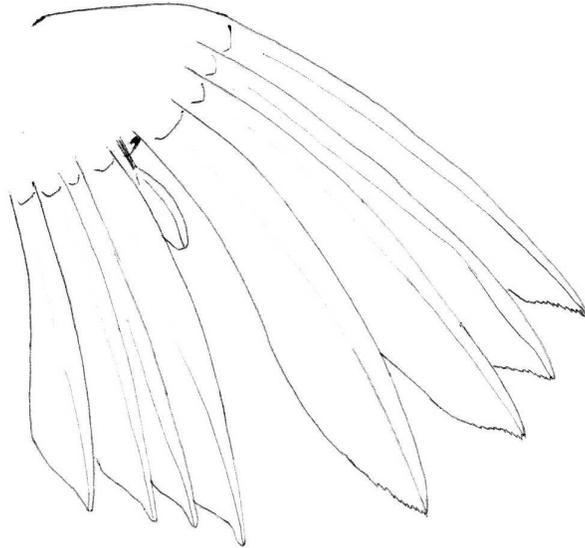


## Chapter 5

### **Geographic variation in breeding seasonality and primary moult parameters in Cape Weavers, Southern Masked Weavers and Southern Red Bishops in South Africa**





# Geographic variation in breeding seasonality and primary moult parameters in Cape Weavers, Southern Masked Weavers and Southern Red Bishops in South Africa

## Abstract

The Southern Masked Weaver *Ploceus velatus* expanded its range into the south-western part of the Western Cape, and here it has advanced its peak breeding and moult onset by one month relative to other areas, but is still a month behind that of the Cape Weaver *P. capensis*. Peak breeding in the Southern Red Bishop *Euplectes orix* is the same as that of the two *Ploceus* species in KwaZulu-Natal, and retarded by one or two months in the other regions. Southern Masked Weavers use trees and reeds equally early in different parts of South Africa. Variation in start and end of breeding depends largely on rainfall. In the three ploceids, primary moult started in the same month that the last eggs are laid. For the Cape Weaver moult started progressively later along the coast from the Western Cape to KwaZulu-Natal, and duration of primary moult varied from 3.3 months to 4.1 months. In Southern Masked Weavers moult started between 27 December and 22 March, while duration of moult was 2.2 to 2.8 months. In Southern Red Bishops moult started early in the Western Cape (13 December), and much later in the other regions. Duration of moult varied from 2.4 to 3.1 months.

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## Introduction

The Cape Weaver *Ploceus capensis*, Southern Masked Weaver *P. velatus* and Southern Red Bishop *Euplectes orix* are three common ploceids found in South Africa. They are polygynous, colonial, seed-eating ploceids (Fry and Keith 2004). The distributions of the three species span regions with contrasting rainfall patterns: the winter rainfall region of the Western Cape, with a typical Mediterranean climate, the south coast region with rain throughout the year, and the summer rainfall region over the remainder of South Africa (Allan *et al.* 1997). Within South Africa, the strongest climate gradients are east-west (Allan *et al.* 1997). The winter-rainfall region of the Western Cape is on the same latitude band (33°–35°S) as the summer-

rainfall region of the Eastern Cape. Within the summer rainfall region (24°–30°S), there is a gradient from subtropical coastal forest on the east coast to desert on the west coast. The Western Cape largely contains the fynbos biome, while Gauteng and KwaZulu-Natal are mainly in savanna and grassland biomes. The Eastern Cape is a transition area with a mixture of biomes.

The extent of local movements by birds determines the environmental conditions to which they are exposed during a year. None of the three ploceids studied here are long-distance migrants. Based on ring recoveries, the median distance moved by Cape Weavers and by Southern Masked Weavers was 4 km and 1 km, respectively (Oatley and Underhill 2001). At all percentiles, the dispersal distances of Cape Weavers were about three times as great as those of Southern Masked Weavers (Oatley and Underhill 2001). The Southern Masked Weaver, inhabiting arid areas with unpredictable rainfall, should be the species most compelled to move about to seek patchy food resources. Herremans (1994) presented evidence that the Southern Masked Weaver is a partial migrant in south-eastern Botswana, based on the emigration of juveniles and sometimes also females during the dry winter season. Southern Red Bishops do not move great distances. 79% of recoveries were at the original capture site and 20% were within 20 km from the original capture site (n = 1520); the greatest distance between ringing and recovery site reported was 112 km (Friedl 2004). In the non-breeding season Southern Red Bishops are nomadic, frequenting grasslands and agricultural lands in large flocks, often in association with other *Euplectes* species (Craig 1980).

The Southern Masked Weaver is a relatively new arrival in the Western Cape, having expanded its range into this region in the last 60 years. Brooke (1985) reviewed the literature concerning the early published records of this bird in the Western Cape, while MacDonald (1990) investigated its expansion westwards through the Karoo. Oschadleus *et al.* (2000) provide evidence of an earlier range expansion based on the Nest Record Collection of BirdLife South with records from 1921 and 1925.

