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The Breeding Seasons of Birds on Timor

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Summary The breeding seasons of land birds on Timor, the largest island of the Lesser Sundas (Nusa Tenggara) is hitherto undocumented. This preliminary report draws upon historic data from the early 20th century and opportunistic observations made by the author on Timor during the 1990s, and compares these data with those available for other islands in the region (including Roti and Sumba), as well as western Indonesia and Papua. Evidence is presented that nesting occurs throughout the wet season (November to April), possibly peaking in November. This pattern contrasts strongly with that for western Flores (Verheijen 1964), where breeding is concentrated in the three months from April to June. Interpretation of these patterns must be cautious, however, given the hiatus of data from Timor for the period from late August to November, as well as the opportunistic or approximate nature of the data presented here. It is hoped that this report stimulates a more comprehensive study of avian reproduction in the region.

Musim Berbiak Burung-burung di Timor

Ringkasan Sampai saat ini, musim berbiak burung-burung daratan di Timor, pulau terbesar di Sunda Kecil, tidak terdokumentasikan. Laporan pendahuluan ini menggambarkan data lama dari awal abad ke-20 dan data dari adanya beberapa pengamatan lapangan sepintas yang dilakukan penulis di Timor selama tahun 1990-an, yang kemudian membandingkan data tersebut dengan data yang tersedia untuk pulau-pulau lain dalam kawasan ini (termasuk Pulau Roti dan Sumba), dan juga Indonesia bagian barat dan Papua. Bukti menunjukkan bahwa persarangan berlangsung selama musim hujan (November hingga April), kemungkinan puncaknya pada bulan November. Pola ini agak mirip dengan di Australia bagian barat laut tetapi sangat kontras dengan daerah Flores bagian barat (Verheijen 1964), di mana perkembangbiakan terkonsentrasi pada tiga bulan, yaitu dari April hingga Juni. Akan tetapi, interprestasi pola-pola tersebut harus hati-hati, mengingat kekosongan data dari Timor selama periode akhir Agustus hingga awal Desember, dan juga data yang disajikan di sini sifatnya sepintas atau perkiraan. Diharapkan bahwa laporan ini dapat merangsang kajian yang lebih komprehensif mengenai reproduksi burung di daerah ini.

Introduction

In terms of their reproductive ecology, the forest birds of South-east Asia are probably the least known in the world. Indeed very little has been written on the subject since Voous (1950) summarized data on the breeding seasons of birds in Java and Sumatra. Voous (1950) concluded that egg laying on these islands peaked between March and June, towards the end of the wet season. This period corresponds with the major breeding season of birds further north in Peninsular Malaysia and other parts of mainland South-east Asia (e.g. Gibson-Hill 1952; Medway & Wells 1976; Robson 2000).

The breeding seasons of birds in Wallacea would be a complete mystery were it not for the extensive data-set of Verheijen (1964), who over 18 years collated the months of 2,040 clutches of 101 species in western Flores. Whilst his data demonstrate that nesting occurs throughout the year, there is a clear peak in egg-laying from April to June. This coincides strikingly with the main breeding season of birds in much of South-east Asia (see above), but contrasts sharply with that of land-birds in monsoonal Australia, where breeding peaks during the austral spring months of September through November (Noske & Franklin 1999).

Despite Timor being the largest of the Lesser Sunda islands, the breeding seasons of its birds have not been hitherto documented. Largely as a result of its proximity to north-west Australia, Timor is one of the driest parts of tropical South-east Asia, showing pronounced seasonality. Of the 1,450 mm mean annual rainfall (MAR) in Kupang, West Timor, 95% falls in the wet season (November through April). This pattern is almost identical to that of Darwin in north-western Australia, where 94% of its 1,577 mm annual rain falls over the same period. In contrast, Ruteng in western Flores, where Verheijen was based, has a MAR of over 3,500 mm, of which 74% falls within this period. However, annual rainfall varies greatly across Timor, being lowest on the coast (e.g. 667 mm at Vemasse, East Timor) and highest in the mountains (e.g. 3,194 mm at Lolotoe, East Timor) (Metzner 1977; RePPProT 1989).

