

# Breeding biology of the Siberian Tit *Parus cinctus* in northern Lapland

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JÄRVINEN, A. 1978: *Breeding biology of the Siberian Tit Parus cinctus in northern Lapland*. — *Ornis Fennica* 55:24—28.

The breeding biology of a population of Siberian Tits nesting in boxes was studied at subarctic Kilpisjärvi (69°03'N, 20°50'E) in 1966—77. The mean date on which the first egg was laid was 31 May. The mean clutch was 7.2, which does not differ significantly from the observations made in S Lapland. The incubation period averaged 17 days and there were 4.2 fledglings per nest. The species preferred luxuriant and open birch forests, and was not found in the least productive habitats. The Pied Flycatcher evicted the Siberian Tit from its nest five times, but a repeat clutch was observed only once.

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## Introduction

The breeding biology of the Siberian Tit is poorly known both in Finland and elsewhere. The scarcity of information is largely due to the species' restriction to the northern forests, where it has escaped the notice of ornithologists. Another factor which makes ornithological investigation rather difficult is the species' apparent preference of natural cavities to nest-boxes. The Siberian Tit was previously common in northern Finland (MERIKALLIO 1958), but has recently decreased very much, probably owing to extensive cuttings and other changes effected by forestry (O. JÄRVINEN et al. 1977, O. JÄRVINEN & VÄISÄNEN 1977).

20°50'E) in 1966—77. The vegetation is more diverse and richer at Kilpisjärvi than elsewhere in Finnish Fjeld Lapland, but the birches are only 4—8 m high. The climate is subarctic and rigorous. The average daily temperature does not rise above zero until early May; the snow in the birch forests melts at the beginning of June and the mean temperature in June is +8.0°C. During the breeding season there are often cold spells with occasional falls of snow. The sun does not set below the horizon between 21 May and 22 July. For a detailed description of the study area, see FEDERLEY (1972).

Kilpisjärvi lies near the northwestern boundary of the range of the Siberian Tit. All the nests were situated in nest-boxes 1—2 m above the ground; as LIND & PEIPONEN (1963) remark, at Kilpisjärvi the species is largely dependent on the availability of nest-boxes, as natural cavities are rare. The boxes were placed in birch forest at altitudes of 475—600 m, the upper boundary of the birch zone lies at 600 m. The distance between the nest-boxes was 20—50 m.

## Study area and material

My data were collected in mountain birch forest at Kilpisjärvi Biological Station (69°03'N,

## Results and discussion

Twenty nestings of the Siberian Tit were observed in 1966—77; this was

4.2 % of all nestings in the nest-boxes in the study area (the dominant species were the Pied Flycatcher *Ficedula hypoleuca*, 72.5 %, and the Redstart *Phoenicurus phoenicurus*, 20.4 %). The Siberian Tit usually nested in boxes with a small entrance hole (diameter 30 mm), but twice in boxes with a 45-mm hole. This indicates a significant ( $p < 0.025$ ) preference for boxes with small holes (expected ratio 12.6:7.4).

**Egg laying.** The date on which the first egg was laid by the Siberian Tit ranged from 17 May to 9 June, averaging 31 May ( $N = 13$ ). In southern Norway ( $62^{\circ}11'N$ ,  $9^{\circ}50'E$ ) the mean date of the first egg was 2 June ( $N = 4$ , HAFTORN 1973). Similarly, DEMENT'EV & GLADKOV (1970) report that laying commences at the end of May or the beginning of June. Accordingly, the variation in the start of laying between different areas seems to be small. However, the average dates recorded in Finnish Forest Lapland are slightly earlier (v. HAARTMAN 1969), and Mr. H. Lindén informed me that laying started on about 23 May in six nests at Meltaus in Forest Lapland ( $66^{\circ}55'N$ ,  $25^{\circ}15'E$ ). DANILOV (1967) and SLAGSVOLD (1975) point out that the retardation in the beginning of laying with increasing latitude is fairly small: birds breed at an earlier phenological stage in the north. This generalization also seems to apply to the Siberian Tit.