Annual variation in breeding seasonality and in starting date of moult and duration of moult in relation to climatic and environmental conditions have not been well studied in African birds (Craig 1983). In broad terms, breeding by the three ploceids considered in this paper is in the summer months and is known to be earlier in the winter rainfall region compared to the summer rainfall region (Oschadleus *et al.*

2000, Craig *et al.* 2001). In the Western Cape adult wing-moult is from October to March in Cape Weavers, November to April in Southern Red Bishops (Craig *et al.* 2001), and January to March in Southern Masked Weavers (Oschadleus *et al.* 2000).

The aims of this paper are to investigate variation in breeding seasonality and timing and duration of primary moult in three common ploceids in South Africa. In particular these differences are investigated in different climate zones which lie on the same latitude, thus factoring out the effect of day-length (see Oschadleus *et al.* 2001). Craig *et al.* (2001) suggested later breeding by Southern Red Bishops may be related to nesting sites so nest sites are analysed. The timing of moult of long-established species in the winter rainfall region (Cape Weaver and Southern Red Bishop, Layard 1867) is compared with the newly established Southern Masked Weaver. Finally, timing of breeding is related to timing of moult in all three species.

## Methods

Breeding seasonality data were obtained from the BirdLife South Africa Nest Record Card Scheme (NRC) (RP Prÿs-Jones and I Newton unpublished data; Underhill *et al.* 1991) and by adding my own unpublished records of breeding for Southern Masked Weavers in Dundee, KwaZulu-Natal. Prÿs-Jones and Newton (unpublished data) estimated the month of laying of the first egg for each record. They then summarised breeding seasonality for all birds in South Africa by presenting monthly totals of clutches laid per species per region. One of the regions they used was the former Transvaal province: this region incorporates the current Gauteng Province, from where most of the records originate anyway. To compare breeding seasonality of weavers, the tabulated data of Prÿs-Jones and Newton were used to estimate the median and the 5th and 95th percentiles for each species and region. The median was calculated by finding the cumulative monthly sums of the percentage of nest records. The median month was the month in which the cumulative sum first exceeded 50%. The values of the sums of the previous and successive months were used to assign a relative distance into the month. For example, if there were 47% of cumulative records by the end of October, and 64% by the end of November, the median clearly falls during November. Then using proportions  $(50-47)/(64-47)$  gives 17.7%, the relative distance into November. Thus the median lies 17.7% into November (month 11), calculated as 11.177 (and rounded to 11.2 for presentation, i.e. a precision of

about three days). The 5th and 95th percentiles were interpolated in a similar fashion. Dates in January were recorded as being in month 1 (not month 0).

Ringling data were collected by ringers in the standard SAFRING (South African Bird Ringing Unit) electronic format. This includes standard ringling information (such as location and date) and data on bird body mass, wing length and primary moult (de Beer *et al.* 2001). Ringling and recapture records submitted to SAFRING from 1998 to 2003 for adults of the three species were extracted from the database.

Primary moult records were extracted from SAFRING's database for all three species in the Western Cape, KwaZulu-Natal and Gauteng Provinces (Figure 1). Data were taken from one-by-one degree grid cells to reduce geographic effects within provinces, except in Gauteng where data from grids 2528 and 2627 were combined. In all cases except one, extraction of data was restricted to the period from September 1998 to September 2004. For Cape Weavers in KwaZulu-Natal, records from 1992 onwards were included so that the number of records would be sufficient for the Underhill and Zucchini (1988) moult model to converge. Timing and duration of moult parameters were compared to breeding seasonality. Results were compared with those published for these three species in the Eastern Cape (Craig *et al.* 2001).

In the three species, moult of the primaries is ascendant, with the feathers renewed from one to nine outwards. The relative masses of each primary (as described in Underhill and Summers 1993) were obtained from published sources: Cape Weaver (Underhill and Joubert 1995), Southern Masked Weaver (Oschadleus *et al.* 2000) and Southern Red Bishop (Craig *et al.* 2001). Underhill and Joubert (1995) showed that small samples are adequate to determine the relative masses of primary feathers because there is little intra-specific variation in this characteristic. The Underhill-Zucchini moult model (Underhill and Zucchini 1988), developed to estimate start and duration of primary moult, was applied to the data sets. The data were considered to be of 'type 2' of the model, because full moult scores were recorded for each bird and all birds were considered available for sampling throughout the moult period. The parameters of primary moult were estimated using the transformations recommended by Summers *et al.* (1980, 1983), designed to reduce the bias introduced by the fact that the individual feathers are of different masses. The moult index used was percentage feather mass grown (PFMG), calculated from the

moult score for the individual feathers according to the method of Underhill and Summers (1993).

## Results

The range for egg-laying months (5th and 95th percentiles) is shortest in Southern Red Bishops (1.4–6.5 months, mean 3.3 months), intermediate in Cape Weavers (2.7–5.3 months, mean 3.9 months) and greatest in Southern Masked Weavers (3.9–5.4 months, mean 4.6 months) (Table 1). By region, the range for egg-laying months was most variable across species in the arid regions, i.e. the Karoo (2.7–6.5 months) and Northern Cape (1.4–4.6).