In this paper I attempt to characterize the breeding season of birds on Timor using both historic and recent data. Historic data for Timor were derived from reports of two expeditions during the early part of the 20th century. The first of these was the 1911 Wanner expedition of West Timor from Kupang and Semau (near sea level) to the summit of Mount Timau (1,770 m asl) via Lelogama and Bonleo. Over the four months between 14 April and 3 August 1911, Curt Daniel collected more than 400 bird specimens, including immatures and juveniles of 35 species (Hellmayr 1914).

The second source of historic data was Mayr's (1944) report of a more extensive expedition from 21 December 1931 to 6 May 1932 by Georg Stein, who travelled from Kupang to Mount Mutis (2,427 m asl) in West Timor to Dili and Mount Ramelan (2,600m asl) in East Timor. Stein collected over 1300 specimens from Timor, including young birds of 41 species, almost all from West Timor. Thus the months of the two expeditions overlapped little (latter part of April and early May only) and covered over two-thirds of the year, from late December to the start of August. More than 30 years later the small island of Roti, only 11 km from Timor's western tip, was visited from 12 March to 23 April 1969, by Verheijen (1976), who observed or collected 44 land-bird species, of which 23 species (52%) were found breeding.

Recent data are derived mostly from opportunistic observations of the breeding behaviour of 24 species made by the author while conducting bird surveys of West Timor during the following periods, totalling 19 days: 12 July 1994, 3-9 December 1995, 15-20 September 1996, and 7-14 November 1997. Some additional observations were made during more extensive surveys in May and June 1993 (Noske & Saleh 1996). In the first section of the results I provide details of these observations, along with any relevant historic data for Timor and Roti (Verheijen 1976; Johnstone & Jepson 1996). Additional breeding records for these 24 species and their congeners from other parts of Wallacea are also provided, including the Banda Islands in South Maluku (Moores *et al.* 1995; Johnstone & Sudaryanti 1995), Sumba (Mayr 1944; Linsley *et al.* 1998) and Flores (Verheijen 1964; Verhoeye & Holmes 1998; Drijvers *et al.* 2000).*Methods*

By convention, the breeding season is defined as months of egg-laying. I extrapolated egg-laying months from the stage of breeding observed (nests with eggs or young, and estimated age of juveniles), assuming that the average nest cycle (combining the incubation and nestling periods) took 4 weeks. For the Wanner expedition, I estimated months of egg-laying from the dates of collection of young birds as stated by Hellmayr (1914). As Stein's specimens were undated, I had to infer the months of collection from the collection localities of each specimen, and Stein's itinerary, as described by Mayr (1944). I assumed that the egg-laying month of "immatures" was 2-3 months prior to the date of collection; for juveniles, 1-2 months, and for pulli or chicks, 2 weeks to 1 month. However given our

ignorance of development rates of birds in the region these estimates are necessarily crude and should be treated with caution. For this reason I have ignored specimen records of juveniles of three raptor species and the Red Junglefowl *Gallus gallus*. Where the estimated laying date fell within the first few days of a month, half of the clutch is attributed to the previous month. Unless otherwise stated, records of nest building were excluded from the analyses, because of the well-known tendency of many Australian birds to abandon nests before laying in them.

Observations of breeding during 1993-97 with notes from other islands in the region:

Banded Fruit-dove *Ptilinopus cinctus*
An immature bird (head and upperparts light grey, chest band dark-grey, and wing coverts with pale edges) was seen at Buat (Soe) on 5 December 1995. Daniel collected a juvenile on 7 May at Benu (Hellmayr 1914), whereas Stein (in Mayr 1944) did not collect any young birds among the 14 *P. cinctus* collected during his expedition (December-May). Stein did, however, collect an immature Rose-crowned Fruit-dove *P. regina* at Camplong in January.

