

# Breeding biology of the Pied Flycatcher *Ficedula hypoleuca* in eastern Finland

SEPPO PASANEN

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Altogether 119 nests with eggs (115 completed clutches) were studied in Lieksa (63°30'N, 29°40'E), E Finland, in 1972—75. The clutch size averaged  $6.08 \pm 0.09$  (S.E.). On average  $5.56 \pm 0.12$  young hatched (hatching percentage 91.3 %). After egg-laying had started, 16.0 % of the nests were deserted or destroyed by predators. The clutch size, the number of young hatched and the hatching percentage declined as the season progressed. Similar decreases have been noted in other Fennoscandian studies. Comparison of the results of these studies indicates that the clutch size of this species decreases northwards.

S. Pasanen, Department of Biology, University of Joensuu, Box 111, SF-80101 Joensuu 10, Finland

## Introduction

The breeding biology of the Pied Flycatcher *Ficedula hypoleuca* has been studied extensively (for references, see v. HAARTMAN 1967a, KÄLLANDER 1975), but mainly in the southern part of its range. The aim of this study is to provide some material on the breeding biology that may contribute to elucidate its geographical variation. The data were collected during the years 1972—75 in Lieksa, eastern Finland (63°30'N, 29°40'E).

## Study area and methods

The study area consists of two separate plots provided with wooden nest-boxes for small birds. One plot (A, 3.6 ha), situated by the lake Viekkijärvi, has fairly luxuriant woodland (mainly spruces, with some alders and birches on the shore). The other plot (B, 10.5 ha), situated near the village Koukokoski about 8 km from A, is covered with rich mixed forest of spruce and birch, with a small meadow (2.4 ha) in the middle of the plot.

The bottom of the nest-boxes measured  $10 \times 15$  cm, and the entrance hole (35 mm) was 15 cm from the bottom. The boxes were fastened on trees at a height of 1.5—2 m and at distances of about

30—50 m from each other. Plot A had 38 boxes (about 10.5/ha) and plot B 54 (about 6.7/ha). In addition, there were nine nest-boxes in a yard near plot B, so that the total number of nest-boxes was 101.

The date of the onset of egg-laying was calculated by assuming that one egg was laid each day. During the four years of study Pied Flycatchers laid eggs in 119 of the nests. Altogether 65 breeding females and more than 500 nestlings were ringed. The boxes were inspected regularly (at least once in 10 days) from late May to the end of July.

## Results

Egg-laying began in late May or early June, with little annual variation (Table 1). The mean date for the first egg was 6 June ( $n = 119$ ).

TABLE 1. Onset of egg-laying of the Pied Flycatcher in Lieksa ( $n =$  number of nests with eggs).

Year	Range	Average	n
1972	26 May — 22 June	3 June	25
1973	24 May — 4 July	5 June	28
1974	1 June — 7 July	10 June	40
1975	27 May — 28 June	5 June	26

TABLE 2. Breeding density (pairs/ha) of the Pied Flycatcher in the two study plots (A 3.6 ha, B 10.5—2.4 ha).

Plots	1972	1973	1974	1975
A	3.33	3.61	3.61	3.61
B	1.36	1.85	3.09	1.60

The breeding density of the Pied Flycatcher was fairly high (Table 2); in plot A it was 3.54 pairs/ha, in B 1.98 and in the whole material 2.46 (meadow excluded).

Of the 119 nests with eggs, 19 were deserted or destroyed by predators before hatching. Thus the proportion of unsuccessful nests was 16.0 % (12.4, 7.4, 7.7 and 24.1 % in the years 1972—75 respectively).

The clutch size varied between 3 and 8, averaging  $6.08 \pm 0.09$  ( $n = 115$ ) and the number of young hatched varied between 1 and 7, averaging  $5.56 \pm 0.12$  ( $n = 100$ ) (Table 3). The clutch size (Table 4), the number of young hatched (Table 5) and the hatching percentage (Table 6) decreased towards the end of the breeding season. The hatching percentage in successful nests averaged 91.3 %.