Peak egg-laying (median) occurred first in the Western Cape for all three species; thereafter the median followed different sequences northwards for the different species. Median egg-laying was similar for Cape and Southern Masked Weavers in the Eastern Cape, Karoo, KwaZulu-Natal and former Transvaal, with the maximum difference in medians being eight days in the Karoo. In the Western Cape the Cape Weaver median breeding time was earlier than that for Southern Masked Weavers by 19 days. In the Karoo records were less seasonal due to irregular rainfall. Southern Red Bishop median egg-laying months lagged behind the median for Cape Weavers in all regions by 3.5 days in KwaZulu-Natal to 46 days in the former Transvaal.

The suggestion made in Craig *et al.* (2001) that later breeding by Southern Red Bishops may be related to nesting sites was tested. The seasonality of nesting habitat use by Southern Masked Weavers were checked in different parts of South Africa, and found that both trees and reeds are used early, as well as throughout, the breeding season by this species (Table 2).

Moulting birds were captured throughout the moulting season (Figure 2); this enabled the moult parameters to be estimated reliably (Table 3). The onset of moult began first (11 November – 2 February) and was longest (3.3–4.1 months) for the Cape Weaver, began later (27 December – 22 March) but was shortest (2.2–2.8 months) for the Southern Masked Weaver, and began latest (13 December – 23 March) and was of intermediate length (2.4–3.1 months) for the Southern Red Bishop.

For the Cape Weaver moult started progressively later along the coast from the Western Cape to KwaZulu-Natal, onset of moult varying from 11 November to 2

February (Table 3). The duration of primary moult varied between regions from 3.3 months to 4.1 months (Table 3). Looking at data from all species and all regions, there is a significant negative correlation of moult start date and duration of moult ( $F_{1,16}=264.4, P<0.05$ ).

The interval between peak breeding (median) and the mean start of primary moult was 1.7–2.2 months in Cape Weavers in the different regions, 3–4.7 months in Southern Masked Weavers, and 2.8–4.4 in Southern Red Bishops (Table 3). This interval was greatest in the Eastern Cape for two species (Southern Masked Weavers and Southern Red Bishops).

## **Discussion**

### **Breeding duration and seasonality**

Breeding seasonality in ploceids seems to depend mainly on rainfall, although different aspects of rainfall may be of differing importance, depending on the region. Over the whole range of the Southern Red Bishop in southern Africa clutches are mostly laid in or shortly after the start of wet season, except in the Western Cape where the peak breeding is after the winter rains (Craig 1982). Rainfall also influences the end of breeding of the Southern Red Bishop; the greater the amount of mid-season rainfall, the later the breeding season ended in the Eastern Cape in different years (Friedl 2004).

Elliott (1973 p 50) suggested that the combination of the end of the rains with rising temperatures is the cue for Cape Weavers in the Western Cape to start breeding, but in the former Transvaal the start of breeding probably depends on the start of the rains. He did not suggest factors affecting the end of breeding, but found some variation in the end of breeding: the last eggs were laid between 9 November and 25 November in four successive seasons in the Western Cape (Elliott 1973, Table 4.3).

The most comprehensive single source of quantitative breeding seasonality data in South Africa is the Nest Record Scheme, held at the Avian Demography Unit. It has not been computerised, thus the latest unpublished analysis (RP Prÿs-Jones and I Newton unpublished data) is used in this study. The range of egg-laying months shows that there is wide variability in length of breeding season across regions and species. This is due to sampling effort and, more importantly, variability in annual rainfall patterns. In arid regions breeding will vary in particular years, giving long

breeding seasons overall. There are several records of early or late breeding by ploceids in response to unusual rainfall (see Craig 1982). In urban areas weavers are able to extend their breeding season every year, as is reflected in the high value of 5.4 months for Southern Masked Weavers in the former Transvaal (Harrison *et al.* 1997).

Cape and Southern Masked Weavers both breed in trees or reeds, while Southern Red Bishops breed chiefly in reeds (Fry and Keith 2004). Craig *et al.* (2001) suggested later breeding by Southern Red Bishops may be related to nesting sites, i.e. reeds may not be available as early as trees are. Southern Masked Weavers, however, breed in reeds as early as they do in trees. Thus reeds should be available to Southern Red Bishops at the same time, yet breeding is delayed. A possible explanation is that reeds used early in the season by Southern Masked Weavers may be dry reeds from the previous season (Brooke 1959), while Southern Red Bishops wait for fresh reeds. The later start of breeding in the Southern Red Bishop compared to the two *Ploceus* species may be due to different cues (aspects of rainfall), e.g. possibly waiting for more cumulative rainfall to fall (Friedl 2002).

Oschadleus *et al.* (2000) found that Southern Masked Weavers in North-west Province started moult on 15 February and moult lasted 80 days. This is similar to the result found here for Gauteng, where moult began on the 11 February and lasted 76 days.

