1URNAL BIOLOGI IX (I): 65 - 69

ISSN : 1410 5292 Akreditasi No. 23a/Dikti/Kep/2004

BREEDING BEHAVIOUR OF THE NEW HOLLAND HONEYEATER *Phylidonyris novaehollandiae* NEAR HOBART, TASMANIA

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ABSTRACT

Study on breeding behaviour of the New Holland Honeyeater *(Phylidonyris novaehollandiae)* was conducted near Hobart, Tasmania between September 2000 (early spring) and August 2001 (late winter). The birds had a long breeding season from early winter to midsummer. This lengthy period was primarily related to the availability of the food source in the study sites. The birds were multi-brooded with a mean clutch size of 2.14.

Keywords: Breeding season, clutch size, Honeyeater, Tasmania

INTISARI

Penelitian mengenai tingkah laku berbiak Wrung madu telah dilakukan antara September 2000 (awal musim semi) clan Agustus 2001 (akhir musim dingin) di Hobart, Tasmania. Burung tersebut memiliki musim berbiak yang cukup panjang dari awal musim dingin sampai pertengahan musim palms. Periode yang cukup panjang ini terutama disebabkan oleh ketersediaan bahan makanan di wilayah tersebut. Burung tersebut dapat menghasilkan lebih dari satu *brood* dengan rata-rata jumlah telur atau anakan 2.14.

Kata kunci: Musim berbiak, jumlah (=kan, bulling madu, Tasmania

INTRODUCTION

The production offspring for subsequent generations is the most important aspect of any animal's life (Perrin and Birkhead, 1983). Therefore, an intense selection exists on any organism to maximize its lifetime reproductive success (Ford, 1989). For example, breeding during the appropriate time, and producing optimal clutch sizes may ensure successful rearing of young. Perrin and Birkhead (1983) stated that the timing of breeding (breeding season) and reproductive rates (clutch-size) were two of the most ¡mportant features of reproduction determining the success of an individual.

Honeyeaters are members of the most diverse family of Australian birds (Meliphagidae) and represent about 10 % of avian diversity in Australia (Clarke and Clarke, 2000). Breeding activity of the honeyeaters have been examined widely in mainland Australia (e.g. New Holland honeyeater *Phylidonyris novaehollandiae:* McFarland, 1986; White-cheeked honeyeater *Phylidonyris nigra:* Armstrong, 1991; Crescent honeyeater *Phylidonyrispyrrhoptera:* Clarke and Clarke, 2000; Regent *honeyeaterXanthomyzaphrygia:* Oliver, 2001). However far fewer data on breeding are available for Tasmania. Thomas (1974) stated that Tasmania had the lowest number (3.03) of equally good months for breeding of honeyeaters (Meliphagidae) compared to other states in Australia (e.g. 8.94 in New South Wales; 8.33 in Victoria). These data were generated from data of the Royal Australasian Ornithologists Union Nest Record Scheme (1974). However he also stated that these numbers might be underestimated, as the sample size of nest records from Tasmania was very small.

Regarding the above matters, observations on various aspects of the breeding of the New Holland honeyeater were conducted. The observations were primarily focused on breeding period and clutch size of the bird. However, other aspects e.g. number of broods produced in a season of breeding, time interval between egg laying by a single female and incubation period were also observed. Data obtained were later compared to other studies on breeding biology of the New Holland honeyeater and/ or other honeyeater species in mainland Australia.These data were expected to provide a basis for further studies on this species and/or honeyeaters in general in Tasmania.

STUDY SITES

The study was conducted on land owned by the University of Tasmania at Sandy Bay, Hobart and nearby areas (S 42° 54' 10", E 147° 19' 26", average 50 m a.s.l.). The total area of the study site was approximately 5.23 km^2 in size. The site consisted of two adjacent habitats, which

Naskah ini diterima 19 September2003, disetujui 22 September2005

were a dry sclerophyll forest and the other a modified man-made habitat. The dry sclerophyll forest consisted mostly of *Eucalyptusglobulus, Eucalyptuspulchella, Banksia marginata* and *Acacia* sp. There was also a low (< 1 m) dense shrub layer predominantly *Lepidosperma laterale* and *Lomandra longifolia.*

The modified man-made habitat consisted of native Tasmanian plants and some introduced species from mainland Australia. The native plants were mostly *Eucalyptus globulus, Eucalyptus ovata, Eucalyptus pulchella, Eucalyptus cordata, Banksia marginata, Grevillea* sp. and *Correa* sp. whereas the introduced plants were mostly *Eucalyptus ficifolia, Eucalyptus haematoxylon, Eucalyptus sideroxylon* and *Eucalyptus lehmannii.* Both habitats were used by the birds as their home range.