On Roti, Verheijen (1976) recorded a nest and egg of *P. regina* on 20 March 1969. On Sumba, Linsley *et al.* (1998) reported Red-naped Fruit-doves *P. dohertyi* courting in August.

Glossy (White-bellied) Swiftlet *Collocalia esculenta*
Carrying material (shred bark) near Kapan on 6 December 1995. Carrying epiphytic moss near Lelogama (*c.* 1,000 m asl) on 11 November 1997.

On Roti, Verheijen (1976) collected nest and eggs during March-April 1969, and Johnstone & Jepson (1996) found nests with young in caves at Oeseli during October. In western Flores, Verheijen (1964) recorded breeding in all months from March to November, with 14 of 27 nests (52%) during April and May.

Elegant Pitta *Pitta elegans*
At Baumata on 9 December 1995, adult flushed from nest containing two eggs (white, speckled dark-brown with fewer dark lavender-grey dots) in nest composed of vines, tendrils and dead leaves on a loose stick platform base, situated in fork of a trunk of tree (*Schleichera oleosa*) at 1.6 m. Nest dimensions: 15 cm high, 20 cm deep; internal diameter *c.* 8 cm. Stein (in Mayr 1944) collected an immature bird at Camplong between 5 and 29 January 1932. He also collected two juveniles on Sumba in early June.

In western Flores, Verheijen (1964) recorded breeding from January to April, with 50% of nests (n = 8) in April.

Cicadabird *Coracina tenuirostris*
Female sitting on nest at Oelnasi (*c.* 500 m asl) on 7 December 1995 at 12 m in tall tree, probably *Pterocarpus* sp. Stein recorded five immatures of Wallacean Cuckoo-shrike *C. personata* at Noilmina and Camplong during January-February. Daniel collected a juvenile Black-faced Cuckoo-shrike *C. novaehollandiae* at Kapan on 22 June.

On Roti, a nest and well-developed nestlings of *C. personata* were found on 26 March (Verheijen 1976). Verheijen (1964) also found four nests of the latter species in western Flores from April to June.

Pied Bush-chat *Saxicola caprata*
Male inspecting hole in dead stem (*c.* 5 m) at Baumata on 16 September 1996. Female with building material in *Acacia* open woodland 21 km east of Kupang on 9 November 1997.

Adults carrying food near Nenas and Lelofui (*c.* 1300 m and 1750 m asl, respectively) on 13 November 1997. Juvenile at Soe on 5 December 1995. Stein collected juveniles at Camplong (January) and Mount Mutis (20 February 8 March).

On Roti, Johnstone & Jepson (1996) found a nest with chicks at Oeseli on 12 October 1990. In western Flores 132 clutches were found from July to November, with 94 (71%) during September-October (Verheijen 1964). Verhoeye & Holmes (1998) also reported adults carrying food on 18 September and 4 October in ricefields on Flores.

White-bellied Bush-chat *Saxicola gutturalis*

Pair feeding young (audible) in nest inside dead hollow branch (0.7 m long) angled about 20 degrees from trunk, at 5.5 m above ground in 15 m-high *Eucalyptus* sp aff. *alba*; 1 km from Soe on 12 November 1997. Two fledglings (with very short tails) perched in low bushes along gully in cleared country on Lelogama road (*c.* 1,000 m asl) on 11 November 1997, giving incessant low churring notes; parents highly agitated. Stein collected four immature birds from Camplong during January, and another from Nenas in mid-February, whilst Daniel collected immatures at Camplong and Bonleo on 4 May and 10 June, respectively.

Timor (Black-banded) Flycatcher *Ficedula timorensis*

Two pairs feeding juveniles at Buat (near Soe) on 5 December 1995 and another at Oelnasi (west of Soe) on 7 December 1995. The juvenile plumage will be described elsewhere. Stein collected three juveniles of the Little Pied Flycatcher *F. westermanni* at Nenas, and another at Soe, during late February and/or March.