### **Primary moult and annual cycle**

Moult was earliest in the Western Cape winter-rainfall region for all three species, as found by Bonnevie *et al.* (2004) for Southern Red Bishops. In the summer-rainfall region (KwaZulu-Natal and Gauteng), moult started in late January to mid February for the *Ploceus* weavers and in late March for the bishop. Start of moult was most divergent between the three species in the Eastern Cape, varying by nearly four months (Table 3).

For the three ploceids, in all regions studied, primary moult started on average in the same month that the last eggs were laid (Figure 2). Because the breeding cycle takes about a month to complete (incubation plus nestling periods), breeding and moult may overlap in the population, but this is unlikely to apply to individuals. These ploceids follow the normal pattern of a complete moult soon after breeding (Payne 1972). In the Eastern Cape, however, there seems to be a delay between the end of breeding and the start of primary moult for Southern Masked Weavers and Southern

Red Bishops as shown by the relatively large interval between peak breeding and start of moult of over four months (Table 3). Moulting parameters are usually considered more fixed than timing of breeding in a passerine's annual life-cycle (King 1973, Snow 1976). Further research is needed to investigate the reasons for the delay between breeding and moult in these two species in the Eastern Cape.

The Cape and Southern Masked Weavers have the same peak breeding seasons in all regions except the Western Cape, but primary moult in Southern Masked Weavers consistently starts later (greater interval between peak breeding and start of moult). The Cape Weaver has a shorter breeding season (shorter range of egg-laying months) than the other two species, suggesting a more synchronised breeding season and thus ability to time moult sooner after breeding. Larger colonies in Cape Weavers than in Southern Masked Weavers may be a mechanism to synchronise breeding: Cape Weavers breed in single-male colonies or in colonies of 2–20 males, while Southern Masked Weavers usually breed in single-male colonies and rarely in colonies with 2–9 males (Tarboton 2001).

Termination of primary moult varied widely in the different regions for each species. This is in sharp contrast to the pattern in Red-billed Quelea *Quelea quelea* which show a high degree of synchronisation in end of moult (Chapter 4). The Red-billed Quelea may need to complete moult before starting the return migration (see Chapter 4) whereas the weavers covered in this chapter are resident and can schedule moult onset and termination according to local environmental conditions. There is, however, a significant negative correlation of moult start date and duration of moult, i.e. the later moult starts the shorter is the duration of moult. This indicates that the weavers covered in this chapter do try to complete moult sooner if they started moult later. In Cape White-eyes *Zosterops pallidus* duration of moult is fixed in different regions of South Africa, and may be a species-specific trait in this species. Onset of moult follows breeding and is one month earlier in the Western Cape than in the Free State and Eastern Cape (Hulley *et al.* 2004). The weavers studied here show variation in timing and duration of both breeding and moult parameters, suggesting adaptability to local environmental conditions, irrespective of day-length.

### **Range expansion and moult**

The median date of egg-laying in Cape and Southern Masked Weavers was similar throughout South Africa (Table 1), but Southern Masked Weavers breed 0.6 months

later than Cape Weavers in the Western Cape. In recent decades, the Southern Masked Weaver expanded its range into the south-western part of the Western Cape. Oschadleus *et al.* (2000) found that Southern Masked Weavers in the Western Cape started moult 9 January and lasted 74 days, while in this study moult started 27 December and lasted 84 days. The data set used by Oschadleus *et al.* (2000) was from 1988 to 1995, while in this study the data was from 1998 to 2004. Southern Masked Weavers in the Western Cape appear to have advanced the start of primary moult by about two weeks. Monitoring, e.g. the nest Record Scheme, in future decades will show if the Southern Masked Weaver continues to advance its peak breeding season in the Western Cape to match that of the Cape Weaver. The duration of primary moult differed widely (74 and 84 days) but the 74 days recorded by Oschadleus *et al.* (2000) had a large standard error of 13 days associated with that duration.

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**Table 1:** Months of egg-laying (percentages) for Cape Weaver, Southern Masked Weaver and Southern Red Bishop in South Africa (from Prÿs-Jones and Newton unpublished data). For Southern Masked Weavers additional breeding records from northern KwaZulu-Natal are included. The percentages are summarized as 5th percentile (represents start of moult), 95th percentiles (end of moult), range (90% range of months of egg-laying) and median egg-laying month; numbers represent parts of months, e.g. 12.5 = mid December, 12.4 = 40% through December WC=Western Cape, EC=Eastern Cape, KZN=KwaZulu-Natal, Tvl= former Transvaal (this region incorporates the current Gauteng Province), NC=Northern Cape