METHODS

The observation was conducted between September 2000 (early spring) and August 2001 (late winter). The study site was visited every morning and afternoon, three times a week and nests were sought for. Observations were not taken during rain or heavy wind. Nest observations were facilitated using a mirror, which was mounted on an extendable pole. Observation on other breeding activity was conducted using binoculars (8 x 40) and recorded with a micro-cassette recorder and later transcribed. Data were recorded in descriptive observations. As the sample size in this study was very small, data obtained could not analyzed statistically. Data were presented as descriptive data.

RESULTS AND DISCUSSION

Breeding Period

Birds time their breeding period in order to maximize the number of young produced (Perrin and Birkhead, 1983). Several studies on the breeding period of the New Holland honeyeater have been conducted in mainland Australia. Recher (1977) found that in Sydney, New South Wales this species bred the whole year round with peaks in late winter (July) to early spring (September). Furthermore, Ford (1980) found that in the Mt Lofty Ranges and Murray Mallee of South Australia, this species bred the whole year with the exception of January. On the other hand, several studies found that birds were nesting at a particular time of year and some of them found that the nesting period coincided with food availability on the study site (e.g. Ford, 1979; Pyke, 1983; Pyke *et al.,* 1993).

In this study, the New Holland honeyeater had bred before the beginning of observations began in early spring (September 2000) and finished in mid-summer (January 2001). Initiation of the following breeding activity was observed in early winter (June 2001) and was still taking place when observations finished in late winter (August 2001). This indicates that the breeding period of this species in this study was between early winter and midsummer, which is much longer than the data generated by Thomas (1974).

In a seasonal environment the timing of avian reproductive cycles would be adapted to cycles in resource availability (Masman et al., 1988). Other studies have observed the importance of resource availability during the breeding season (e.g. Ford, 1979; Pyke, 1983; Paton, 1985b; Pyke et al., 1993). Perrins and Birkhead (1983) stated that birds timed their breeding so that they have young in the nest at the time when food is most abundant. Moreover, Weathers and Sullivan (1993) stated that in many species, reproduction is timed to coincide with peak food availability because juvenile birds are such inefficient foragers that they require abundant food in order to balance their energy budgets.

As the food source is available through the year in this study site (Table 1.), the absence of breeding during autumn in this study was more likely to be correlated with the moulting period. Visual inspection on mist-netted bird during this season showed the sign of moulting in this species. Paton (1985a) stated that adult New Holland honeyeater commenced moult immediately after breeding and this period required additional amounts of energy and protein. Ford (1989) stated that all birds need to moult at least once per year, and as this period requires additional energy, the breeding and moulting periods rarely coincide. Furthermore he stated that moult typically follows breeding in late summer and autumn when daylight are relatively long enabling extended foraging and food is still plentiful. As a result, cessation of breeding in autumn was likely to occur at this study sites.

During the one-year observation, one pair of birds (Ybl/PrPr) was observed to have three broods (Table 2.). In October 2000 (spring) the pair was found to have three fledglings. The fledglings were able to fly and feed by themselves at that time but still followed their parents. Then in December 2000 (summer) the pair was also found to have three nestlings and in July 2001 (winter) the pair had a further two nestling. This finding reflected that the New Holland honeyeaters in this study were able to produce three broods in the one-year observation period. Armstrong (1996) stated that the New Holland honeyeaters sometimes had new brood one to two weeks after the last one had fledged. Moreover, Armstrong (1991) found that pairs of New Holland honeyeaters on the east-coast of Australia had up to seven broods over a 6 to 8 months period. Many passerine birds can regularly raise two or more successive broods each year depending on the suitability of condition over that time (Lack, 1968).

