Occurrence and breeding of the Little Bunting *Emberiza pusilla* in Kuusamo (NE Finland)

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The Little Buntings arrive in Kuusamo (NE Finland) on an average on June 6. In warm springs, the time of arrival is earlier and the number of individuals settling down in the area is greater.

Laying begins on an average on June 11, but the date varies, depending on the time of arrival. A second brood is often produced in July. The eggs are of two colour types. The breeding result is good: 76 % of the eggs produced young leaving the nest.

The Little Buntings bred in three different habitats, pine peat bogs, shore meadows with willows (fens), and moist birch forests. The vegetation cover above the nest was mostly 100 %. The nest cup was lined with dry leaves of *Festuca ovina.*

The first records of the breeding of the Little Bunting, *Emberiza pusilla* Pall., in Finland are from the years 1935 (PALMGREN 1936) and 1942 (KIVIRIKKO 1947), and, since the number of records has grown, the species is presumably still increasing in the westernmost part of its area (PALMGREN 1936, MIKKOLA & KOIVUNEN 1966).

Nowadays the Little Bunting is a regular but scarce breeding species in Northeastern Finland. The picture of its occurrence is, however, still unclear; there are few reports of observations at breeding time and very few of nests. The records of breeding birds made since 1956 are as follows (MERIKALLIO 1958, MIKKOLA & KOIVUNEN 1966, HAAPANEN et al. 1966, HIETAKANGAS 1967, TENOVUO 1969, VIRTANEN 1969 and v. HAARTMAN et al. 1972):

1956—60	21 (9 from a single excursion in 1957)
1961—65	19
1966—70	23 (20 from a single area in 1967)

The records for 1971—72 are still more restricted (HILDÉN 1973).

Until now, knowledge of the breeding biology of the Little Bunting has been based on observations made at single nests (ANDERSSON 1968, DEMENT'EV et al. 1970, v. HAARTMAN et al. 1972). In Finland only the first nest found in Kuusamo in 1964 has been described in detail (MIKKOLA & KOIVUNEN 1966).

This article presents data gathered in 1964—73 on the migration, occurrence and breeding biology of the Little Bunting in Kuusamo (NE Finland).

The observations were mainly made by P. KOIVUNEN with the help and advice of the two other authors. E. S. Nyholm is responsible for the data on the structure and site of the nests and the eggs; the other parts of the article were written by S. Sulkava. Several observations were also received from other ornithologists.

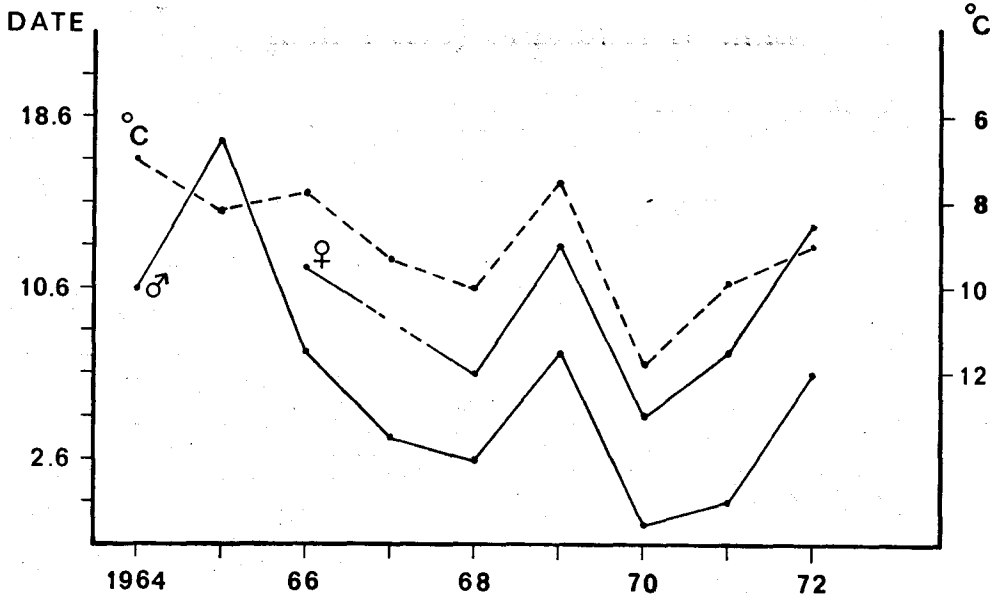

FIG. 1. Arrival of the Little Bunting in spring in Kuusamo and mean temperature of the period 26.5.—9.6. in Kuusamo in 1964—72.

