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The relation between spring migration and onset of breeding in the Pied Flycatcher Ficedula hypoleuca in northern Finland

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The difference between the date of arrival of the first Pied Flycatcher female to Tauvo bird observatory and that of the first egg of the season in the nearby Oulu area was 7.0 ± 3.2 (*SD*) days, the respective difference in the median days being only 1.6 ± 3.2 days. The small difference between arrival and onset of breeding is considered to reflect the shortage of time in the summer schedule of this species, although some of the migrants at Tauvo may be birds breeding north of the Oulu area.

At arrival, female Pied Flycatchers have lipid reserves of 14% of body weight (excluding ovaries and oviducts). The reserves decreased during the phases of nest-building and laying, lipids comprizing only 7% of the body weight at the latest phase.

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1. Introduction

The summer schedule in the Pied Flycatcher *Ficedula hypoleuca* is hectic during their stay in the northern breeding areas. The females start nest-building activities rapidly after having arrived at their breeding places in spring (von Haartman et al. 1963-72, own observations). It may start the moult while feeding the young (Ojanen & Orell 1982) and it may also start the autumn migration before having finished the moult (Hyytiä & Vikberg 1973).

In this paper, the spring migration and onset of breeding are examined based on data collected in northern Finland. The time difference between the arrival and start of egg-laying in the Oulu area as well as the changes in the lipid reserves at arrival and also at the breeding phases of nest-building and laying are studied.

2. Material and methods

The arrival of the Pied Flycatcher was studied on the basis of mist-net data collected at Tauvo bird observatory (64 48'N, 24 38'E). During 1976-1980 the netting period covered well the arrival season of the species. Netting usually started in early May and ended c. 6-10th June, extending occasionally to 18th June. The very few late arrivals, mist-netted later than 10th June, were rejected from calculations.

The start of breeding was studied at the Oulu area, where a large number of nest-boxes have been available since 1969 (Orell & Ojanen 1983). The boxes were examined at least once a week, and in most cases the onset of laying was determined from clutches not yet completed.

The amount of lipids was determined from females collected during arrival and during different phases of breeding. The detailed processes of preparation of the specimens and extraction of lipids have been published elsewhere (Ojanen 1983b). In short, after collection the specimens were preserved in a deep freezer. In the laboratory they were weighed, measured and prepared, and the lipid extraction was made with a mixture of 5:1 petroleum ether and chloroform.

3. Results

3.1. The relation between the arrival and start of breeding

In 1976-1980 the median date of laying of the first egg at the Oulu area, c. 50 km NE from Tauvo, was only 1.6 ± 3.2 (*SD*) days later than the median date of arrival of the females in the same spring at the Tauvo bird observatory

(Fig. 1). When the time difference was calculated between the first female trapped at Tauvo and the first egg of the season at Oulu this appeared to be much longer: 7.0 ± 3.2 days.

3.2. Weight changes and fat reserves in the female Pied Flycatchers

The mean weight of Pied Flycatchers has been reported to vary between 11.5 g and 16.8 g over the annual cycle in Europe (Table 1). The arriving females at Tauvo weighed 13.7 g and the weight increased by 2.2 g to the phase of finishing the nest-building and by a further 0.3 g to the phase of egg laying (Table 2).

The total fat content of the body (excluding fat in reproductive organs) comprized 1.9 g in arriving females. Thereafter the amount of fat decreased as breeding advanced (Table 2).

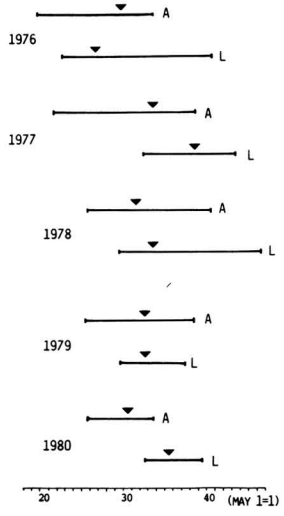

Fig. 1. The main periods (central 80 % of the period, omitting the early and late 10 %) for arrival (A) at the Tauvo Bird Observatory and start of laying (L) at the Oulu area. The median date shown by a black triangle.

4. Discussion

In the Oulu area the time difference between arrival and start of laying is shorter than what is physiologically possible. The minimum interval between arrival and the laying of the first egg could be about 4–5 days, i.e. the time taken to construct the nest (e.g. Lundberg et al. 1981, own observations) and to produce simultaneously the first egg (Ojanen 1983b).

