DAYLENGTH DETERMINES DEPARTURE DATE OF THE SPOTTED FLYCATCHER *Muscicapa striata* FROM ITS WINTER QUARTERS

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ABSTRACT The annual arrival and departure dates of the Spotted Flycatcher *Muscicapa striata* at Bloemfontein in the Orange Free State, South Africa, were noted for a continuous period of 36 years (1950-1986). According to a stepwise regression analysis, daylength is by far the most important environmental factor influencing the date of departure. The influence of the minimum, maximum and mean daily temperatures, duration of sunshine, rainfall and wind speed seems to be unimportant in this context.

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INTRODUCTION

The Spotted Flycatcher *Muscicapa striata* is a non-breeding Palaearctic migrant which commonly occurs in southern Africa during the period October - March (Maclean 1984). Under local conditions the birds are often associated with the trees and shrubs of man-made landscapes such as public parks and gardens. Owing to their habit of returning to the same area in successive seasons (Creutz 1941) and even using the same set of vantage-points in specific trees day after day (Moreau 1972), the flycatcher is readily observed under field conditions. This presented the opportunity to accurately determine the arrival and departure dates of the birds over an extended period. In this study possible environmental factors affecting the annual time of departure of the Spotted Flycatcher to breeding areas in the Northern Hemisphere are discussed.

STUDY AREA AND METHODS

The annual arrival and departure dates of the Spotted Flycatcher at Bloemfontien (29° 07'S 26° 13'E) in the central part of the Orange Free State, South Africa, were noted for a continuous period of 36 years (1950-1986). Up to and including 1986 daily field observations were carried out at the Bloemfontein Zoo and adjacent King's Park from the last week in October till the end of November and again during March to determine the status of the flycatchers in the area concerned. Since 1969 similar observations were limited to the Botanical Gardens situated due north of the city limits.

The following environmental factors were investigated for possible correlation with the date of departure of the Spotted Flycatchers: minimum, maximum and mean daily temperatures, daylength, duration of sunshine, rainfall and wind speed. Three sets of data were used for each of the factors, namely the values as determined on the day of departure, as well as the mean values of the preceding one and two weeks respectively. Statistical analyses were based on complete sets of data which were only available from 1960 for all the factors involved. All appropriate climatological data were obtained from the head office of the Weather Bureau at Pretoria.

RESULTS

The first flycatchers of the season usually arrive at Bloemfontein during the second half of November (Fig. 1). Although the birds have been observed in the city as early as the fifth of the month, the mean date of arrival has been calculated as 21 November. As a bird species which especially feeds on low flying insects (Maclean 1984, Moreau 1972), the

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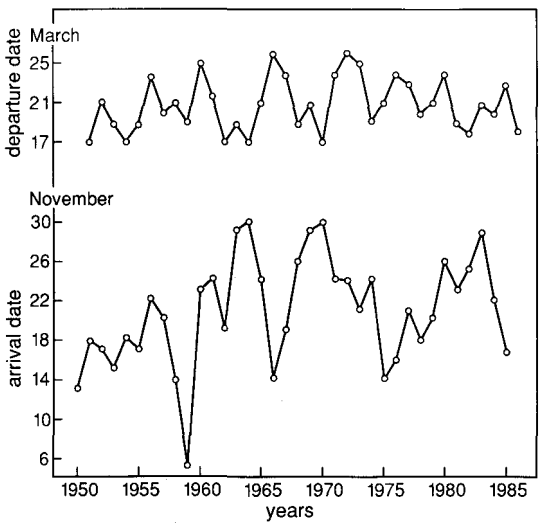

Fig. 1. Arrival and departure dates of the Spotted Flycatcher at Bloemfontein, South Africa, over a period of 36 years.

flycatchers were often observed in the immediate vicinity of open water bodies where arthropods are presumably abundantly available. During the nights the shelter of exotic tree species such as the blue gum *Eucalyptus* sp., poplar *Populus* sp. and weeping willow *Salix* sp. were used. After a stay of approximately four months (121 days on average) the annual exodus from Bloemfontein takes place within a time-span of ten days (17-26 March) (Fig. 1).

Based on a stepwise regression analysis (Kleinbaum *et al.* 1988) daylength was found to be the environmental factor which most influenced the date of departure of the Spotted Flycatcher. For all three sets of data, daily, weekly and two weekly, the relationship is highly significant ($F_{1,24} = 2520$, 1980 and 5120 respectively; $p < 0{,}01$). With only daylength as concomitant variable, 99.14, 98.90 and 99.55% of the variation are respectively accounted for by the different models. The fact that the residuals of each of the models are normally distributed gives an indication of the goodness of fit together with the high percentage variation which is explained. For all practical purposes the influence of all the other environmental factors investigated can, therefore, be considered unimportant. On account of daylength alone the annual date of departure of the Spotted Flycatcher during March can be predicted as follows: $\hat{Y} = 25.23 - 0.58 \cdot X$ where X indicates the number of minutes more than 12 hours per day. During the past 24 years the mean daylength when the birds started flying northwards was 12 hours 7.3 minutes, which means that the expected date of departure from the Orange Free State falls on 21 March each year.

DISCUSSION

Only a few cases of flycatchers ringed in Europe and recovered in South Africa have been recorded thus far (Maclean 1984). Ringing data confirm that the birds migrate over distances of approximately 10 000 km, amongst others from Finland and Wales (T. Oatley, South African Bird Ringing Unit, Rondebosch, pers. comm.). Because of varying circumstances experienced during such long migratory flights, the date of arrival at their ultimate destination at Bloemfontein shows a fairly large amount of variation (range of 26 days). As opposed to this, the annual date of departure, which is greatly influenced by daylength, is more synchronised and falls within the time-span of ten days (17-26 March). The influence of daylength is in accordance with the findings of various other studies of divergent nature (Lofts & Marshall 1960, Weise 1963, Farner 1967, Yapp 1970).

As mentioned by Moreau (1952), most migratory species arrive in southern Africa at the start of the rainy season when insects are abundantly available as a potential source of food. It is, therefore, noteworthy that the Spotted Flycatcher already occurs in countries such as Botswana (J.M. Winterbottom, Percy FitzPatrick Institute of African Ornithology, Rondebosch, pers. comm.), Zambia (M.P.S. Irwin, National Museum, Bulawayo, pers. comm.) and Zimbabwe (O.P.M. Prozesky, Transvaal Museum, Pretoria, pers. comm.) during October, although the birds only arrive in the more southern regions of South Africa at the end of November. Together with the warmer climate and day-

lengths of up to 14 hours (average 13 hours and 25 minutes), the flycatchers thus experience a relatively stress-free wintering period in comparison to the breeding season which takes place in the Northern Hemisphere each year.

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SAMENVATTING

De jaarlijkse aankomst- en vertrekdata van de Europese Vliegenvanger *Muscicapa striata* te Bloemfontein zijn gedurende een aaneengesloten periode van 36 jaren (1950-1986) genoteerd. Bloemfontein ligt in het centrale gedeelte van de Oranje Vrijstaat, Zuid-Afrika. De data werden gecorreleerd met een groot aantal weergegevens (stapsgewijze regressie-analyse). Hieruit bleek dat daglengte de omgevingsfaktor is die verreweg de belangrijkste invloed uitoefent op de datum van vertrek. De invloed van de minimum, maximum en de gemiddelde dagtemperatuur, het aantal uren zonnenschijn, de regenval en de windsnelheid blijken in dit verband onbelangrijk.