The migration of the Little Bunting

In spring the Little Bunting is one of the latest migratory birds to arrive in Kuusamo. This is due to the long migration route from the east and southeast; in north Siberia it arrives in May, but it does not reach the breeding areas west of the Ural mountains before the beginning of June (DEMENT'EV et al. 1970).

In Kuusamo in 1964—72 the first male was observed on an average on June 6, and never earlier than on May 30—31. The first females were seen 4—7 days later than the males (Fig. 1).

In spite of the late date, the arrival in Kuusamo depended on the average temperature around the beginning of June (May 26 — June 9) (Fig. 1); in cold springs it was often a week later than in warm springs.

The autumn migration seems to begin in August in Kuusamo, but several observations were made in September in 1970 (September 2—5, 1—4 ind., and September 4—26, 6 ind. on a weed meadow). In the north of the Soviet Union (Petšora) some observations were made in October (DEMENT'EV et al. 1970).

The Little Buntings of Northern Europe mostly migrate east and southeast in autumn (DEMENT'EV et al. 1970), but part of the population seems to migrate southwest (VOLSØE 1959 and v. HAARTMAN et al. 1972). According to the observations made outside the breeding area in Finland, mostly at bird stations (ANON. 1966 and 1969, HELO 1972, RÄSÄNEN 1965, PAASIVIRTA 1967, HILDÉN 1968 and 1969 and TENOVUO 1969), the migration towards the southwest proceeds slowly during August-November:

	VII	VIII	IX	X	XI
64—65°N	1	12	1	—	—
63°N	—	3	—	—	—
61°N	—	—	2	1	—
60°N	—	—	1	6	4

There are only three spring records and they are all from the first half of May (v. HAARTMAN et al. 1972), which indicates that the return from the southwest is also slow.

Development of the population near Kuusamo village in 1964—72

The main study area comprised the peninsula of Tolpanniemi and the shore meadows of the lake Torankijärvi (Fig. 2). The territories occupied by a pair or a single singing male were counted yearly. Two to three males often live near each other. The study area was enlarged in 1960—70, but the main area of Isosuo — Museum — West Toranki was investigated each year with equal care, and is treated separately.

The number of the observed territories increased in 1964—68 from two to nine. The population was most numerous in 1970; the main area contained 11 territories and the whole area 16. The population decreased in 1971—73 (Fig. 3).

In 1964—72 the number of territories was correlated with the mean temperature of the arrival time (May 26—June 9, Fig. 3). The Little Bunting is living at the border of its distribution area in Kuusamo and prolongation of the spring migration increases the number of individuals arriving there in warm springs.