Species	Area	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	n	5 <sup>th</sup>	95 <sup>th</sup>	Range	Median	
<b>Cape Weaver</b>																			
	EC	2	5	4	13	21	35	15	2		1	1		97	7.6	12.9	5.3	11.1	
	Karoo				38	35	27							48	9.1	11.8	2.7	10.4	
	KZN				1	1	5	22	58	13				148	10.7	1.6	2.9	12.4	
	Tvl				8	14	22	23	25	9				65	8.6	1.4	4.8	11.3	
	WC	3	12	30	25	28	3							1225	7.2	10.9	3.7	9.2	
<b>Southern Masked Weaver</b>																			
	EC				2	23	23	32	16	5				44	9.1	1.0	3.9	11.1	
	FS					9	29	34	12	15	1			82	9.6	1.7	4.2	11.4	
	Karoo		1		9	14	42	16	11	2			1	2	85	8.4	1.5	5.1	10.6
	KZN					15	2	3	55	25				89	9.3	1.8	4.5	12.5	
	NC							34	31	13		22		32	11.1	3.8	4.6	12.5	
	Tvl		<1		6	14	20	27	18	10	5	<1		<1	512	8.8	2.2	5.4	11.4
	WC		1		15	40	14	20	9	1				205	8.3	12.6	4.3	9.8	
<b>Southern Red Bishop</b>																			
	EC					1	3	15	58	14	8	2		160	11.1	2.6	3.5	12.6	
	FS							3	36	56	4	<1	<1	240	12.1	2.0	1.9	1.2	
	Karoo				2	6	34	4		1	6	43	3	96	9.5	4.0	6.5	2.3	
	KZN						6	12	67	13	1	1		1276	10.8	1.8	2.9	12.5	
	NC						5	86	9					22	11.0	12.4	1.4	11.5	
	Tvl						2	20	34	30	10	4		1043	11.2	2.9	3.7	12.8	
	WC		<1		18	47	25	10	<1					1109	8.3	11.5	3.2	9.7	

**Table 2:** Breeding habitat (percentages) for Southern Masked Weavers in South Africa (from the Nest Record Cards)  
 SWC=south-western Cape, WC=Western Cape (excluding SWC), EC=Eastern Cape, KZN=KwaZulu-Natal, FS=Free State, Tvl=former Transvaal

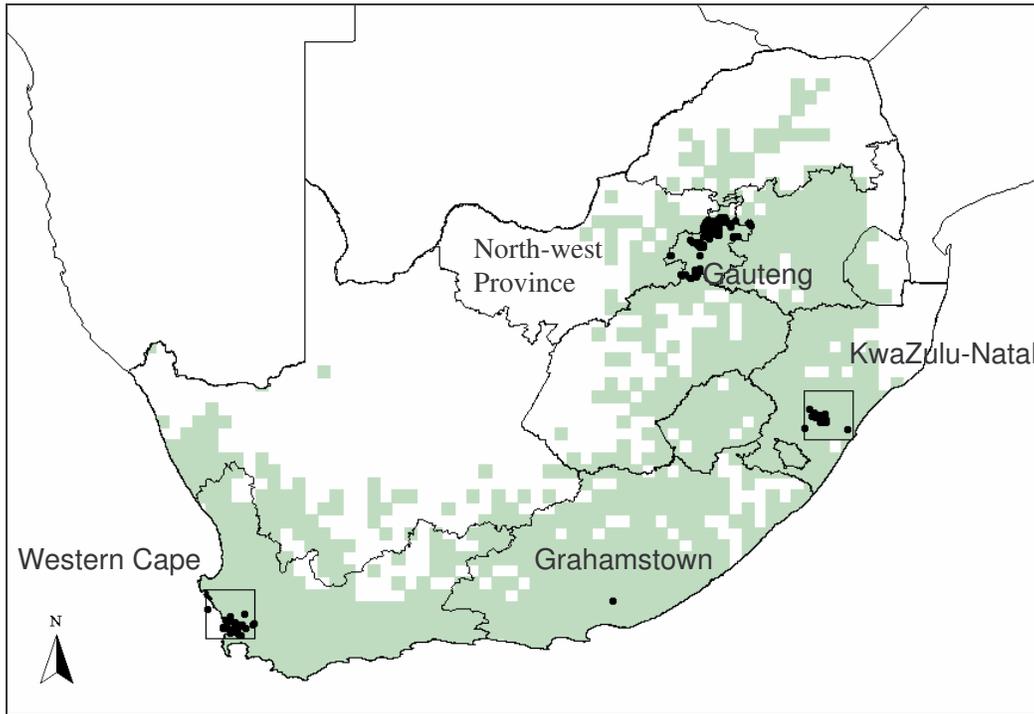
Area	Species	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Totals
SWC	reeds		<1	12	36	9	27	14	1					222
	trees		2	11	43	38	4	2						47
WC	reeds			4	46	18	14	14			4			28
	trees			5	25	25	18	13	2		7	2	4	56
EC	reeds			10	30	30	30							10
	trees				15	48	17	15	4					52
KZN	reeds													0
	trees					50	25	13	13					8
FS	reeds				50	10	10		30					10
	trees					15	41	11	30	4				27
Tvl	reeds				14	40	23	3	17	3				70
	trees			6	9	21	24	19	13	6		2		224

**Table 3:** Estimates of the primary moult parameters of adult Cape Weavers, Southern Red Bishops and Southern Masked Weavers in South Africa, 1998–2003. The final column gives the estimated difference between the median egg-laying date and the mean date of start of moult EC data are from Craig *et al.* (2001); \* data from Oschadleus *et al.* (2000)