Perrins and Birkhead (1983) stated that there are several factors that determine the number of broods reared in a breeding season. The first factor is the availability of food. The birds may rear additional broods when food is abundant. In this study, flowering trees as the nectar source for the bird were available throughout the year and birds did not face difficulty in finding food. The second factor influencing the number of broods is the duration of parental care. The shorter the period required for caring

for young, the greater the chance that birds will produce additional broods given suitable conditions. The New Holland honeyeater in this study required 11 to 14 days for the incubation of eggs and about thirteen days for rearing nestling before the young were able to leave the nest. Thus after the young reached independence, the parents were free to produce another brood if the conditions were suitable. Clarke and Clarke's (2000) study on the Crescent honeyeater *Phylidonyris pyrrhoptera* found that the pairs re-nested after young had fledged, and the construction of the new nest began three, four and ten days after fledging. The last factor is a cost to parents. The additional broods would be produced if the costs are not outweighed the costs to the parents such as increased risk of predation, reduced time to lay down fat reserves for the winter or migration, and insufficient time to complete the moult.

Clutch Sizes

Macdonald (1973) stated that New Holland honeyeaters could produce two to three clutches of eggs, light pinkish in colour and spotted with dark red and grey. Paton (1985a) also found that clutches size averages 2.0 eggs both in autumn and spring near Melbourne. However, Recher (1977) found that New Holland honeyeaters in Sydney, New South Wales were laying one to three eggs, with two as the most common clutch size. The present study found that New Holland honeyeaters in Hobart Tasmania had one to three nestling (Table 2.) over a twelve months period with an average of 2.14 ± S.E 0.13 (n = 21). Lack (1968) stated that the number of eggs in the clutch had evolved so that the most young were raised. In nidicolous species like the New Holland honeyeater, this limit was set by the amount of food that the parents could bring for the young. Nidicolous species are those whose young hatch in an immature condition, blind and helpless and are fed and reared by their parents in the nest (Perrins and Birkhead, 1983).

However, the observations could not accurately define the number of eggs that were laid in the nest as most of the nests were found after the eggs had hatched. For example, it was not possible to tell if YBd/F had laid one egg due to the presence of the one nestling, or more eggs had been laid but hatching had been unsuccessful, or other hatched nestlings had died. Recher (1977) stated that of 177 New Holland honeyeaters' nests, 32 % failed partially or wholly with 22 % of eggs and young lost due

Table 1. Annual cycle of flowering plants in the study sites in which the New Holland honeyeaters fed.

Specific Name	Common Name	2000				2001							
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Eucalyptus fcifolia	red flowering gum	1	1	1	1	1			1	2	2	2	2
E. cordata	heart-leaved silver gum	1	1	1					1	1	2	2	1
E. pulchella	white peppermint gum	11	2	2	1								
E. lehmanii	bushy yate			1	1	1	1	1	2	2	2	2	1
E. haematoxylon	-			1	1	1	1	1	2	2	2	1	1
E. sideroxylon	red ironbark				1	2	1						
E. oblique	Messmate				1	1	1	1	2	2	1		
E. ovata	swamp/black gum							1	1	2	2	2	1
E. brookerana	rocka rivulet gum							1	1	2	2	1	
E. viminalis	white gum									1	2	2	1
E. globules	blue gum									1	2	2	2
E. crenulata	silver gum										1	2	2
Banksia marginata	silver banksia					1	1	1	2	2	2	1	
Callistemon citrinus	crimson bottlebrush	1	1	1	1	1	1	2	2	1			
C. macropunctatus	scarlet bottlebrush			1	2	2	1						
Correa reflexa	common correa	1	1					2	2	2	2	1	1
C. lawrenciana	mountain correa	1	1	1	1	1	1	2	2	2	2	1	
C. alba	white correa								1	2	2	1	1
Grevillea macrostylis	mt. Barren grevillea	1	1	1	1	1	1	1	1	1			
G. banksii	bank's grevillea	2	1								1	2	2
G. excelsior	flame grevillea	2	1								1	2	2
G. lavandulacea	lavender grevillea	2	1						1 °	2	2	2	2
G. longifolia	fern leaf grevillea	2	1								1	2	2
G. hookeriana	Toothbrush grevillea	2	1								1	2	2
Hakea ulicina	furze hakea								1	2	2	1	1
Kunzea baxteri	-	2	1	1									
Anigosanthos flavida	yellow kangaroopaw					1	2	1					
A. manglesii	red green kangaroopaw					**1**	**2**	**1**					

Note : 1 = flowering; 2 = peak of flowering

Table 2. The clutch sizes of the New Holland honeyeater near Hobart, Tasmania.