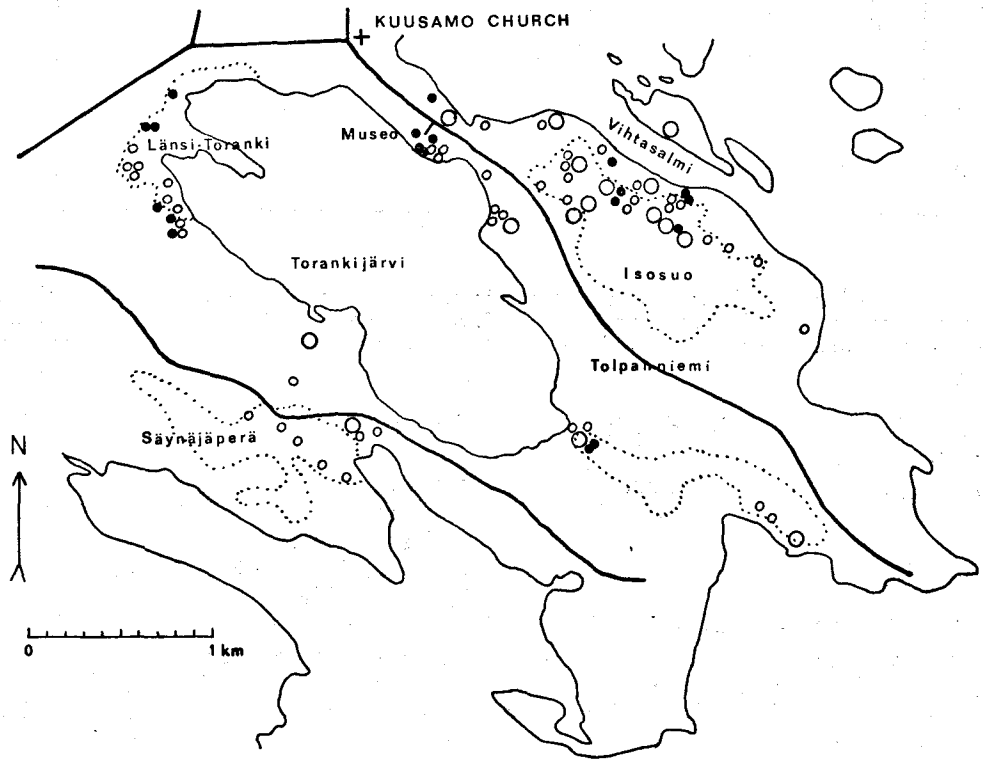

FIG. 2. Territories of the Little Bunting in the study area near the church village of Kuusamo in 1964—72. Black spot = nest, large circle = only fledglings found, small circle = male holding territory (or pair, nesting uncertain).

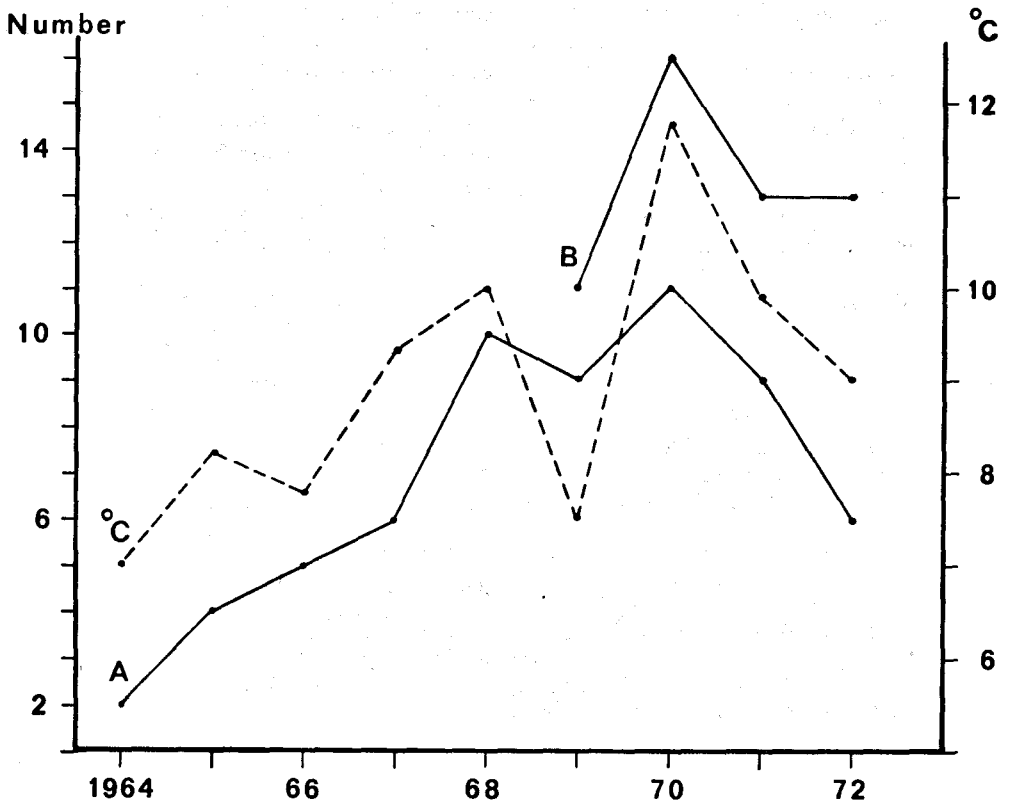

FIG. 3. Number of the Little Bunting territories in the study area and mean temperature of the arrival time (26.5.—9.6.) in Kuusamo in 1964—72. A = territories in the area of Isosuo — Museo — West-Toranki, B = territories in the whole study area (Tolpanniemi — Lake Torankijärvi).

In cold springs the migration is delayed and some of the birds probably start nesting before they reach Kuusamo.