Localities are abbreviations for South African provinces: WC=Western Cape, EC=Eastern Cape, KZN=KwaZulu-Natal, GP=Gauteng, MP=Mpumalanga, FS=Free State, NW=North-west Province; and one degree grid cell in which the data were collected

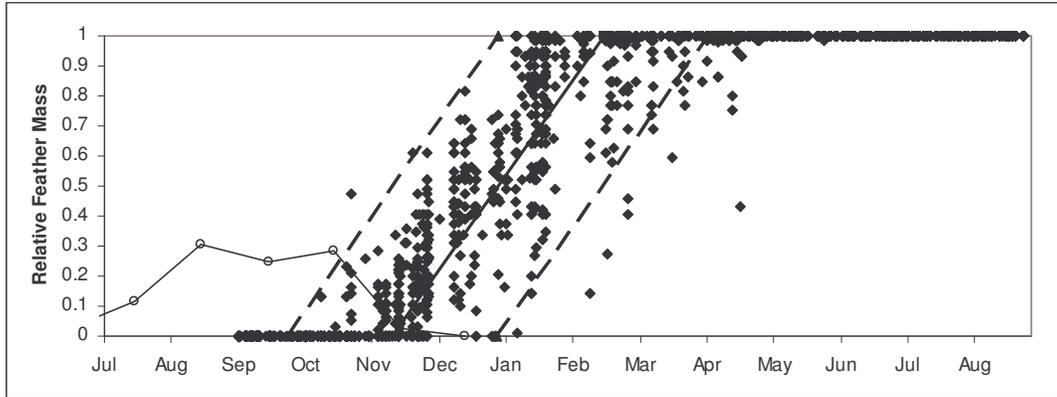
Locality	Mean starting date	Standard error (days)	Standard deviation (days)	Standard error (days)	Duration (days)	Standard error (days)	Mean completion date	Standard error (days)	n	Mean moult — peak breed (months)
<b>Cape Weaver</b>										
WC, 3318	11 Nov	1.4	24.2	0.6	98.1	2.0	17 Feb	1.3	3226	2.1
EC	9 Jan	4	25.2	2.1	106	7	25 Apr	4.7	316	2.2
KZN, 2930	2 Feb	4.1	31.5	2.7	124.2	9.5	6 Jun	7.4	238	1.7
<b>Southern Masked Weaver</b>										
WC, 3318	27 Dec	2.4	33.2	1.2	84.4	3.3	22 Mar	2.2	1411	3.1
EC	22 Mar	3	24.8	1.9	67	5	28 May	3.6	391	4.7
GP	11 Feb	0.9	18.8	0.6	75.9	1.7	28 Apr	1.3	2556	3.0
WC *	9 Jan	7.5	24.0	2.1	73.8	13.2	24 Mar	6.5	2318	
NW *	15 Feb	2.7	22.7	1.6	80.4	3.9	7 May	2.5	1547	
<b>Southern Red Bishop</b>										
WC, 3318	13 Dec	1.1	25.3	0.6	88.6	1.7	12 Mar	1.2	3154	2.8
EC	28 Apr	4	47.3	2.9	89	7	26 Jul	6.1	622	4.4
GP	23 Mar	1.5	35.1	1.1	71.9	2.5	3 Jun	2.3	4808	2.9

**Figure 1:** Capture sites of adult Cape Weavers, Southern Masked Weavers and Southern Red Bishops in selected areas in South Africa, 1998–2003. Dots show sites from which primary moult data were obtained; the data from Craig *et al.* (2001) for the Eastern Cape was centred on Grahamstown. All the quarter-degree grid cells in South Africa in which Cape Weavers were recorded during the Southern African Bird Atlas Project are shaded (Mundy and Herremans 1997); Southern Masked Weavers and Southern Red Bishops are found nearly throughout the region.

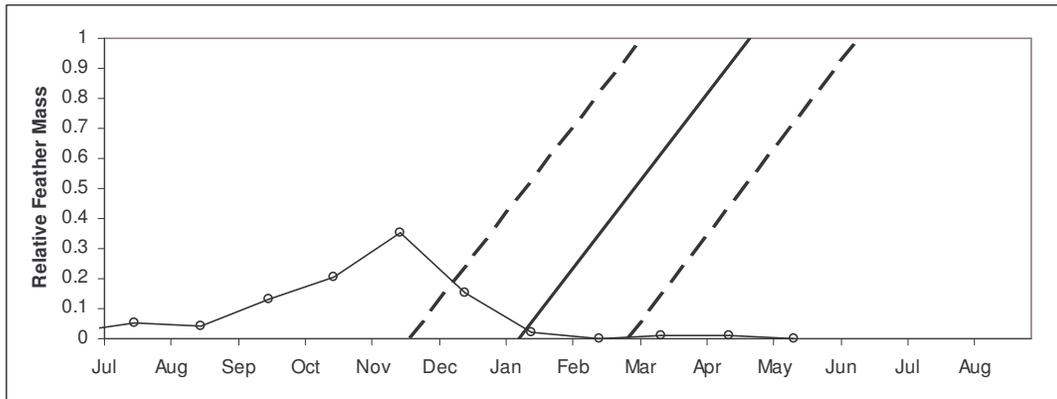


**Figure 2:** Timing of egg-laying and primary moult for adult weavers in different parts of South Africa; the open circles with thin solid line shows the proportion of eggs laid per month (from the Nest Record Cards summary by Prŷs-Jones and Newton unpublished data); the solid diamonds represent relative feather mass values by date; the solid diagonal line joins the estimated mean start and end dates of moult, while the diagonal dotted lines show the approximate 95% confidence intervals of moult scores on any given date. Original moult data for the Eastern Cape are not available, hence only mean and confidence lines are shown

