding season for this species. For instance it is probable that a repeat clutch was involved or even that this was a second brood.

White-throated Nightjars occur annually in the vicinity of this breeding site. The egg had been laid in an area of woodland dominated by spotted gums and ironbarks with sparse understorey. The egg was laid on leaf litter near a fallen stick with no nest structure.

REFERENCE

Higgins, P.J. (Ed.) (1999). ‘Handbook of Australian, New Zealand and Antarctic Birds. Volume 4: Parrots to Dollarbird’. (Oxford University Press, Melbourne.)

The *Whistler* – Instructions to Authors

The *Whistler* is an occasional publication of the Hunter Bird Observers Club Inc. (HBOC), which is based in Newcastle. HBOC members are active in observing birds and monitoring bird populations in the Hunter Region. This journal-style publication is a venue for publishing these regionally significant observations and findings. The journal publishes three types of articles:

1. **Contributed Papers**
2. **Short Notes**
3. **Book Reviews**

The Publications Sub-committee requests that authors consider the appropriateness of their study to this publication. The publication is suitable for studies geographically limited or related to the Hunter Region and papers attempting to address data and issues of a broader nature should be directed to other journals, such as Corella, Australian Field Ornithology and Emu. Contributed papers should include analyses of the results of detailed ecological or behavioural studies or syntheses of the results of bird monitoring studies and/or comprehensive annotated species lists of important bird areas and habitats. These data would then be available for reference or further analysis in the many important issues of bird conservation in the Hunter Region. Communication of short notes on significant bird behaviour is also encouraged as a contribution to extending knowledge of bird habits and habitat requirements generally. Reviews of bird books that members have enjoyed or disliked are also being solicited to provide a guide for other readers on their usefulness regionally and more broadly.

General

- Manuscripts must be submitted electronically; please attach your manuscript to an email as a Microsoft Word document.
- Introduce species using English and scientific names.

Contributed Papers

- Manuscripts should be formatted as per the instructions below.
- Up to 12 pages in length (longer in exceptional circumstances) and of factual style.
- Provide a summary of approximately 250 words.
- Introduction/Background introduces the aims of and rationale for the study and cites other similar work that stimulated initiation of or is relevant for comparison with the study.
- Methods describes the location of the study, citing map co-ordinates or including a map, how observations were made and data were collected and analysed.
- Results of the data analyses include description and/or analysis of data highlighting trends in the results, divided into subsections if more than one body of data is presented; use of photos, drawings, graphs and tables to illustrate these is encouraged.
- Discussion and Conclusions should indicate the significance of the results locally and regionally; comparison with national and international work is optional, as is the discussion of possible alternative conclusions and caveats with the study; suggestions for future extension of the work are encouraged.
- Appendices of raw data and annotated lists of bird species and habitats can be included in tabular form at the end of the article.
- References should be cited within the text of the article with the last names of the authors and the year of publication in parenthesis unless there are more than two authors, in which case the first author's last name can be used followed by '*et al.*' for the others. References should be listed at the end of the text after any Acknowledgements and before Appendices and Annotated Lists and should be formatted as per the instructions below.

Short Notes

- Up to 4 pages of descriptive or prosaic style.
- Provide an adequate description of the location of observations, a rationale for documenting the observations, an entertaining and cogent description of observations; relevance to similar observations should be cited with references if appropriate.
- References should be cited and listed as for contributed papers.

Book Reviews

- Approximately 2 pages of critical assessment and/or appreciation.
- Introduce topics and aims of the book as you understand them, analyse thoroughness and rigour of content (chapter by chapter or topic by topic), and conclude with comments on the effectiveness and originality of the book in meeting its aims, particularly for birdwatchers in Hunter Region area if appropriate.
- References should be cited and listed as for contributed papers.

Formatting Instructions

Where possible, authors are asked to format their manuscripts as follows:

1. A4 size page, portrait layout except for large tables or figures;
2. Margins of 2 cm top, bottom, left and right;
3. Title in bold Arial font, 16 pt size, centred;
4. Authors names in Arial font, 12 pt size, centred;
5. Affiliations or addresses of authors in Arial font, 12 pt size, centred;
6. Section headings capitalized in bold Arial font, 12 pt size, left justified;
7. Sub-section headings not capitalized in bold Arial font, 12 pt size, left justified;
8. First line of each paragraph should not be indented and one line should be left between paragraphs;
9. Typescript should be Times New Roman, 11 pt, except methods and acknowl-edgements which are 10 pt;
10. Figures and Tables to be included at the end of the document in Times New Roman font, 10 pt minimum size, title left justified, below figures and above tables with "**Figure x.**" or "**Table y.**" heading the title;
11. Nomenclature and classification of bird species should follow Christidis, L. and Boles, W. E. (2008). 'Systematics and Taxonomy of Australian Birds'. (CSIRO Publishing, Collingwood, Victoria) or latest edition of this work; the scientific names of all bird species should be shown in italics after the first mention of their correct English name in the text. Scientific names should also be included after the first mention of the bird in the summary.
12. References to be cited in the text in parenthesis as close as possible to the information taken from the paper: for one author (Smith 2000), two authors (Smith & Jones 2001b) and more than two authors (Smith *et al.* 2002) with the authors listed in the order they are listed on the original paper;
13. References should be listed in alphabetical order and secondarily by year of publication; if published in the same year then in alphabetical order with an a, b, or c after the year to indicate which paper is being cited in the text (see below); each reference should form a separate paragraph.

Reference Format

Journal articles:
Jones, D. N. and Wieneke, J. (2000a). The suburban bird community of Townsville revisited: changes over 16 years. *Corella* **24**: 53-60.

Edited book Chapters:

Lodge, D. M. (1993). Species invasions and deletions: community effects and responses to climate and habitat change. In 'Biotic interactions and Global change' (Eds. P. M. Karieva, J. G. Kingsolver and R. B. Huey) Pp. 367-387. (Sinauer Associates, Sutherland, MA.)

Books:

Caughley, G. and Sinclair, A. R. E. (1994). 'Wildlife Ecology and Management'. (Blackwell, Cambridge, MA.)

Theses:

Green, R. (1980). 'Ecology of native and exotic birds in the suburban habitat'. PhD. Thesis, Monash University, Victoria.

Reports:

Twyford, K. L., Humphrey, P.G., Nunn, R. P. and Willoughby, L. (2000). Investigations into the effects of introduced plants and animals on the nature conservation values of Gabo Island. (Dept. of Conservation & Natural Resources, Orbost Region, Orbost.)

Please submit all manuscripts to:

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