Breeding season

Altogether 19 nests were found in the study area in 1964—72. Several were found so late that the laying-time had to be calculated from the hatching date of the young (Table 1). According to our observations, the incubation period was 11 days and the nestling period was 7.

The laying dates are divided between the first halves of June and July (Fig. 4), which shows that the Little Bunting often breeds twice in the summer. This is common in the north of the Soviet Union (DEMENT'EV et al. 1970). In Kuusamo 5 of the 21 clutches were laid in July (Table 1).

The laying of the first clutch began on an average on June 11. The earliest date was June 4 (1970) and the latest June 17 (1972). The start of breeding depends mainly on the time of arrival. On average laying began 6—10 days after the arrival of the males (Fig. 4).

Three of the July broods may be

TABLE 1. The nests of the Little Bunting found in Kuusamo in 1964—72. A = clutch size and B = brood size at moment of finding, C = full clutch size, D = number of unhatched eggs, E = number of hatched young and F = number of young leaving the nest.

Date	A	B	C	D	E	F
11.6.1970	6	—	6	—	6	6
12.6.1970	4	—	6	—	6	6
12.6.1971	3	—	3	—	3	3
14.6.1964	2	—	5	—	?	?
14.6.1971	6	—	6	—	6	5
17.6.1971	2	—	6	—	—	—
21.6.1968	5	—	5	—	—	—
24.6.1972	5	—	5	1	4	4
26.6.1970		6	6	—	6	6
26.6.1972	6	—	6	—	6	6
28.6.1969	6	—	6	—	6	6
29.6.1968	1	4	5	1	4	4
2.7.1966	1	5	6	1	5	—
2.7.1968		5	5	—	5	5
2.7.1970	6	—	6	1	5	5
3.7.1969	2	4	6	2	4	4
4.7.1964	1	—	5	—	5	5
9.7.1968	3	—	4	—	4	4
16.7.1969	2	—	4	—	—	—
17.7.1966	4	—	4	—	4	4
18.7.1972	3	—	3	—	3	3

renewals of destroyed broods, but two (1968 and 1969) were obviously second broods. Egg-laying began in them on July 6 and 14 (Fig. 4). When the female commenced her second brood, the young of the first one were in the care of the male.

Clutch size and nesting result

The clutch size of the June broods was

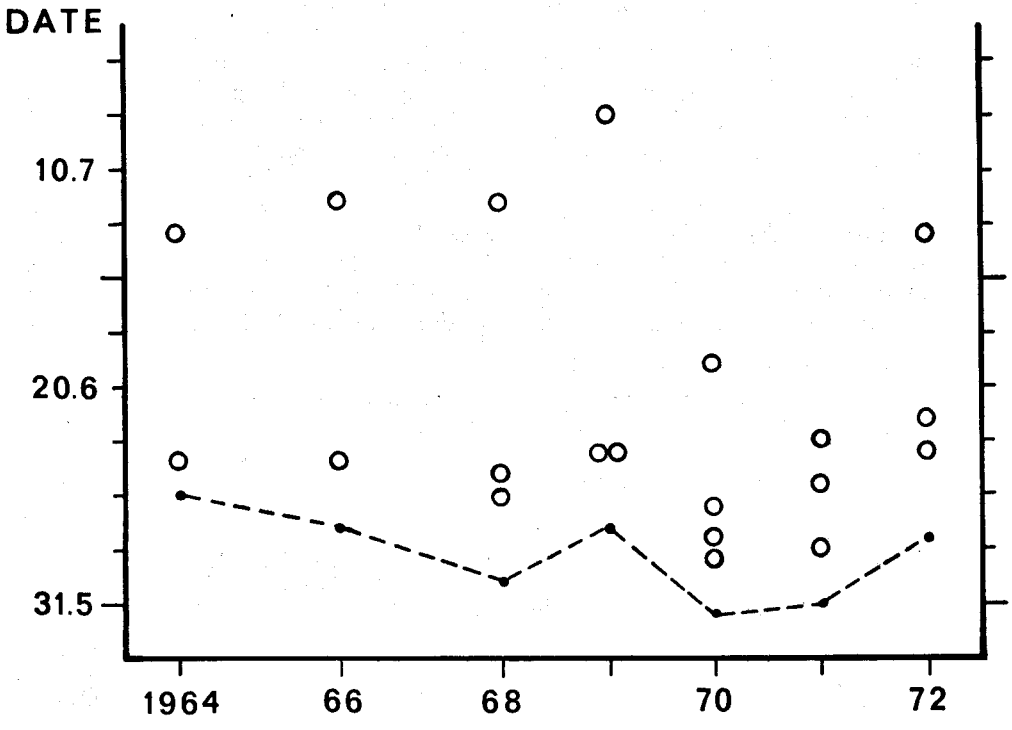

FIG. 4. Breeding time of the Little Bunting observed in Kuusamo in 1964—72. ———— = arrival of the first males in spring, o = laying date of the first egg of the clutches.

