

Autumn movements of the Long-tailed Tit *Aegithalos caudatus caudatus* L. at an inland locality in Central Sweden

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The Long-tailed Tit was recorded as an annual migrant during 13 autumns (1962—1974) in the northern part of Vänern, Central Sweden. About 4 000 birds were observed on passage, the estimated annual numbers varying between 50 and 100 (1967, 1971, 1974) and about 1 300 (1973). Migration peaks were noted at intervals of 3 to 4 years. Most birds (80—85 %) passed in October. In 1969—1974, when 1 264 individuals were ringed, nearly 67 % of the days with observations of the species were one-flock days. The trapping efficiency was high, and it was calculated that about 55—60 % of the observed birds were ringed. The proportion of ringed birds recaptured later in the study area was small; it averaged 2.3 % in 1969, 1972 and 1973. Most flocks consisted of 6—17 birds, and the majority of the flocks passed between 08 and 15 hours.

Introduction

In Sweden the Long-tailed Tit is known as an irregular autumn migrant. Most information on the movements has earlier been collected at the coastal bird stations in southernmost Sweden (EDELSTAM 1972, ULFSTRAND et al. 1974, Annual ringing reports from Ottenby, Torhamn and Falsterbo Bird Stations).

Normally the species either occurs in comparatively small numbers or is absent, but in certain years mass movements are recorded and several hundred individuals can pass a single observation point. It is supposed that during irruption years at least some of the invading birds in Scandinavia have a more easterly origin (DURANGO 1941, SVÄRDSON 1957). Almost all the Long-

tailed Tits recorded in Sweden belong to the subspecies *Aegithalos caudatus caudatus* L.

Observations at bird stations in Finland show that in its migration habits the Long-tailed Tit is a typical irruptive species (HILDÉN 1974). In the northwest part of the Soviet Union and along the southeastern coasts of the Baltic, observations and ringing work indicate much stronger migration activity than that reported from Fennoscandia (MESHKOV 1963, VEROMAN 1965, BIANCHI 1967, VILBASTE 1971, 1972, VILBASTE & KASTEPOLD 1973).

This paper describes some features of the autumn movements of Long-tailed Tits at Hammarö Bird Station (about 59°15'N/13°31'E), an inland locality in the northern part of Lake Vänern in the province of Värmland,

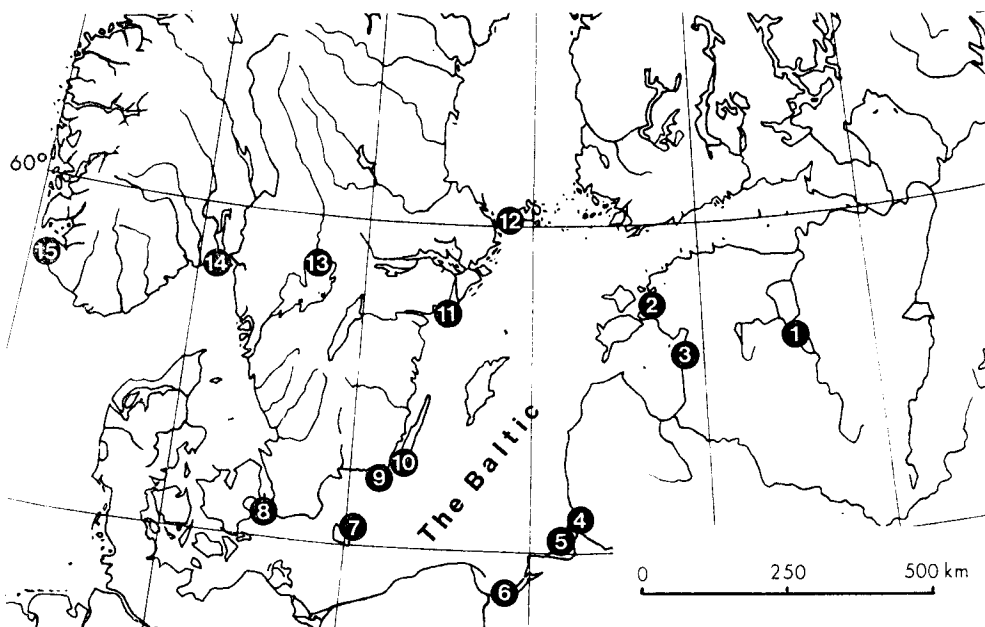


FIG. 1. Map showing the position of Hammarö Bird Station and other stations mentioned in the text.

- | | | | |
|-----------------|---------------------|-------------------|-------------------|
| 1. Mtezh | 5. Rybachi | 9. Torhamn | 13. Hammarö |
| 2. Puise | 6. Mierzeja-Wislana | 10. Ottenby | 14. Store Faerder |
| 3. Kabli | 7. Christiansø | 11. Hartsö-Enskär | 15. Revtangen |
| 4. Ventes-Ragas | 8. Falsterbo | 12. Signilskär | |

Central Sweden. Observations were made during a 13-year period (1962—1974), with more extensive studies in 1963 and 1969—1974. Information is given about ringing and recaptures, variation in flock size, diel patterns of migratory activity, seasonal differences in occurrence, and annual fluctuations in the number of observed birds.