**Clutch size.** The size of the complete clutch could be recorded for 16 nests:

1966: 8 eggs	1972: 8, 9
1967: 4	1973: 4, 7
1969: 7, 7	1974: 7
1970: 5, 8, 9	1975: 10
1971: 6	1977: 8, 8

The average at Kilpisjärvi was thus  $7.19 \pm 0.43$  (S.E.). Clutch size and nesting success have been observed to be different in nest-boxes and natural holes

TABLE 1. Clutch size of the Siberian Tit at Kilpisjärvi in 1966—77 and in S Lapland.

	Clutch size								Total
	4	5	6	7	8	9	10	11	
Kilpisjärvi	2	1	1	4	5	2	1	—	16
S Lapland	—	3	6	6	8	5	1	1	30

(NILSSON 1975); too small boxes can decrease the clutch size, whereas natural holes are generally less well protected. The nest-boxes used at Kilpisjärvi are quite large, the basal area being about 80 cm<sup>2</sup>. Hence the clutch size and especially the nesting success observed at Kilpisjärvi are more probably too high than too low.

According to v. HAARTMAN (1969), the mean clutch of the Siberian Tit is 7.35 ( $N = 17$ ), the range being 5—11. His data come mainly from southern Lapland and natural cavities. v. HAARTMAN's data can be supplemented with the new nest card observations, and the nest-box data of PULLIAINEN (1977) and H. Lindén (unpublished) from Forest Lapland ( $N = 4, 3$  and 6, respectively). The new mean thus obtained is  $7.43 \pm 0.27$  (Table 1), which does not differ significantly from the average at Kilpisjärvi ( $t$ -test). Subarctic conditions apparently do not decrease the clutch size of the Siberian Tit in the same way as that of the Pied Flycatcher (VALANNE et al. 1968, A. JÄRVINEN 1978). The mean for the whole of Finland is  $7.35 \pm 0.23$ .

**Incubation and nestling periods.** The incubation periods observed were 16, 17, 18 and 18 days. The mean hatching date for seven nests was 22 June (range 14 June to 1 July). At Värriö ( $67^{\circ}44'N$ ,  $29^{\circ}37'E$ ) the average incubation period of three nests was 17 days (PULLIAINEN 1977). The incubation period at Kilpisjärvi and Värriö is about two days longer than in S Norway (HAFTORN

1971, 1973). According to DEMENT'EV & GLADKOV (1970), incubation lasts about two weeks. The daily incubation efficiency of the Siberian Tit is probably lower at Kilpisjärvi and Värriö than in more southern regions.

The female incubates most intensively when the weather is cold, but the more intensively she has previously incubated, the longer is the period off the nest (HAFTORN 1973). Similarly, the Willow Warbler *Phylloscopus trochilus* incubates for a longer continuous night period at Kilpisjärvi than in S Finland, but it seems to compensate the long nightly fast by taking a great number of short feeding periods in the daytime (PEIPONEN 1970).

According to v. HAARTMAN et al. (1967—72), the nestling period is 19 days ( $N = 1$ ). This is confirmed by PULLIAINEN (1977), whose observations were 19 and 20 days. The only record from Kilpisjärvi was an abnormal one: just one egg hatched and the nestling period was only 13 days. The small brood size must have shortened the nestling period, for the growth rate of the young partially depends on the amount of food received (e.g. KENDEIGH 1952:66).

*Nesting success.* The number of fledglings was 4.2 per nest (Table 2). This indicates that nesting success was relatively low, as has also been observed in the Pied Flycatcher and the Redstart at Kilpisjärvi (VALANNE et al. 1968, A. JÄRVINEN 1978). The main factor responsible for the poor nesting

TABLE 2. Nesting success of the Siberian Tit at Kilpisjärvi in 1966—77,  $N = 14$ .

	Total	Per clutch	%
Eggs	99	7.1	100.0
Hatched	77	5.5	77.8
Fledglings	59	4.2	59.6

TABLE 3. Habitat preference of the Siberian Tit at Kilpisjärvi in 1966—77. Preference has been so calculated that the effect of the different availability of the nest-boxes in different habitats has been eliminated. Availability is given as "nest-box years". The habitats are: ELiT = oligotrophic forest, EMT = oligo-mesotrophic forest, GDrMT = mesotrophic forest, TrGT = eutrophic forest (see KALELA 1961). Habitat productivity thus increases from ELiT to TrGT.