mostly six (10×6, 5×5 and 1×3), averaging 5.5 ± 0.20 (N = 16) (Table 1). In July the clutch size was significantly smaller (1×5, 3×4 and 1×3), averaging 4.3 ± 0.25 (N = 5). In the Soviet Union the clutch size of the eight June nests reported by DEMENT'EV et al. (1970) averaged 5.8 eggs.

Unhatched eggs (totalling 6) were found in five nests, and were still there 3—5 days after hatching.

Some data on the nesting result are given below, and corresponding information for the Reed Bunting (HAUKIOJA 1970) is provided for comparison.

Clutch size of "early" nests	5.5	(15)	5.2	(98)
Unhatched eggs %	5.8	(6)	9.4	(55)
Destroyed clutches %	14	(3)	53	(48)
Destroyed broods %	5	(1)	21	(11)
Young leaving nest, % of eggs	76	(107)	48	(288)

The nesting result of the Little Bunting population in Kuusamo may be regarded as very good. All the losses are considerably smaller than those of the Reed Bunting. The nesting losses of the Reed Bunting seem to be much larger than the losses of the Little Bunting in Kuusamo also. In the years 1966—1972, 37 % of the 30 nests found, mainly by P. Koivunen, were destroyed, as compared to only 20 % of the nests of the Little Bunting.

Colour and size of the eggs

In Kuusamo the eggs of the Little Bunting are of two types, dark and light ones. They occur in the ratio of 4:1. In spite of its rarity, the light type was observed in all three habitats used by the species. The colour types have not been described earlier.

Dark-coloured type: light greenish-grey ground marked with evenly spaced light brown stripes and dots, and grey blotches, and marbled with spots and rings of different colours, the general tone of the egg being grey or red-brown.

Light-coloured type: light greenish-grey ground with tar brown blots, stripes and rings, which are less numerous than in the dark-coloured type and are concentrated at the thicker end of the egg; light blue-grey blotches and underlying spots also scattered over the surface of the egg.

The eggs seemed to vary less in size and to be somewhat smaller in Kuusamo than those measured by WITHERBY et al. (1965) and DEMENT'EV et al. (1970). The eggs which did not hatch varied greatly in size, but weighed less than normal

TABLE 2. Egg measurements of the Little Bunting in Kuusamo in 1964—72 and figures given by WITHERBY et al. (1965) and DEMENT'EV et al. (1970).

All eggs:	Kuusamo 1964—72 Mean	Limits	N	WITHERBY et al. Mean	Limits	N	DEMENT'EV et al. Limits
Length mm	18.31	17.9—19.0	27	18.67	16.4—20.1	37	16.5—20.2
Breadth »	14.18	13.5—14.8	27	14.29	13.2—14.8	37	13.5—14.5
Weight g	1.75	1.49—1.93	36				
Unhatched eggs:							
Length mm	18.60	18.0—19.0	5				
Breadth »	14.20	13.5—14.8	5				
Weight g	1.46	1.32—1.66	6				
Shell weight g	0.12	0.11—0.12	4				

eggs (Table 2). The average weight of the egg-shell was less (0.11—0.12 g) than the weight given by KIVIRIKKO (1947) (0.13 g).

Nesting habitats

A botanical description of our study area was provided by Dr. T. Ahti (Museum of Botany, Helsinki University). The area lies in the northern boreal vegetation zone. The vegetation is influenced by the following factors:

(1) Succession is occurring from a more open stage, when meadows and fields covered a larger proportion of the land.

(2) Prolonged flooding occurs in spring, so that the area greatly resembles riversides in the north of the Soviet Union.

(3) The lowering of the lakes has made the shores more open.