	Time of Hatching	Parents	Nest-lings	Species Tree where Nest located
1	September 2000	A	2	*Grevillea* sp.
2	September 2000	B	2	*Grevillea* sp.
3	October 2000	Ybl/PrPr *	3	*Melaleuca* sp.
4	October 2000	YBd/F *	1	*Eucalyptus ficifolia*
5	October 2000	M/PM *	2	*Grevillea* sp.
6	October 2000	C	2	*Callistemon citrinus*
7	November 2000	D	2	*Melaleuca* sp.
8	November 2000	E	3	*Melaleuca* sp.
9	November 2000	G	3	*Hydrangea* sp.
10	November 2000	H	1	*Eucalyptus* sp.
11	November 2000	I	2	*Melaleuca* sp.
12	November 2000	J	2	*Grevillea* sp.
13	December 2000	Ybl/PrPr *	3	*Melaleuca* sp.
14	July 2001	K	2	*Pomaderis apetalae*
15	July 2001	Ybl/PrPr *	2	*Melaleuca* sp.
16	July 2001	YY/F *	2	*Melaleuca* sp.
17	July 2001	YBd/F *	2	*Correa lawrenciana*
18	August 2001	00/F *	2	*Grevillea* sp.
19	August 2001	L	2	*Melaleuca* sp.
20	August 2001	Ypr/F *	2	*Melaleuca* sp.
21	August 2001	N	3	*Bedfordia salicina*

Average of clutch size was 2.14 S.E 0.13

A—N were uncolourbanded birds, Ybl:Yellow-blue light, PrPr:Purple-purple, Ybd: Yellow-Blue dark, M: Mauve, PM: Pink-Mauve, YY: Yelow-Yelow,00:Orange, * : the colour of bird ring on coluorbanded birds

F : Female bird M : Male bird

to predation by rodents, snakes and other birds. McFarland (1986) also found that of the 57 eggs found in New England National Park in New South Wales, only 36.8 % survived to become fledglings with most of the losses being attributed to predation by Pied Currawongs *Strepera graculina* and Laughing Kookaburras *Dacelo novaeguineae.* Kookaburras were often present in the Tasmanian study sites. However, predation was never recorded during the observation period.

The time interval between egg laying within a single nest was found to be more than 24 hours. Observations of two nests indicated a time interval of 4 days and 2 days respectively. A forty-eight hours interval between egg laying by a single female was considered an adaptation to breeding in temperate areas, which allow the females to obtain the additional food needed to form eggs (Lack, 1968; Thomas, 1974). Moreover Perrins and Birkhead (1983) stated that small birds tend to produce relatively large eggs compared with large birds based on proportion of female body weight and egg weight. Consequently they require relatively larger amounts of energy for egg production. However, large eggs would be of benefit as they provide the newly hatched chick with a larger store of food, which aids survival in the critical first few days after hatching (Lack, 1968).

The eggs were incubated for about 11 to 14 days in this study. Marchant (1980) found that the incubation period of this species in New South Wales was about 13 days. Lack (1968) stated that incubation starts when the clutch is complete, therefore the young would leave the nest together, which is advantageous to parents enabling them to care for them afterwards. In this study, the young left the nest about thirteen days after hatching. Recher (1977) also stated that the young leave the nest about thirteen to fifteen days after hatching, and Marchant's (1980) observation in New South Wales found that the nestling period of this bird was about twelve days. However, the young remained present near the nest and were fed by both parents. Paton (1985a) stated that both sexes fed nestlings and fledgelings. It was difficult to know how long they were fed by their parents or remained with the parents as the family moved from the nest territory and observation could no longer be conducted. Paton (1985a) stated that the fledgelings reached independence at about 40 days old or about four weeks after leaving the nest.

In summary, the New Holland honeyeater in this study had a long breeding season from early winter to midsummer. This period is much longer than that reported by Thomas (1974) for breeding period of honeyeater in Tasmania. This lengthy period was primarily related to the availability of the food source in the study sites. The birds were multi-brooded with a mean clutch size of 2.14 ± S.E 0.13. However, there are limitations in this study regarding data was collected with very small sample sizes. Future inter-year observations on breeding would enable further detail of the annual variation in breeding patterns in Tasmania.

ACKNOWLEDGEMENTS

We are grateful to Dr. Rob Wiltshire and Susan (Sue) Baker for the plant identification. This research was funded by Australia Development Scholarship (ADS). should also be acknowledged. Our special thanks should also go to the reviewers (Drs. F.X. Sudaryanto, M.S. and Ir. A.A.Gde Raka Dalem, M.Sc.(Hons)) of this scientific article.

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