Breeding data for the Pied Flycatcher *Ficedula hypoleuca* in southernmost Sweden

HANS KÄLLANDER

KÄLLANDER, H. [Dept. of Animal Ecology, Ecology Building, S-223 62 Lund, Sweden] 1975. — *Breeding data for the Pied Flycatcher* Ficedula hypoleuca *in Southernmost Sweden.* Ornis Fenn. 52:97—102.

Data on start of laying, clutch size, and fledging success are given for nest-box populations of the Pied Flycatcher in various deciduous woods in Skåne (c. 55°40′N, 13°20′E) for the period 1969—1974. Some data from a pine wood are also included. The median date for the laying of the first egg was 27 May. Clutch size varied between 5.9 in 1970 and 6.8 in 1971 and 1972. The mean clutch size was 6.5 in deciduous woodland and about 6.2 in pine. Clutch size decreased by about 0.08 egg/day as the breeding season proceeded. Desertions and natural predation were negligible. For nests untouched by predators, nesting success amounted to 86 %, about a third of the loss being due to hatching failure.

The present paper presents basic breeding data for the Pied Flycatcher, *Ficedula hypoleuca*, such as clutch size and fledging success. They were obtained as a side result of a nest-box study of Great Tits, *Parus major*. I have considered their publication justified, e.g. as a contribution to analyses of geographical trends and variations in clutch size.

The data were collected in 1969—1974 in deciduous woods in SW Skåne, southernmost Sweden (c. 55°40′N, 13°20′E). A small material was also obtained from a study plot in a pine wood in the same region in 1971—1973.

The deciduous woods differ in size, age, and composition, some being rich oak-hazel, others being dominated by beech (for a description of the various woods, cf. KÄLLANDER in press). Despite this and the fact that the woods were included in the study for different numbers of years, the data from all the deciduous woods have been lumped in the following presentation. Although no significant differences were found between the woods, this does not exclude the possibility that differences may exist between, for instance, oak and beech or sycamore.

Work on the tits did not permit me to devote enough time to the flycatchers to avoid certain deficiencies in the material. Clutch size, for instance, was not determined for every clutch in every year and was missed almost completely in 1969. Nor was the number of fledged young determined for every brood. In some years more very late clutches may have been missed than early ones, but as very late clutches are rare, their influence on mean clutch size is small.

The nest-boxes were wooden boxes with a bottom area of 10 by 12.5 cm, and a circular 35-mm entrance hole 14.5 cm from the bottom. In all the woods there were about seven boxes/ha; usually a third of them remained unoccupied after all the tits and flycatchers had started breeding. The total number of boxes varied in different years, being slightly more than 550 in 1971, when

all the woods were included, and only some 225 in 1974. They were inspected on average every sixth day. Females were only occasionally taken and ringed.

Number of pairs, breeding density

In Linnebjer, a mature oak-hazel wood some 24 ha in size, the number of pairs in the six study years was about 16, 23, 31, 26, 31, and 45, giving a mean density of about 1.2 pairs/ha. In 1974 the number of boxes was increased in part of the wood, four pairs breeding in the new boxes.

The breeding density reached about 1 pair/ha in a 18-ha wood consisting of blocks of beech, sycamore, and oak-ash-alder, 1.4 pairs/ha in a similarly divided 17-ha wood, and 2.3 pairs/ha in a 5-ha beech wood. In the beech wood the birds presumably utilized hedgerows and tree stands nearby. In the pine wood the density in the nest-box area varied between 1.1 and 1.8 pairs/ha.

Desertions, predation

About 2 % of the nests were deserted after egg-laying had started. A Wood Mouse *Apodemus flavicollis* destroyed one nest, but otherwise predation does not seem to have occurred, with the remarkable exception of cats, which learnt to remove the lids from the boxes and caused losses in one wood in 1971 and 1972, and in another in 1973.

Time of breeding

The date on which the first egg was laid was calculated by assuming that one egg was laid each day. The earliest date for the first egg in several years, was 15 May. Since data from the egg stage are largely missing for 1969, I have used the observed or calculated hatching dates instead. When the clutch size is known, the date of laying of the first egg can be calculated with reasonable accuracy. The mean date for hatching was 14, 18, 7, 13, 9, and 12 June, respectively, for the years 1969—1974. Thus 1971 was the earliest year, which is also true for the pine wood. The onset of laying in the Pied Flycatcher did not correlate well with that of the Blue Tit, *Parus caeruleus* (KÄLLANDER in press), or that of the Great Tit (unpublished) in the same woods.