The following vegetation zones may be distinguished on passing landwards from Lake Toranki:

(1) Emergent aquatic vegetation: extensive stands of *Equisetum fluviatile, Phragmites* and *Scirpus lacustris.*

(2) Flooded zone: wet eutrophic and mesotrophic alluvial fens near the water's edge dominated by *Carex aquatilis* and *C. rostrata.*

(3) Hardwood swamp zone: various combinations of many swamp types, often with high willow and birch thickets. These are usually mesotrophic or eutrophic (with grasses) and often flooded in spring.

(4) Deciduous forest zone: mostly birch-dominated forest (trees 4—8 m), with some spruces and pines. The bush layer is well developed, with abundant willows and junipers. The forest has usually become slightly swampy, with hummocks, and often grows on former fields. Many small fields in this zone have recently been abandoned.

(5) Coniferous zone: this begins 0.3—1 km from the lake shore. The coniferous forests are usually fairly dry heath forests of *Empetrum-Myrtillus* type (pine and spruce dominant). This zone contains the Isosuo bog of Tolpanniemi, which is a large oligotrophic bog complex of pine bogs and treeless fens.

Distribution of the nests in the study area

In the years 1964—1972, 19 nests were found in the study area (Fig. 2):

1964	1	1970	4
1966	2	1971	3
1968	3	1972	3
1969	3		

They were found by P. Koivunen (16 nests), T. Heikkinen (2) and H. Ketola (1). Two nests were found elsewhere in Kuusamo: in 1964 at Lake Kiitämö (S. Sulkava) and in 1968 in the village of Tammelankylä (E. Nyholm).

In the study area, breeding was concentrated in three areas: Isosuo-Vihtasalmi (nests mainly in pine bog), the Museum area (nests in birch forest and hardwood swamp) and the shore meadows (eutrophic fens) of West Toranki. In addition, two nests were recorded southeast of Lake Toranki (swampy clearing) and many territories were observed south of the lake in the area of the bog Säynäjäperä (Fig. 2).

The nests were distributed among the different vegetation types as follows:

Hardwood swamps	6
Pine bogs of fen type	5
Pine bogs with many dwarf shrubs	5
Treeless oligotrophic flooded fens	3
Treeless eutrophic flooded fens	2

The most favoured nesting habitat seemed to be pine bogs with abundant *Betula nana* in the field layer and some *B. pubescens* growing among the pines. The second most favoured habitat was wet shore meadow (flooded fen) with low willows and some birches. Typical plants of the field layer were *Rubus chamaemorus, Betula nana* and *Carex chordorrhiza* (Table 3).

Nest sites

The nests were most often situated on

TABLE 3. Structure of the vegetation around the nests of the Little Bunting in different vegetation types (trees > 2 m and bushes < 2 m in 100 sq.m and ground vegetation in 4 sq.m around the nest). The table includes only plant species covering at least 10 % of the ground surface around at least one nest.

Vegetation type Location	Pine bog Isosuo	Alluvial bog West Toranki	Alluvial fen Vihtasalmi	Birch forest Museum
Trees:				
Betula pubescens	5	15	—	60
Pinus silvestris	20	25	—	—
Bushes:				
Betula pubescens	—	15	5	10
Salix phylicifolia	—	—	50	45
S. lapponum	—	—	10	10
Juniperus communis	—	—	—	30
Pinus silvestris	10	—	—	—
Field layer:				
Rubus chamaemorus	70	65	—	—
Ledum palustre	30	—	—	—
Chamaedaphne calyc.	10	—	—	—
Betula nana	60	5	—	—
Vaccinium myrtillus	5	3	—	20
V. uliginosum	5	5	2	16
Melampyrum silvaticum	—	—	—	10
Equisetum silvaticum	—	—	—	15
Carex chordorrhiza	—	—	80	5
Carex sp.	—	—	15	—
Ground layer:				
Hylocomium proliferum	—	30	—	50
Pleurozium schreberi	10	—	—	—
H. splendens	—	—	—	20
Sphagnum parvifolium	90	—	—	—
S. warnsdorfianum	—	45	30	—
Campylium stellatum	—	20	50	5
Drepanocladus interm.	—	—	10	10
Dicranum undulatum	—	—	—	10

hummocks 10—30 cm high (12 of 21 nests). Eight nests were on even ground and one on the edge of a ditch.