Timor Blue Flycatcher *Cyornis hyacinthinus*

Female carrying nest material (lichen), deposited at 7.5 m in a hollow formed by split in stem (13 cm diameter) in of a deciduous tree at Oelnasi on 19 September 1996. Female carrying food near Soe on 5 December 1995. Stein collected juveniles from Noilmina, Nenas and Mount Mutis during early, mid and late February respectively.

Plain Gerygone *Gerygone inornata*

Adults with juveniles (1-2) on following dates: 6 June 1993 (Bipolo); 14 June 1993, 3 December 1995 (Camplong); 20 June 1993, 8 December 1995 (Buraen). Juveniles distinguished by behaviour, dark irides, and lack of pale eyebrow. Daniel collected juveniles at Kupang and Lelogama on 17 April and 25 May, respectively (Hellmayr 1914). Stein collected a juvenile at Camplong in January and four immatures from Noilmina and Mount Mutis between early February and early March. On Roti, two nestlings and two immatures were collected on 15 and 26 March, respectively (Mees 1975; Verheijen 1976).

For the Flyeater *G. sulphurea* on Flores, Verheijen (1964) recorded 86 clutches from March to October, 46 (54%) of which occurred during May-June, and another 22 (26%) during September-October, suggesting a bimodal breeding season. Additionally Drijvers *et al.* (2000) found an active nest at Mausambi on 30 August 1998.

Rufous Fantail *Rhipidura rufifrons*

Feeding juveniles at Camplong on 3 December 1995. Immature bird 10 km NW of Kapan on 6 December 1995. Daniel collected nestlings at Lelogama on 28 May.

On Roti, Verheijen (1976) reported a nest with newly hatched young and another with eggs on 16 and 17 April. On Banda Neira, Maluku, Moores *et al.* (1995) found an active nest in April 1994, whereas Johnstone & Sudaryanti (1995) found nests with eggs or chicks during 25-29 September 1992.

On Sumba, Linsley *et al.* (1998) reported both an active nest and recently fledged young during October, though Stein collected an immature bird in late May. In western Flores, 12 nests were found between April and June, the majority (7) being in April (Verheijen 1964).

Fawn-breasted Whistler *Pachycephala orphaeus*

Food-begging juvenile at Bipolo on 12 July 1994. Carrying food for over 5 minutes, but nest/ young not observed, near Buraen on 8 December 1995. Daniel collected an immature bird at Lelogama on 24 May, as well as immatures of the Golden Whistler *P. pectoralis* on Semau and at Lelogama on 23 April and 22 May, respectively. During his expedition (December to May), however, Stein collected only adults of *P. orphaeus* (n = 26) and *P. pectoralis* (n = 16), possibly suggesting that it does not breed during the mid wet season.

In western Flores *P. pectoralis* nested from March to August, with 17 (65%) of 26 nests occurring in April and May (Verheijen 1964). On Sumba, Linsley *et al.* (1998) reported an active nest of *P. pectoralis* in August.

Thick-billed Flowerpecker *Dicaeum agile*

Juvenile (orange bill) at Camplong on 14 June 1993. Stein collected two immature birds at Camplong in January, and a juvenile at Melolo, eastern Sumba, in mid-June.

The Golden-rumped Flowerpecker *D. annae* of Flores and Sumbawa was shown to breed in all months except December, although 76 (73%) were found from April to July (Verheijen 1964). Drijvers *et al.* (2000) also reported a dependent juvenile of this species at Inerie, Flores, on 22 September.

Red-chested Flowerpecker *Dicaeum maugei*

Male carrying food to juvenile at Camplong on 3 December 1995. Female carrying material at Baun on 4 December 1995. Juvenile near Kapan on 6 December 1995. Daniel collected juveniles at Semau and Lelogama on 23 April and 22 May.