Field-work and methods

The investigation was done on the southernmost part of Hammarön Island, off the north coast of Lake Vänern (Fig. 1). The study area (= trapping area) and the trapping work in 1969—1972 have been described in earlier papers (EHRENROTH 1965, 1973).

In 1962—1968 migration was studied with varying intensity. In 1963 daily observations were made from the early morning before sunrise to the middle of the day (normally to 12.00 or 13.00 hrs) throughout the autumn up to November 17, and in 1967 most of the same period was covered in a similar way. The data from 1962 and 1964 are particularly incomplete as there were few observation days during the late autumn. The scarcity of afternoon recording in 1962—1968 is an unfortunate deficiency. Most Long-tailed Tits were recorded in the study area between September 25 and November 10, and the number of observation days falling in this important period in the years 1962 and 1964—1968 were:

1962: 19 days (11 in Oct.)
 1964: 15 days (10 in Oct.)
 1965: 26 days (20 in Oct.)
 1966: 25 days (20 in Oct.)
 1967: 35 days (25 in Oct.)
 1968: 22 days (16 in Oct.)

1969: 4 100 net hours 1972: 2 500 net hours
 1970: 4 900 " 1973: 2 700 "
 1971: 4 700 " 1974: 2 000 "

The trapping effort in 1969—1971 and 1972—1974, described in net square metre hours, was around 288 000 and 285 000 respectively.

Large-scale ringing of tits started in 1969. All the Long-tailed Tits were trapped with mist nets at two permanent netting places, one in front of an old lighthouse on Fyrholmen Island (usually 3—4 nets) and the other between this small island and the mainland (usually 5—8 nets). The nets used had a mesh size of 15 mm; in 1969—1971 they measured 10 times 2.1 m, but from 1972 onwards most birds were trapped with nets measuring 12 times 3.3 m. The introduction of the larger nets and the cutting of vegetation in strategical places, attractive to forest-dependent migrants, made it possible to trap more birds with fewer nets in 1972—1974.

The trapping effort, expressed in net hours (= the number of nets used times the time in hours), during the period September 25 — November 10 in different years is given below (the figures also include the use of nets in forest vegetation, especially in 1969—1971):

Most of the flocks of Long-tailed Tits visiting the study area flew out to Fyrholmen Is., passed close by the lighthouse and later turned back northwards, which often gave the ringer two or three chances to trap a flock. Normally the moving flocks are rather dependent on small guiding-lines in the vegetation, trying to avoid even small open areas without bushes and trees. This habit, which is typical of many migrating tits of different species, is one important factor contributing to a good trapping result. Even if only a small part of a flock is trapped during the first seconds, the strong social behaviour of the species often makes it possible for the ringer to catch every or almost every flock member just by waiting at the nets. The contact calling from a trapped and bagged flock is sometimes enough to attract another flock to the nets.

In the calculations of the approxi-

TABLE 1. Numbers of *A. caudatus* ringed during Sept.—Nov. in the years 1969—1974 and latest records of the recaptured individuals. In 1969 the ringing work was finished on Oct. 20.

Year	Ringed birds	Number of flocks	Recaptured birds					Total ¹⁾	%	
			Number of days after ringing							
			1	2—7	8—14	15—35	232 331—351			
1969	96	8		3				3 (1)	3.1	
1970	29	3	1					1 (1)	3.8	
1971	42	4			6	9		15 (2)	35.7	
1972	232	22	2			1		5 (4)	2.2	
1973	827	77	8	1	2	7	1	19 (6)	2.3	
1974	38	6	3					3 (1)	7.9	
Total	1264	120	18		25		3		46(15)	

¹⁾ Figures in brackets show the numbers of flocks in which the retrapped birds were ringed.

mate annual totals of Long-tailed Tits passing in 1962—1968, use was made of material from 1969—1974, mainly ringing and recapture results. Most of the flocks visiting the area during the diel observation periods have certainly been noted in the station diaries, because the species is one of the conspicuous and, in most years, less frequent visitors.

Annual totals of Long-tailed Tits ringed in Sweden in 1960—1973 were obtained from the Bird-Ringing Office, Museum of Natural History, Stockholm. More detailed reports on the quantities and migratory periods of the species in 1972—1973 were collected from the following stations: Hartsö-Enskär, Ottenby, Torhamn and Falsterbo in Sweden, Store Faerder and Revtangen in Norway and Christiansø in Denmark (Fig. 1).

Information on winter weather in Central Sweden was taken from the monthly and yearly reports published by the Swedish Meteorological and Hydrological Institute.