Habitat	Nest-boxes		Preference %
	Occupied	Available	
ELiT	0	173	0.0
EMT	5	691	16.4
GDrMT	12	618	44.2
TrGT	3	173	39.4
Total	20	1655	100.0

success is presumably the adverse climate (see e.g. VALANNE et al. 1968, FORMOZOV 1970).

*Habitat preference.* The Siberian Tit seems to prefer luxuriant, but fairly open birch forest (Table 3, GDrMT and TrGT); the thinned meadow birch forest (GDrMT) at Lake Kilpisjärvi was particularly favoured. In general, the best habitats are preferred at the periphery of the species' range (SVÄRDSON 1949, HILDÉN 1965). In Finnish Forest Lapland, the Willow Tit *Parus montanus* lives in luxuriant and the Siberian Tit in barren forest (v. HAARTMAN et al. 1967—72).

*Interspecific relationships.* The main competitor for nest-holes is the Pied Flycatcher, which is also stronger than the Siberian Tit (HAFTORN 1973). At Kilpisjärvi the Pied Flycatcher evicted the Siberian Tit from its nest five times, although there were plenty of free nest-boxes available. Only one repeat clutch was observed; a pair forced to leave a nest with eight eggs on 13 June 1977 moved to another nest-box 50 m away. The first egg was laid on 22 June, and three young fledged from the five eggs.

At Kilpisjärvi the laying of the Siberian Tit commences, on average, 15 days earlier than that of the Pied Flycatcher, which reduces interspecific competition (see v. HAARTMAN 1968). In early spring the nest-boxes are almost exclusively at the disposal of the Siberian Tit, because other tits are rare in the area: the Willow Tit has bred twice in the nest-boxes and the first known breeding of the Great Tit *Parus major* occurred in 1966 (VALANNE et al. 1968). However, TAST (1964) had already observed the latter species in 1961, and six pairs bred in 1973, which was a favourable year for the Great Tit (HILDÉN 1974). As the Great Tit and the Redstart preferred nest-boxes with a 45-mm entrance, they probably did not compete strongly for nest-boxes with the Siberian Tit.

*Acknowledgements.* Olavi Hildén, Olli Järvinen and Johan Tast read the manuscript and made suggestions for its improvement. Harto Lindén kindly allowed me to use his unpublished material from Meltaus.

## Selostus: Lapintiaisen pesimäbiologiasta Kilpisjärvellä

Lapintiaisen pesimäbiologiaa tutkittiin 1966—77 Kilpisjärvellä (69°03'N, 20°50'E), joka on kololintujen kannalta äärialueita. Pöntöt sijoitettiin tunturikoivikkoon linjoina, joissa pönttöjen etäisyys toisistaan oli 20—50 m. Pönttötyyppejä oli kaksi: toisessa lentoaukon halkaisija oli 30 mm ja toisessa 45 mm. Yleisimmät lajit olivat kirjosiippo (72.5 % pesistä) ja leppälintu (20.4 %). Lapintiaisen osuus oli 4.2 %.

Ensimmäinen muna munittiin keskimäärin 31.5. ( $N = 13$ ). Lajin levinneisyysalueen eri osissa muninta-ajat näyttävät poikkeavan toisistaan vain vähän. Munamäärä oli keskimäärin 7.2 ( $N = 16$ ), vaihteluväli 4—10. Munamäärä Kilpisjärvellä ei poikennut merkitsevästi pesyekoosta Etelä-Lapissa (taul. 1); koko suomalaisesta aineistosta ( $N = 46$ ) laskettu munamäärä on  $7.35 \pm 0.23$  (S.E.). Haudonta-ajan keskiarvo oli 17 vrk, pari vrk pitempi kuin Etelä-Norjassa. Ainoa havainto pesäpoikasajasta (13 vrk) koski epänormaalia tapausta, missä vain yksi muna kuoriutui.

Pesintätulos oli heikohko, keskimäärin 4.2 lentopoiikasta/pesä (taul. 2). Säätekijät vaikuttanevat ratkaisevasti huonoon pesintätulokseen. Lapintiaisen suosi rehevään ja aukkoiseen koivikkoon asetettuja 30 mm:n pönttöjä (taul. 3). Viidesti kirjosiippo häätii lapintiaisen pesältään, mutta tiaisit munivat uusintapesyeen vain keran.

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*Received October 1977*