Verhoeye & Holmes (1998) observed a female of the closely related Black-fronted Flowerpecker *D. igniferum* carrying nest material at Wolo Tado, Flores, on 2 September 1997.

Blood-breasted Flowerpecker *Dicaeum sanguinolentum*

Recently fledged young (dull grey and whitish plumage; bright orange bill with black along top of culmen) near Lelogama (*c.* 1,000 m asl) on 11 November 1997.

Flame-breasted Sunbird *Nectarinia solaris*

Immature male (sides of blue throat yellowish; pale malar streak; yellow median stripe on orange breast at Baumata on 4 December 1995.

On Roti, Verheijen (1976) was presented with a nest and clutch on 24 March. In western Flores 40 clutches of *N. solaris* were found from March to August and one in October (Verheijen 1964).

Ashy-bellied White-eye *Zosterops citrinellus*

Collecting nest material at Soe on 5 December 1995. Daniel collected an immature bird at Bonleo on 14 June.

On Ndao (7 km west of Roti), Verheijen (1976) was presented with four clutches between 3 an 17 April.

Moores *et al.* (1995) report small fledglings of *Z. chloris* on Banda in April. Of 180 clutches of three lowland species of *Zosterops* (*Z. chloris, Z. palpebrosus* and *Z. wallacei)* found in western Flores between March and October, 148 (82%) fell in the months from April to June (Verheijen 1964).

Spot-breasted Dark-eye *Heleia muelleri*
Immature bird 6 km NW of Kapan, and a group of four (possibly adults with young) 9 km S of Kapan, on 2 June 1993. Stein collected two juveniles at Camplong in January.

The single congener, the Thick-billed Dark-eye *H. crassirostris* was found nesting in western Flores from March to October, with 65% of clutches (n = 31) during April-June (Verheijen 1964).

Black-chested Honeyeater *Myzomela vulnerata*
Female carrying food to distant nest at Oel Bubuk forest near Kapan on 6 December 1995. Immature male at Bipolo on 16 May 1993. Daniel collected juveniles at Camplong and Lelogama on 4 and 29 May, respectively (Hellmayr 1914).

On Banda islands, Moores *et al.* (1995) found Scarlet Honeyeaters *M. sanguinolenta* with recently fledged young in April 1994.

Streak-breasted Honeyeater *Meliphaga reticulata*
Fledgling at Naiola on 31 May 1993. Adult feeding juvenile 12 km east of Kupang on 14 November 1997. Daniel collected juveniles at Lelogama and Bonleo on 24 May and 12 June, respectively (Hellmayr 1914).

Black-faced Munia *Lonchura molucca*
Immature birds on 6 June 1993 (Bipolo), 14 June 1993 (Camplong) and 26 June 1993 (Besi Pae).

On Sumba, Stein collected five juveniles during May-June (Mayr 1944). On Flores, Verheijen (1964) found 8 nests in western Flores from March to June; and P. Lansley (in litt.) noted juveniles at Kisol on 2 August 1991.

Scaly-breasted Munia *Lonchura punctulata*
Building nests on 18 May 1993 (Bipolo) and 14 June 1993 (Camplong). Nest site at Camplong was fruiting body of palm. Daniel collected juveniles at Bonleo, Niki-Niki and Ofu between 8 June and 3 July.

On Sumba, Stein collected a juvenile in early June (Mayr 1944). Verheijen (1964) found 22 nests in western Flores from March to July, of which 18 (82%) fell in the first two months.

Zebra Finch *Taeniopygia guttata*
Carrying nest material in rural gardens near Lelogama on 11 November 1997. Verheijen (1976) reported collecting birds with developing gonads in Kupang on 7 and 8 March, and on Roti, collected eggs in the second half of that month. On Ndao (7 km west of Roti) he was brought eggs, nestlings and juveniles during April.

Figbird *Sphecotheres viridis*
Female carrying twig to nest in tree (*Schleichera oleosa*) at Camplong on 17 September 1996. Daniel collected a juvenile at Lelogama on 13 May, and Stein collected two immature birds at Camplong in January.