Of the 65 females ringed in the course of the study four were found in subsequent years in the study area. Two females returned to the area in two consecutive years. All these females nested in the box in which they were ringed or one adjacent to it. It should be noted that since the fate of the females ringed in 1975 (25 birds) was not known, the return percentage must be calculated according to females

ringed in 1972—74: four of 40 ringed females, or 10 %, and two of four recovered females, or 50 %. A replacement clutch was laid only once, when the first was destroyed by a Wryneck *Jynx torquilla*. No recoveries were made of the young ringed in the area.

## Discussion

The onset of breeding in Lieksa was only a few days later than in S Finland and Sweden: on average, the first egg is laid on 6 June in Lieksa, on 1 June in Lemsjöhölm ( $60^{\circ}30'N$ ,  $22^{\circ}E$ ) (v. HAARTMAN 1969) and on 27 May in Skåne ( $55^{\circ}40'N$ ,  $13^{\circ}20'E$ ) (KÄLLANDER 1975).

The breeding density in the study area was fairly high. KÄLLANDER (1975) reports an average density of 1.2 pairs/ha from Skåne, but his values vary widely between the years (0.67—1.88 pairs/ha). The highest value in the material of KÄLLANDER (1975) is 2.3 pairs/ha in a beech wood. In the present study the breeding density in plot A was about 3.5 pairs/ha, which was evidently due to the excessive density of the boxes (see v. HAARTMAN et al. 1963—72).

LACK (1954, 1972) reported that in European passerine birds the average clutch size increases from the south and west to the north and east. It is difficult to compare the results of different publications, because the clutch size of the Pied Flycatcher clearly varies between different years (v. HAARTMAN 1969) and different habitats (BERNDT &

TABLE 3. Clutch size of the Pied Flycatcher in Lieksa and number of young hatched.

	1	2	3	4	5	6	7	8	n	$\bar{x} \pm S.E.$
Clutch	—	—	2	4	17	55	34	3	115	$6.08 \pm 0.09$
Brood	2	1	4	8	20	47	18	—	100	$5.56 \pm 0.12$

TABLE 4. Seasonal and annual variation in the clutch size of the Pied Flycatcher in Lieksa.

Date of the first egg	1972		1973		1974		1975		Total	
	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$
24—31 May	10	6.60±0.22	9	6.44±0.17	—	—	6	6.83±0.17	25	6.60±0.12
1—14 June	12	6.00±0.28	14	6.00±0.23	31	6.29±0.11	16	6.38±0.15	73	6.21±0.08
15—30 June	2	4.50	4	4.75±0.25	6	4.83±0.40	3	5.33±0.33	15	4.87±0.24
1—7 July	—	—	1	4	1	4	—	—	2	4
	24	6.13±0.22	28	5.89±0.18	38	6.00±0.15	25	6.36±0.14	115	6.08±0.09

TABLE 5. Seasonal and annual variation in the number of Pied Flycatcher young hatched in Lieksa.

Date of the first egg	1972		1973		1974		1975		Total	
	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$	n	$\bar{x} \pm S.E.$
24—31 May	10	6.30±0.21	7	6.14±0.26	—	—	6	6.17±0.31	23	6.22±0.14
1—14 June	10	5.70±0.26	14	5.43±0.36	28	5.85±0.17	10	5.30±0.83	62	5.66±0.15
15—30 June	1	3	3	4.33±0.67	6	4.17±0.65	3	4.33±0.88	13	4.15±0.37
1—7 July	—	—	1	4	1	4	—	—	2	4
Total	21	5.86±0.22	25	5.48±0.25	35	5.51±0.21	19	5.42±0.34	100	5.56±0.12

WINKEL 1967, KÄLLANDER 1975). VALANNE et al. (1968) show that the clutch size of the Pied Flycatcher is smaller in Lapland than in southern Finland. Table 7 lists the Scandinavian results from the south to the north. According to these data, the clutch size of the Pied Flycatcher seems to decrease towards the north. Among the reasons for this could be the changes in the laying dates, habitats and altitudes occurring towards the north, but it is very difficult to say why just the Pied Flycatcher should be an exception to LACK's rule.