It is interesting to note that breeding is only a few days earlier in Skåne than at Lemsjöholm in Finland, 4°50′ north of my study area. Thus the median date for the laying of the first egg was ap-

TABLE 1. Clutch size of the Pied Flycatcher *Ficedula hypoleuca* in deciduous woods in southernmost Sweden 1970—1974.

Year	Clutch size 2	3	4	5	6	7	8	9	n	$\bar{x}$	S.E.
1970	1		5	10	34	13	2		65	5.89	±0.13
1971				5	28	46	14	1	94	6.77	±0.08
1972			1	2	8	19	7		37	6.78	±0.15
1973				6	31	24	4		65	6.40	±0.09
1974				4	19	31	4		58	6.60	±0.09
Total	1		6	27	120	133	31	1	319	6.49	±0.05
In %	0.3		1.9	8.5	37.6	41.7	9.7	0.3	100.0		

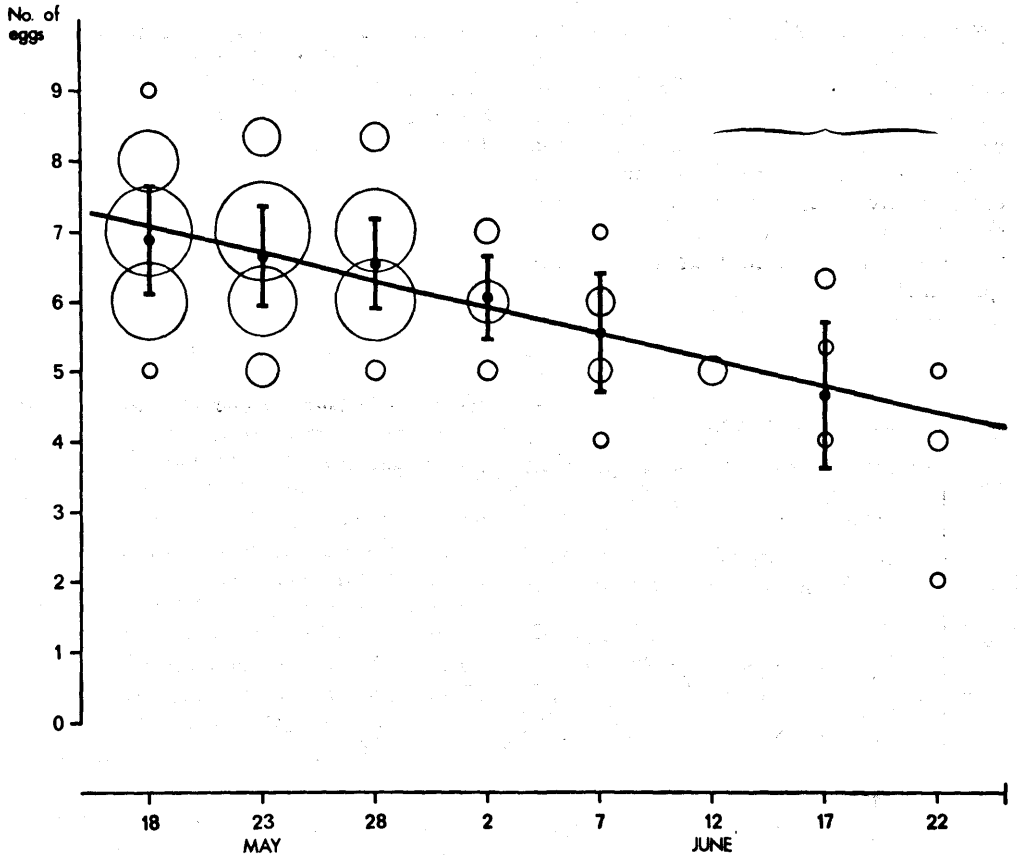

FIG. 1. The decline of clutch size with progress of the season in the Pied Flycatcher *Ficedula hypoleuca* in deciduous woods in SW Skåne, expressed in 5-day periods, the years 1970—1974 taken together. The size of the circles is proportional to the number of clutches in each category. Dots represent means for each 5-day period and vertical bars ± 1 S.D. The regression line, y = 7.44—0.08 x, is calculated from the means with 1 = 14 May.