Short-tailed Starling *Aplonis minor*
A pair inspecting hole at 12 m in trunk of tall tree beside road at Bipolo, and adult entering hole at Lelobatan on 3 and 6 December 1995, respectively. Juveniles (estimated < 2 weeks post-fledging) with pale gapes being fed by adults near Kapan on 12 November 1997. Daniel collected juveniles at Kupang and Lelogama on 17 April and 22 May, respectively.

On Sumba, Linsley *et al.* (1998) reported an active nest in September, and P. Lansley (in litt.) noted this species inspecting "nest hollows" in mid-July 1991.

Breeding season of all species combined

The estimated egg-laying months for 182 broods belonging to 58 species, including most of the above-mentioned species, is shown in Figure 1 and detailed in Appendix 1. Species for which only nest-building was observed were excluded. Breeding occurs throughout the wet season, but evidently ceases during the mid-dry season (June through September). There is a slight suggestion of bimodality in the number of breeding species, with peaks in March-April and November-December. It is possible that breeding activity in the mid and late dry season (June through October) is severely under-represented, given the total lack of museum collecting between early August and late December, and the scant field observations during that period.

Discussion

In the only previous survey of avian breeding seasons in Lesser Sundas, Verheijen (1964) demonstrated that whilst breeding occurred in all months of the year in western Flores, there was a clear peak in egg-laying from April to June. Indeed, analysis of his data shows that, excluding waterbirds and all species for which there were less than four records, 56% of all clutches (from 68 species) were laid in these three months alone. Verheijen noted that breeding activity on Flores was lowest during the first two months of continuous heavy rain (December-January) and highest "at the beginning of the dry season". This situation is similar to that found in Java, where birds nest predominantly from April to June, after the December-March peak in rainfall (Sody 1930; Bouma 1936; Voous 1950). Much closer to Timor, Verheijen (1976) also found 23 species breeding from 12 March and 23 April on Roti, and my extrapolations of egg dates for these birds suggest that the greatest number (18 species) had eggs in March, with smaller numbers in April (11) and February (7). Unfortunately Verheijen's (1976) survey of Roti was limited to six weeks, and it is possible that another breeding pulse occurs later in the year as it does on Timor.

In contrast to Java and western Flores, breeding activity on Timor is high during November and December (Figure 1), just prior to the typically wettest months of January and February (rainfall data from Metzner 1977). It is difficult to interpret the significance of the apparent lack of breeding activity on Timor during the late dry season, and its peak

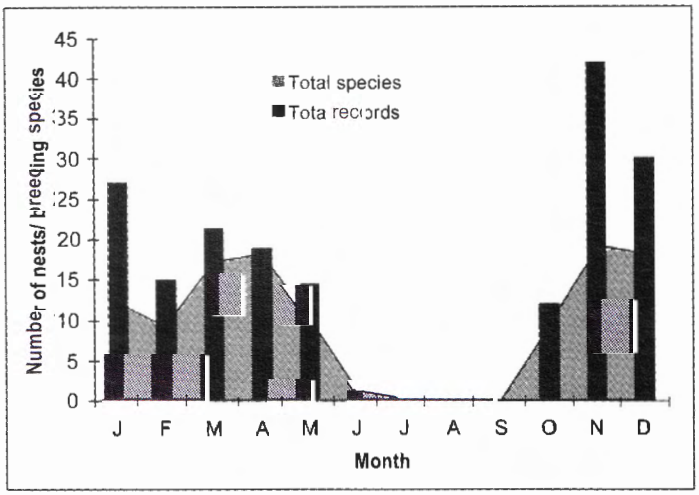

Figure 1. Extrapolated months of egg-laying for birds breeding on Timor

in the early wet season, as very little survey work has been conducted in Timor during the period from late August through November (coinciding with the austral spring). This hiatus of data corresponds with the major peak in breeding activity in north-western Australia, though many species show another peak in the austral autumn (early dry season) and others breed throughout the dry season (Noske & Franklin 1999). Thus whilst the breeding seasons of Timorian birds may have some similarities with those of north-western Australia, it is currently only fair to conclude that they differ from the generalized pattern for western Flores.