The following reasons may be the most important for the very small time difference between arrival to Tauvo and the start of laying. Firstly, the largest proportion of birds caught at Tauvo may be young individuals (see also Payevsky 1982). Secondly, a large proportion of Pied Flycatchers caught at Tauvo may be birds breeding north of the Oulu area, these specimens arriving relatively late to Tauvo. Thirdly, as young Pied Flycatchers tend to lay later than older individuals (e.g. Berndt & Winkel 1967), the difference between arrival and start of laying should be calculated for different age-groups. Unfortunately, the age-determination of Pied Flycatchers was not known when the data used in this study was collected.

On arrival at the breeding sites female birds are usually in good condition. Generally, they have three strategies to cope with the stresses of breeding: 1) they may collect fat and protein reserves before the start of laying (e.g. the Red-

Table 1. Weights (mean±*SD*) of Pied Flycatchers at the different stages of the year cycle in Europe.

Season and place	Stage	*N*	Weight (g)	Source
Spring				
Gibraltar	arriving	28	11.5±0.92	Finlayson 1981
Tauvo	arriving	154 ♀	13.7	Ojanen 1983a
Tauvo	arriving	7 ♀	13.6±0.50	Ojanen 1983b
Oulu	nest-construction	3 ♀	15.8±1.51	Ojanen 1983b
Oulu	laying	6 ♀	16.1±1.06	Ojanen 1983b
Autumn				
Gibraltar	departing	21	14.0±0.28	Finlayson 1981
Portugal	just before departure		16.8	Bibby & Green 1981

Table 2. The weight (mean±*SD*) and percentage of lipids of female Pied Flycatchers at different stages of the year cycle. Percentage of lipids is calculated from fresh weight of female excluding the reproductive organs (see Ojanen 1983b).

Place and stage	*N*	Lipids g	Lipids %
Tauvo, arriving	7	1.9±0.53	14.0
Oulu, nest-constructing	3	1.6±0.56	10.1
Oulu, laying	6	1.1±0.30	7.1

billed Quelea *Quelea quelea*, Jones & Ward 1976), 2) they may collect only fat reserves (e.g. the Pintail *Anas acuta*, Krapu 1974), or 3) they do not collect reserves but feed on a high-quality diet (e.g. the Brown-headed Cowbird *Molothrus ater*, Ankney & Scott 1980).

The first type of strategy occurs in environments which are very unpredictable as in tropical savannas where the productive rainy seasons occur at irregular intervals, or in areas which provide very little food early in spring for females intending to lay and incubate. The last-mentioned type is found e.g. in the high arctic and there, for example, the Lesser Snow Goose *Anser caerulescens* lays the eggs and incubates partially or totally using the reserves collected previously at wintering or resting places (e.g. the review of Drent & Daan 1980). The second strategy occurs in environments where birds confront special difficulties during the early phase of breeding. Using lipid reserves females of this strategy are able to collect special food items, e.g. those rich in protein or calcium (Krapu 1974, Jones & Ward 1976, Schifferli 1977, Fogden & Fogden 1979). The birds of the second strategy thus compensate for the loss in general feeding time by using lipid reserves while searching for these special items. The third strategy is apparently rare.

Pied Flycatcher females represent the second strategy described above. They used part of the reserves during the nest-building phase, which at the Oulu area follows rapidly after arrival. As there are few natural holes in the modern cultivated forests in the Oulu area, competition for suitable nesting holes is strong at the time when the females arrive. Rapid pairing in such situations is essential and females arriving early have an advantage over those arriving later.

Another important consideration is the rapid onset of nesting activities as the summer schedule is hectic. The lipid reserves collected during the latest phase of arrival allow a rapid start of nest-building and also help when special food items, especially snail shells, are collected. Arriving with plenty of reserves thus assists with energy requirements for competition over nest-holes and for a rapid onset of breeding activities.

An early start to breeding also decreases the possibility that breeding and moulting or moulting and autumn migration could overlap which would cause extra stress. Increased stress during breeding is shown to decrease the residual reproductive value (RRV, see Pianka 1976) in the Pied Flycatcher (Askenmo 1979). This decrease in the RRV may be the most relevant cause for arriving with large reserves in spring in the Pied Flycatcher.

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