TABLE 2. Number of fledged young in the Pied Flycatcher *Ficedula hypoleuca* in deciduous woods in southernmost Sweden 1969—1974.

Year	No. of fledged young 0	1	2	3	4	5	6	7	8	9	n	$\bar{x}$	S.E.
1969	1		2	1	1	11	29	10	1		56	5.68	±0.18
1970	2	3		4	14	25	39	11			98	5.17	±0.15
1971		1		7	7	17	21	14	4	1	72	5.56	±0.18
1972				2	4	5	13	15	2		41	6.00	±0.19
1973			2	1	2	11	20	20	1		57	5.93	±0.16
1974	3	1	1	2	7	9	22	15	2		62	5.40	±0.23
Total	6	5	5	17	35	78	144	85	10	1	386	5.55	±0.08
In %	1.6	1.3	1.3	4.4	9.1	20.2	37.3	22.0	2.6	0.2	100.0		

proximately 27 May for Skåne and 1 June for Lemsjöholm as calculated from data for the years 1941—1965 given by VON HAARTMAN (1969, p. 127). The earliest clutches were started in the same 5-day period, but the distribution of clutches over the season was slightly skewed to the left in the Scanian material compared to that from Lemsjöholm.*

Clutch size

The clutch size in the deciduous woods for the years 1970—1974 is given in Table 1. The mean clutch size for the whole period was 6.5 eggs. The series of years is, of course, too short to demonstrate the well-known relation between clutch size and mean laying date, but clutch size was only 5.9 in 1970,

* The very first clutch was commenced at Lemsjöholm on c. 13 (12—14) May 1975 (L. v. Haartman, personal communication).