The decline of clutch size with the progress of the season has been found in many studies (BERNDT & WINKEL 1967, v. HAARTMAN 1967a, b, KÄLLANDER 1975). KÄLLANDER (1975) calculated that the rate of decrease in his area was 0.08 eggs/day. He also showed that the number of fledged young decreased still more steeply and attributed this to the higher proportion of young starving to death later in the summer. According to the present study the decline in fledglings is also partly explained by the decrease in the hatching percentage.

TABLE 6. Hatching success of the Pied Flycatcher in Lieksa.

Date of the first egg	1972		1973		1974		1975		Total	
	n	%	n	%	n	%	n	%	n	%
24 May — 31 May	10	95.5	7	93.5	—	—	6	90.2	23	93.5
1 June — 14 June	10	91.9	14	91.7	28	93.2	10	84.1	62	91.2
15 June — 30 June	1	100	3	86.7	6	86.2	3	81.3	13	85.7
1 July — 7 July	—	—	1	100	1	100	—	—	2	100
	21	93.9	25	91.9	35	92.3	19	85.8	100	91.3

TABLE 7. The clutch size of the Pied Flycatcher in different areas of Scandinavia.

$\bar{x}$	n	Coordinates		Source
		N	E	
6.49	319	55°40'	13°20'	KÄLLANDER 1975
6.22	88	58°	14°30'	JANSON 1960
6.31	64	59°	15°	ENEMAR 1948
6.30	1210	60°30'	22°	v. HAARTMAN 1969
6.38	460	61°	24°	v. HAARTMAN 1967b
6.11	355	62°15'	21°30'	Rosengren (ref. v. HAARTMAN 1967a)
6.08	115	63°30'	29°40'	present study
5.76	104	64°30'	19°	HANSON et al. 1966
5.2	53	69°	20°40'	VALANNE et al. 1968
5.5	47	69°25'	25°45'	Hildén (ref. v. HAARTMAN et al. 1972)

The hatching success of the Pied Flycatcher in this area was high — 91.3 %, calculated from the nests in which at least one chick hatched. VALANNE et al. (1968) reported that the hatching percentage of this species at Kilpisjärvi varied from 28.4 to 94.3 % in different years. They calculated this percentage from the number of eggs laid. The corresponding value in the present study is 78.4 % (556 young hatched from 709 eggs in 119 nests).

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### Selostus: Kirjosiepon pesimisestä Itä-Suomessa

Lieksassa (63°30'N, 29°40'E) tutkittiin vuosina 1972—75 kahta pöntötettyä kenttää, joissa pikkulinnunpönttöjä oli tiheässä (10.5 ja 6.7 kpl/ha). Munapesiä oli tutkimuskauden aikana yhteensä 119, joista 115 pesässä oli täysi munamäärä. Ensimmäinen munimispäivä oli keskimäärin 6.6 (1972—75, taulukko 1). Pesintätiheys vaihteli 1.36—3.61 paria/ha (taulukko 2). Keskimääräinen pesyekoko oli 6.08 ± 0.09 ja kuoriutuneiden poikasten määrä pesää kohti 5.56 ± 0.12 (taulukko 3). Tuhoutumisprosentti laskettuna pesistä, joissa muninta aloitettiin, oli 16.0 %. Kuoriutumisosuus laskettuna pesistä, joissa vähintään yksi poikanen kuoriutui, oli 91.3 % ja laskettuna munituista munista 78.4 %. Munamäärä, poikasmäärä ja kuoriutumisosuus alenivat muninnan viivästyessä (taulukot 4, 5 ja 6). Pohdintaosassa on koottu tulokset skandinaavisista tutkimuksista

(taulukko 7); näiden mukaan kirjosiepon munamäärä näyttää alenevan pohjoista kohti.

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