The island of Sumba is geographically closer to Flores (40 km) than Timor (300 km) yet covers the same latitudes as West Timor and, unlike Flores, both Sumba and Timor are non-volcanic islands of the Outer Banda Arc. Though not as mountainous as Timor or Flores, Sumba's landscape and vegetation are more similar to Timor than to western Flores (RePPProT 1989). During eight weeks on Sumba from 15 May to 9 July 1932, Stein collected 608 bird specimens belonging to 96 species, of which 32 specimens of 17 species were young birds (data from Mayr 1944). These data suggest that clutches of at least nine species were started in May, and five in April but, like Verheijen's observations on Roti, Stein's collection on Sumba was limited to a short time frame. Recent data, however, indicate that breeding seasons of birds on Sumba include the months from June to October. In their review of the Sumba avifauna, Linsley *et al.* (1998) listed months of breeding for 27 land-bird species. Although their data are apparently opportunistic and fragmentary, my extrapolations of egg-laying months from these records suggest that ten species nested in September, corresponding with the austral spring peak in egg-laying in north-western Australia.

Further from Timor than Australia, south-eastern New Guinea occupies similar latitudes to West Timor (both Port Moresby and Kupang are at approximately 10° S). Bell (1982a,b) showed that the breeding season of birds in both his rainforest (MAR, 2010 mm) and savanna (MAR, 1198 mm) sites near Port Moresby peaked in the late dry and early wet season (September-December) and that breeding activity was least during April-May. This austral spring peak contrasts with the alleged autumn (March to May) peak of breeding activity at Lake Sentani situated near the north coast of Papua (Nix 1976). These data were based on estimates of egg-laying dates from the gonadal condition of specimens of 52 species collected during the 1938-39 Archbold expedition, and their dates of collection. The autumn breeding peak may, however, be related to the reversed rainfall pattern of this region, which is greatest in April and least in October. Nevertheless the breeding season of birds in the Port Moresby region is generally similar to that for northern Australia, culminating before substantial rains.

An explanation for the disparity in the timing of breeding peaks between northern Australia - southern New Guinea and Java, western Flores and much of South-east Asia will require a more detailed analysis than possible here. It is already clear, however, that many of Timor's birds (and possibly those of Sumba) breed at both times. This does not appear to be related to their phylogeny, as taxa that colonized Timor from either mainland Asia (belonging to the parvorder Passerida) or Australia (Corvida) appear to nest in both the boreal spring and austral spring. Examples of the latter are the Black-chested Honeyeater, Streak-breasted Honeyeater and Fawn-breasted Whistler, while examples of the former are the White-bellied Bush-Chat, Thick-billed Flowerpecker and Orange-sided Thrush. Moreover, the Black-banded and Timor Blue Flycatchers belong to genera (*Ficedula* and *Cyornis* respectively) that are entirely absent from the Australian region, yet they apparently breed in October-November on Timor. On Java, however, Hill Blue Flycatchers *C. banyumas* nest almost year-round, with apparent peaks in March-June and

October (data from Hoogerwerf 1949; Hellebrekers & Hoogerwerf 1967). Similarly, the Snowy-browed Flycatcher *F. hyperythra* and Rufous-chested Flycatcher *F. dumetoria* appear to have long breeding seasons extending to October and November, respectively (data from Hoogerwerf 1949; Hellebrekers & Hoogerwerf 1967).