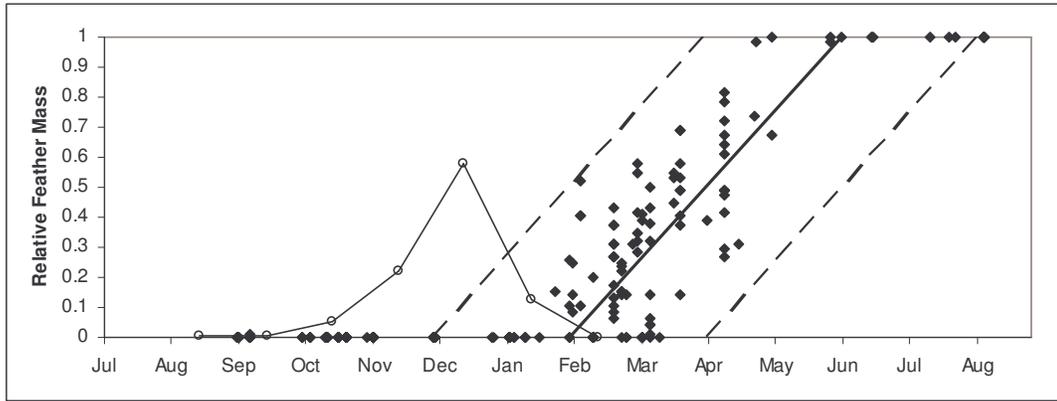
(a) Cape Weaver, breeding and moult records in the Western Cape



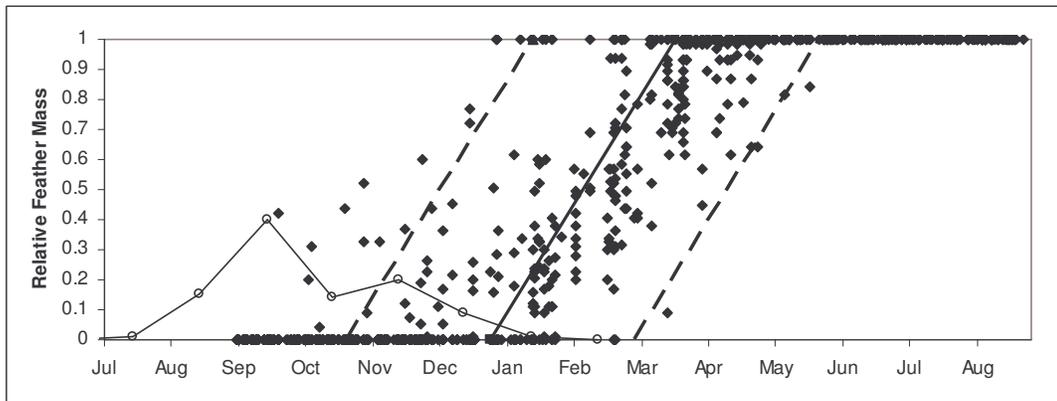
(b) Cape Weaver, breeding records and moult parameters in the Eastern Cape



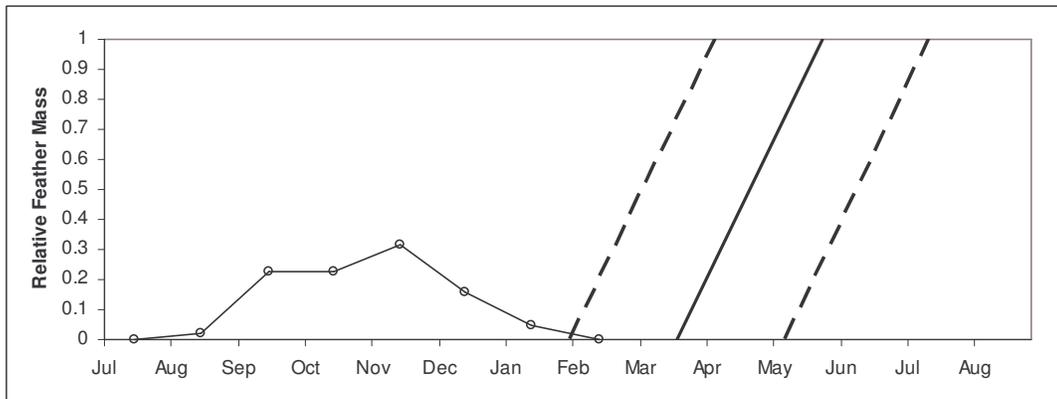
(c) Cape Weaver, breeding and moult records in KwaZulu-Natal