The nests were usually well hidden. The cover of the field layer was 100 % in 15 cases (of 20), 90 % in two, and 80, 70 and 60 % in the other three. *Betula nana* was the commonest plant species sheltering the nests from above (50 % of the nests). The plant species (under 60 cm high) covering the nests were:

Betula nana	10
Vaccinium uliginosum	4
V. vitis-idaea	3
V. myrtillus	3
Rubus chamaemorus	3
Empetrum nigrum	2
Ledum palustre	2
Salix lapponum	2
Andromeda polifolia	1
Betula pubescens	1
Juniperus communis	1
Chamaedaphne calyculata	1
Sorbus aucuparia	1
*Pinus silvestris**	1
Gramineae	1

*A branch on the ground

The nests were mainly approached by the buntings from one direction. The distribution by direction of approach was as follows:

NE	8 nests	NW	3 nests
E	4 »	SE	2 »
N	3 »	S	1 nest

The nests approached from the northeast were open to the morning sun, but protected against noon and afternoon sun (no nests visited from SW or W). The north is significantly commoner as the direction of approach than the south ($\chi^2 = 5.88$, $P = 0.02$).

Size of the nest and building materials

Like those of the other buntings, the nest of the Little Bunting is open. The only measurements published are from the Soviet Union (DEMENT'EV et al. 1970) and from the first nest found in Kuusamo in 1964 (MIKKOLA & KOIVUNEN 1966). In the years 1964—72, 17 nests were measured in Kuusamo by the method of NYHOLM (1975). Their measurements (in mm) were as follows:

	Limits	Mean	N
Outer breadth	70—100	79	13
Outer height	40—77	48	12
Inner breadth	55—72	63	17
Inner depth	28—55	40	16
Wall thickness	2—7	5	13

The nests were measured when they contained eggs or small young. During the nestling period the measurements of the nest cup changes somewhat. For example, the inner breadth of the nest cup grew in three nests by 7, 10 and 18 mm.

The measurements given by DEMENT'EV et al. (1970) from the Soviet Union lie within the limits observed in Kuusamo.

The nest materials reported for the Little Bunting vary greatly; among the linings found in the nest cup are Reindeer hair (KIVIRIKKO 1947 and CURRY-LINDAHL 1968), thin straws and hairs (WITHERBY et al. 1965 and DEMENT'EV et al. 1970) and thin, dry grass (BROOD & SÖDERQUIST 1967). According to v. HAARTMAN et al. (1972), the nest is made of dry grasses and leaves of *Eriophorum vaginatum*.

Dr Leena Hämet-Ahti made a detailed analysis of the material of three nests from different habitats in Kuusamo. In Table 4 the building materials of the nest cup and of the outer part of the nest wall are given separately.

In all three nests *Festuca ovina* was used to line the nest cup, and a little *Calamagrostis purpurea* was used as well in the nest from July. The latter species was the main material of the outer part of the nest, and *Sphagnum girgensohnii* and *Salix phylicifolia* were also generally used.

The uniformity of the main materials of the analysed nests is remarkable, because the three nests came from different vegetation types. It is also notable that neither horse hairs nor other hairs were used, for these are often mentioned in the literature and Reindeer hairs are available in the study area.

The quantity of building material was examined in one nest situated in a hardwood swamp in the Museum area (June 1968). The nest size was near average. The number of different items utilized in this nest is given in Table 5.

The replacement nests (only two were examined) were flimsier than the first (in June) and true second (in July) nests. Noticeable differences were also found in the thickness of the bottom of the nest. In some cases the wetness and coolness of the nesting place seems to have caused the building of a remarkably thick bottom.

TABLE 4. Building materials of three nests from Kuusamo (*** = abundant, ** = some, * = scarce).

Month and year Vegetation type	July 1966 Pine bog	June 1970 Alluvial fen	June 1970 Willow-hard-wood swamp
Nest cup:			
Festuca ovina	***	***	***
Calamagrostis purpurea	*	—	—
Outer part of the nest:			
Calamagrostis purpurea	***	***	**
Sphagnum girgensohnii	**	**	**
Salix phylicifolia	*	—	*
Vaccinium vitis-idaea	*	*	—
Potentilla palustris	—	*	**
Betula pubescens (leaf)	—	*	—
Betula nana	—	*	—
Oxycoccus microcarpus	—	*	—
Polygonum viviparum	—	*	—
Carex juncella	—	—	*
C. aquatilis	—	—	*
C. caespitosa	—	—	*
C. rostrata	—	—	*
Pedicularis palustris	—	—	*
Salix lapponum	—	—	*
Cinclidium stygium	—	—	*
Aulacomnion palustre	*	—	—
Hylocomium splendens	*	—	—

TABLE 5. Material of a single nest from Kuusamo 1968.