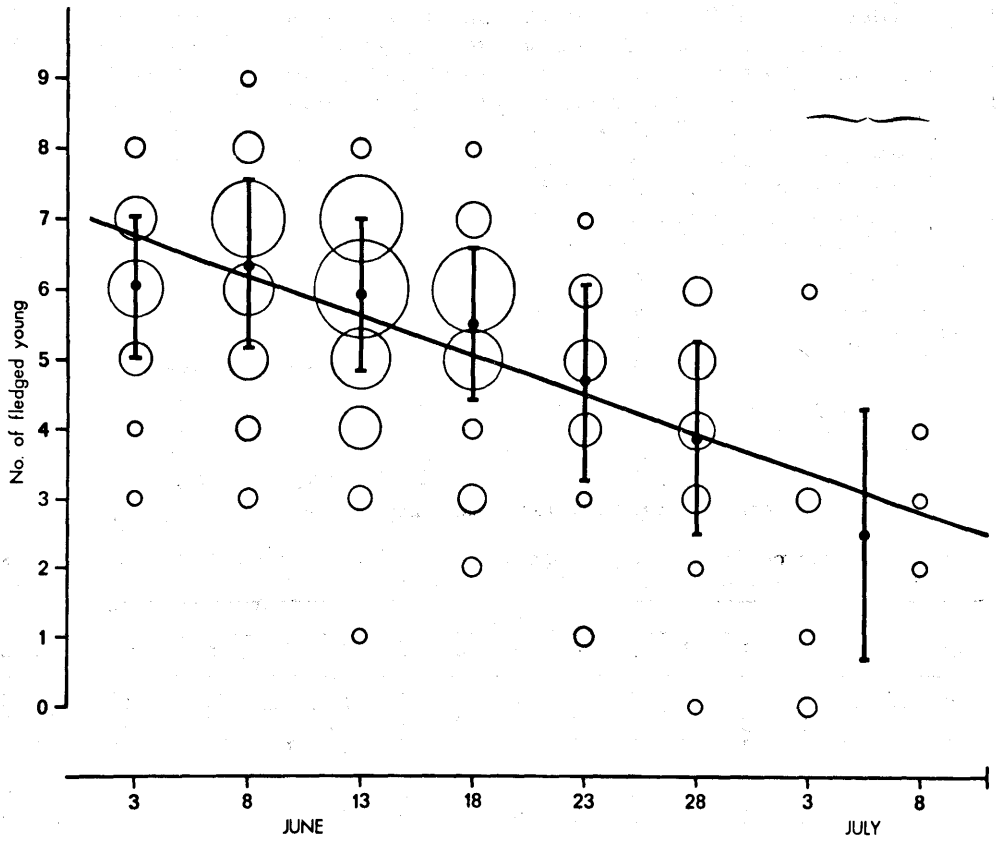

FIG. 2. The decrease in number of fledged young with progress of the season in the Pied Flycatcher Ficedula hypoleuca in deciduous woods in SW Skåne, expressed in 5-day periods, the years 1969—1974 taken together. As in Fig. 1, but with 1 = 1 June, y = 7.09—0.11 x.

the year breeding started latest, against nearly 6.8 in 1971, the earliest year, and in 1972.

The clutch size in the pine wood for the years 1971—1973 was 6.16 (S.D. 0.93, n = 31), and is significantly smaller than for the deciduous woods in the same years (6.65, S.D. 0.83; t-test, $p < 0.01$). This difference was not due to a later start of breeding in the pine wood. Although the number of clutches for the pine wood is small, the difference existed in all three years, which can be taken as additional evidence that the clutch size is really smaller in coniferous woods (cf. BERNDT & WINKEL 1967, CREUTZ 1955, LÖHRL 1965).

The decline of clutch size with the progress of the season is shown in Fig. 1. The linear regression calculated on the mean for each 5-day period gives a decrease of 0.08 egg/day, which is similar to data obtained elsewhere (ALERSTAM unpublished, BERNDT & WINKEL 1967, VON HAARTMAN 1967a, b).

Nestling survival

The number of fledged young per nest for the years 1969—1974 is given in Table 2; the nests suffering predation are excluded. On average, slightly less than one egg per clutch failed to produce a fledgling. Thirty-four per cent of this loss was due to eggs that failed to hatch, the rest to nestling losses. About half the missing nestlings were found dead in the nest and most, if not all, nestling mortality seems due to starvation. The fact that the regression line in Fig. 2, which gives the number of fledged young per brood against hatching date, is steeper than that in Fig. 1, is explained by the higher proportion of young starving to death later in the season. Little is known about the biomass of food in the woods at that time, but compared to the peak period of caterpillar abundance a few weeks earlier, both the ratio of chitin to digestible nutrients and the diversity of prey is higher, both factors almost certainly making the raising of young harder.

The mean number of fledged young in the pine wood was 4.79 (S.D. 1.72) for 29 broods in 1971—1973 against 5.79 (S.D. 1.36) for 170 broods in the deciduous woods in the same years (t-test, $p < 0.01$). This difference is partly due to the lower clutch size in the pine wood. The decrease in nestling survival as the season advanced was not statistically significant for the pine wood.

Selostus: Kirjosiepon pesimisestä eteläisimmässä Ruotsissa

Tutkimus suoritettiin Skoonessa (n. 55°40'N, 13°20'E) 1969—74. Pöntöt sijaitsivat sekä lehti- että mäntymetsissä ja tarkastettiin keskimäärin joka kuudes päivä.

Ensimmäisen munimispäivän mediaani oli 27.V. (1969—74). Pesyekoon keskimäärä vaihteli rajoissa 5.9 (1970) — 6.8 (1971, 1972). Keskimääräinen pesyekoko oli lehtimetsissä 6.5 ja mäntymetsissä 6.2, eron ollessa tilastollisesti merkitsevä. Pesyekoko väheni keskimäärin 0.08 munaa päivässä pesimiskauden edetessä. Pesimiskauden ero eteläisimmän Ruotsin ja Lounais-Suomen välillä oli yllättävän lyhyt (mediaanit 27.V. ja 1.VI.).

Pesyeiden hylkääminen sekä vihollisten aikaansaamat muna- ja poikastappiot olivat vähäisiä. Poikue tuotti keskimäärin 4.8 lentokykyistä poikasta mäntymetsissä, 5.8 lehtimetsissä. Pesissä, joista vähintään yksi poikanen tuli lentokykyiseksi, 86 % munista tuotti lentopoikasen. Kuoriutumattomat munat käsittivät n. kolmanneksen näistä tappioista.

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