Whilst nest-building by Figbirds in September is consistent with the austral spring breeding season of this species in north-western Australia (Noske 1997), the juvenile collected by Daniel during May suggests a much longer breeding season on Timor. The Timor data for the Plain Gerygone also indicate a long breeding season from October to May (or later), possibly with peaks at both extremities (Appendix 1). Interestingly, Verheijen (1964) concluded that the closely related Flyeater *G. sulphurea* in western Flores showed a double peak (May and September). Two species of gerygones in north-western Australia show a very similar bimodal breeding season (Noske 2001, *unpub. data*). Finally the Pied Bush-chat is exceptional in western Flores in having a breeding season that is restricted to the second half of the year, peaking in September-October (which Verheijen refers to as "autumn"!). On Java this species is known to breed from June to December (Sody 1930). Data presented here suggest a possible shift on Timor towards the wet season, with clutches (inferred) as late as February.

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Appendix 1. Extrapolated laying-dates for species breeding on Timor. (see text for explanation).

Sources: H, Hellmayr (1914), S, Mayr (1944), N, Noske (details in this paper).

Species	J	F	M	A	M	J	J	A	S	O	N	D	All	Sources
Streptopelia chinensis			1										1	H
Macropygia ruficeps			1										1	H
Treron psittacea											2		2	S
Ptilinopus cinctus			1							1			2	H, N
Ptilinopus regina											1		1	S
Ducula cineracea												1	1	S
Columba vitiensis												1	1	S
Turacoena modesta	1		0.5	0.5								1	3	H, S
Geopelia maugei												1	1	S
Chalcophaps indica		1	1	1									3	H, S
Geoffroyus geoffroyi			1	1						1	6		9	H, S
Psitteuteles iris				1									1	H
Trichoglossus euteles				1									1	H
Cacomantis variolosus	1										2	1	4	S
Eudynamys cyanocephala											5		5	S
Centropus bengalensis											1		1	H
Caprimulgus macrurus												1	1	S
Halcyon australasia	1											6	7	S
Merops ornatus			1										1	H
Pitta elegans											1	1	2	S, N
Anthus novaeseelandiae				1									1	H
Coracina novaehollandiae					1								1	H
Coracina personata											1		1	S
Coracina tenuirostris												1	1	N
Brachypteryx leucophrys	1	1											2	S
Saxicola gutturalis			1	1						2	4	1	9	H, S, N
Saxicola caprata	1	1								2	2		6	S, N
Zoothera dohertyi	1	2											3	S
Zoothera peronii					1						2	1	4	H, S
Turdus poliocephalus	3	4			1								8	H, S
Phylloscopus presbytes				1									1	H
Cisticola juncidis				1									1	H
Seicercus montis	4											3	7	S
Ficedula westermanni	3	2											5	S
Ficedula timorensis											2		2	N
Cyornis hyacinthinus	5	2									1		8	S, N
Gerygone inornata	2		1	1	3						4	3	14	H, S, N
Myiagra ruficollis	4		1									1	6	H, S
Rhipidura rufifrons					1					1			2	H, N
Pachycephala pectoralis		1	1										2	H
Pachycephala orphaeus			1			1					1		3	H, N
Dicaeum agile					1					2			3	S, N
Dicaeum maugei			1	1							2		4	H, N
Dicaeum sanguinolentum										1			1	N
Nectarinia solaris										1			1	N
Zosterops citrinellus					1								1	H, N
Heleia muelleri				1								2	3	S, N
Myzomela vulnerata			1	1							1		3	H, N

Lichmera flavicans				1									1	H
Meliphaga reticulata				2	1					1			4	H, N
Philemon buceroides			6										6	S
Lonchura punctulata				0.5	3.5								4	H
Lonchura molucca				2	1								3	N
Erythrura tricolor					1								1	H
Aplonis minor			1	1								1	3	H, N
Oriolus melanotis		1	1								2	3	7	H, S
Sphecotheres viridis				1							2		3	H, S, N
Total species	12	9	17	19	11	1	0	0	0	9	19	17	57	
Total records	27	15	21.5	20	15.5	1	0	0	0	12	42	29	183	