	Number	Mean length mm	Total length m
Nest cup:			
Thin leaves of grasses	852	51.4	43.8
Outer part of the nest:			
Leaves of grasses:			
thin (< 2 mm)	821	79.9	65.6
broad (> 2 mm)	5	13.6	
Pieces of *Equisetum* stalk	18	31.0	
Inflorescences of *Calamagrostis purp.*	2	18.6	
Hylocomium splendens	10	8.2	
Leaf of *Vaccinium myrtillus*	1		
Total	1709		109.4

Acknowledgements

We wish to thank Dr. Teuvo Ahti and Dr. Leena Hämet-Ahti, who provided descriptions of the vegetation of the study area and analyses of the plant composition of the nests of the Little Bunting in 1966. Our thanks are also due to the ornithologists in Kuusamo, Kari Ervasti, Teuvo Heikkinen, Heikki Ketola, Tapio Majava and Matti Ryhtä, who placed their observations on the Little Bunting at our disposal.

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Selostus: Pikkusirkun esiintyminen ja pesintä Kuusamossa

Pikkusirkun muuttoa, esiintymistä ja pesimisympäristöjä sekä pesien sijaintia ja rakennetta tarkastellaan perustuen lähinnä aineistoihin jotka vv. 1964—72 on koottu 10 km²:n alueelta Kuusamon kirkonkylän kaakkoispuolelta (Kuva 2). Suurimman osan aineistosta on koonnut P. Koivunen.

Ensimmäiset pikkusirkkukoiraat saapuvat Kuusamoon keskim. 6.6.; tuloaika vaihteli 1966—72 30.5.—7.6. kevään lämpötilasta riippuen. Ensimmäiset naaraat havaittiin 4—7 päivää koiraita myöhemmin (Kuva 1).

Tutkitulle alueelle asettuneiden pikkusirkkukoiraiden (reviirien) lukumäärä vaihteli 1964—72 kahdesta kuuteentoista. Lukumäärä oli säännöllisesti lämpimien muuttokausien jälkeen suurempi kuin kylmien (Kuva 3).

Ensimmäisen pesueen muninta alkoi keskim. 11.6. ja vaihteli eri vuosina 6—15.6. muuton ajasta riippuen. Heinäkuussa tapahtuu usein toinen pesintä, jonka muninta on alkanut 6—14. 7. Munaluku on ollut kesäkuussa suurempi, 5.5, kuin heinäkuussa, 4.3. Pikkusirkun pesimistulos on ollut esim. pajusirkkuun verrattuna hyvä, 76 % munista on kehittynyt pesästä lähteviksi poikasiksi (pajusirkulla 48 %).

Pikkusirkun pesät yht. 21 sijaitsivat useimmiten koivukorvessa (6), rantaniittyä muistuttavalla tulvaletolla (5) tai isovarpurämeellä (5). Munia esiintyi kahta värityyppiä, tumma- ja vaaleapohjaista; vaaleassa tyypissä kirjailua oli vähemmän ja paksumpaan päähän keskittyneenä. Munat olivat mitoiltaan aikaisempien tietojen mukaisia, mutta kuoren paino oli hiukan pienempi (taulukko 2).

Pesät on useimmiten rakennettu mättäisiin (12 pesää) ja kohtisuora suoja ylhäältä oli 90—100 % (17). Pesien suojakasveista vallitsevin oli vaivaiskoivu. Kulku pesiin tapahtui useimmiten koillisesta (8) tai idästä (4); pohjoisenpuoleisista ilmansuunnista tapahtuva kulku oli merkitsevästi yleisempää kuin etelänpuoleisista.

Munavaiheessa olevien pesien mitat olivat keskimäärin: leveys 79 mm, korkeus 48 mm, pesämaljan halkaisija 63 mm ja sen syvyys 40 mm sekä pesän sisäseinän paksuus 5 mm.

Pesämaljan rakennusaineena oli käytetty lähes yksinomaisesti kuivia lampaannadan lehtiä, kun taas ulkokuoressa oli runsaimpana purppurakastikan lehtiä ja muista rakennusaineista säännöllisimmin rahkasammalta (Taulukko 4). Rakennusosia oli lähemmin tutkitussa pesässä kaikkiaan 1709 kpl.