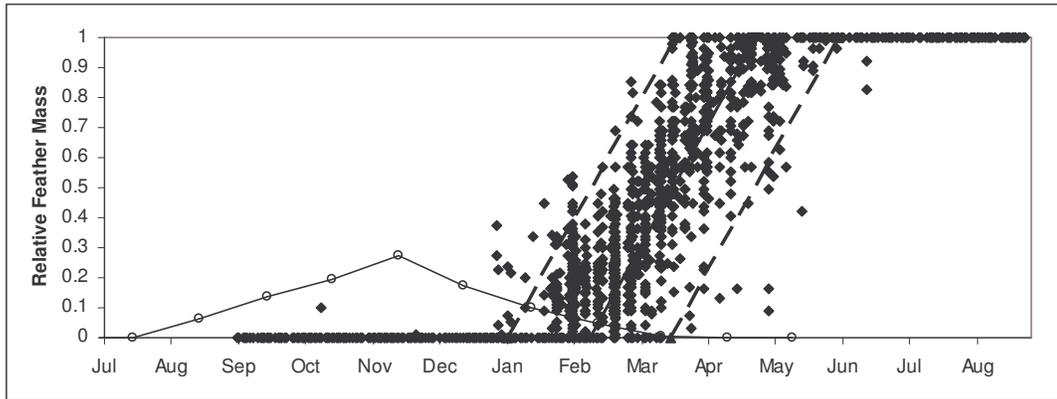
(d) Southern Masked Weaver, breeding and moult records in the Western Cape



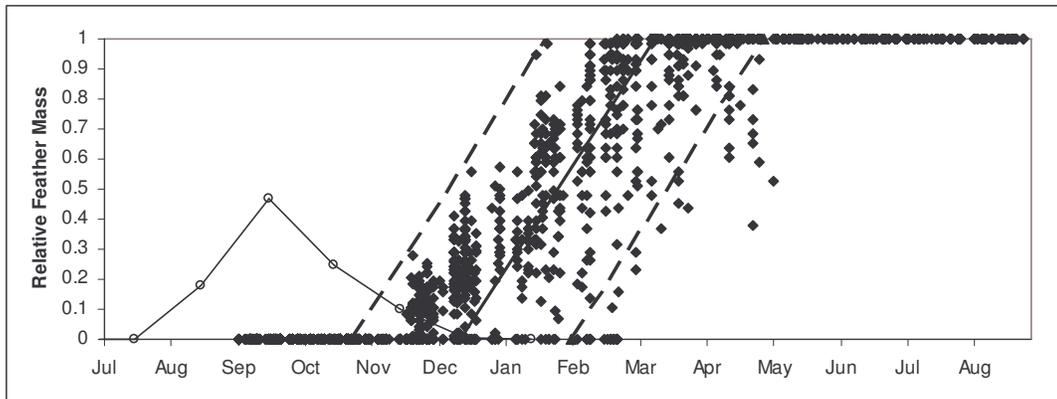
(e) Southern Masked Weaver, breeding records and moult parameters in the Eastern Cape



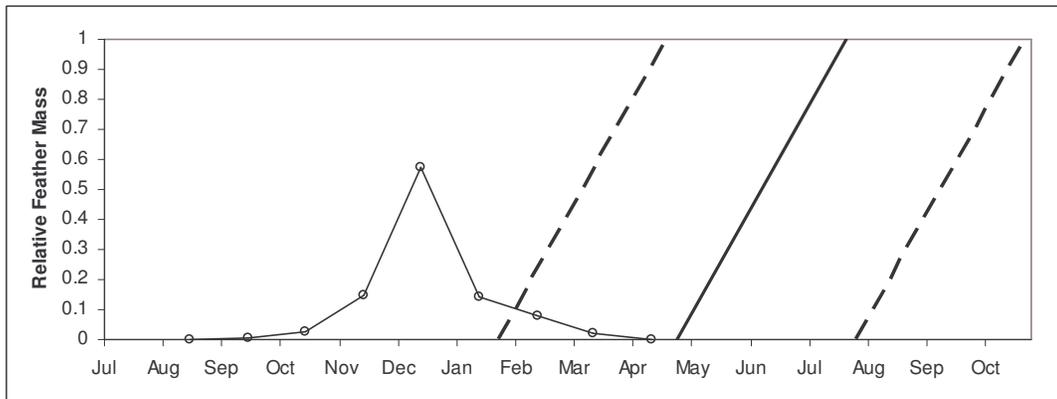
(f) Southern Masked Weaver, breeding records in former Transvaal and moult records in Gauteng



(g) Southern Red Bishop, breeding and moult records in the Western Cape



(h) Southern Red Bishop, breeding records and moult parameters in the Eastern Cape



(i) Southern Red Bishop, breeding records in former Transvaal and moult records in Gauteng