Results

Ringing and recaptures

Since 1963 a total of 1 300 Long-tailed Tits have been ringed in the study area, most of them — 1 264 individuals from 120 flocks — in 1969—1974. During the last-mentioned period about 2 200 birds were observed on passage, which gives a trapping efficiency of 55—60 %.

The number of Long-tailed Tits ringed and recaptured during six autumns is presented in Table 1. Of the individuals ringed during autumns with considerable movements (1969, 1972, 1973), about 2.3 %, on average, were retrapped later in the study area. Only

TABLE 2. Total ringing of *A. caudatus* in Sweden in 1960—1973, the percentage ringed at the Swedish bird stations, and the percentage ringed at Hammarö Bird Station in 1969—1973.

Year	1960	1961	1962	1963	1964	1965	1966	1966	1967	1968	1969	1970	1971	1972	1973	1960—1973
Annual total	25	36	242	75	126	155	491	23	152	23	253	82	108	430	1707	3905
Bird stations (%)											78.7	79.3	69.4	89.1	91.4	
Hammarö (%)											37.9	35.4	38.9	54.0	48.4	

56.0

no regular ringing work

TABLE 3. Frequency of days with different numbers of observed flocks of *A. caudatus* in 1969—1974.

Number of flocks each day	1	2	3	unknown (2—4)	4	5	6	7	8
Number of days	74	15	7	5	2	3	1	1	3
Percentage	66.7	13.5	6.3	4.5	9.0				

six individuals from two flocks were retrapped twice.

The recaptures can be divided into three categories according to whether they were made within a week (39 %), after 2—5 weeks (54 %) and after more than 7 months (7 %). Of the three tits belonging to the third category, two were ringed in different flocks in October and November 1972 and recaptured in one flock almost one year later. The third tit was ringed on September 10, 1973 and retrapped on April 30, 1974, and another bird from the same flock was found dead 5 km N of the study area about 11 months after the ringing date.

The only long-distance recovery hitherto is a bird ringed on October 14, 1971 and found dead on April 7, 1974 about 105 km NE of the study area. One individual ringed on October 23, 1972 at Kabli, Estonia, was recaptured on October 23, 1973.

The total ringing of Long-tailed Tits

in Sweden in 1960—1973 is presented in Table 2. During the 5-year period 1969—1973 the bird stations ringed about 88.5 %, and of these 47.5 % were trapped in the study area and 21.7 % at Torhamn Bird Station. Most of the tits were ringed during the autumn.

Daily flock number and flock sizes

In the autumns of 1969—1974 the Long-tailed Tit was recorded on a total of 111 days. Only one flock was observed on two-thirds of these days and more than two flocks were recorded on about 20 % (Table 3). Daily numbers exceeding three flocks were recorded only in 1973 (and probably also occurred on a few days in 1963). If the extreme year 1973 is excluded, the proportion of one-flock days is almost 80 %.

The maximum daily number of

TABLE 4. Variation in flock size of *A. caudatus* during the autumn periods in 1969—1974.

Year	Frequency of flocks with different numbers of individuals									Total
	6—8	9—11	12—14	15—17	18—20	21—25	26—30	31—40	41—50	
1969	1	4	2	2	2	1				12
1970	1		2	1						4
1971		3	1							4
1972	5	11	6	2	3		1			28
1973	16	20	12	7	4	3	1	1	1	65
1974	7	1								8
Total	30	39	23	12	9	4	2	1	1	121
%	57		29		11		3			

Long-tailed Tits observed in 1973 was 114 (Oct. 14) and 90 individuals were ringed during the best trapping day (Oct. 16). During the irruption in 1963 the highest daily total recorded was 85 birds (Oct. 19).

As mentioned earlier, the trapping of Long-tailed Tits normally gives good opportunities to count all the individuals in a flock. Small and medium-sized flocks flying over open areas are also easy to count, while the exact number of birds in larger flocks is often difficult or impossible to determine. From a total of about 190 flocks observed in 1969—1974, the flock size was recorded for 121, mainly trapped, flocks (Table 4). About 86 % of the flocks contained 6—17 individuals ($\bar{x} \approx 10.4$). The highest number recorded in a flock was 49. The large flocks are slightly underrepresented in Table 4 for the reason mentioned above. Three small three-bird groups are excluded from the table owing to uncertainty whether they represented true flocks.

The comparatively few flocks examined in September comprised 7—16 birds ($\bar{x} \approx 11.0$; $n=13$). Flock sizes between 17 and 49 birds were noted only in October, and the average for all flocks studied during that period was 11.9 ($n = 103$). Information from November is scarce, but no flock exceeding 15 birds has been reported.

Diel patterns of migratory activity and flight behaviour

During six October periods (1969—1974) a total of 107 flocks of Long-tailed Tits were ringed in the study area. The distribution of trapping time for 100 of these flocks is presented in Fig. 2. Records of the time are lacking for two afternoon flocks on 13 Oct. 1972, the four flocks on 1 Oct.

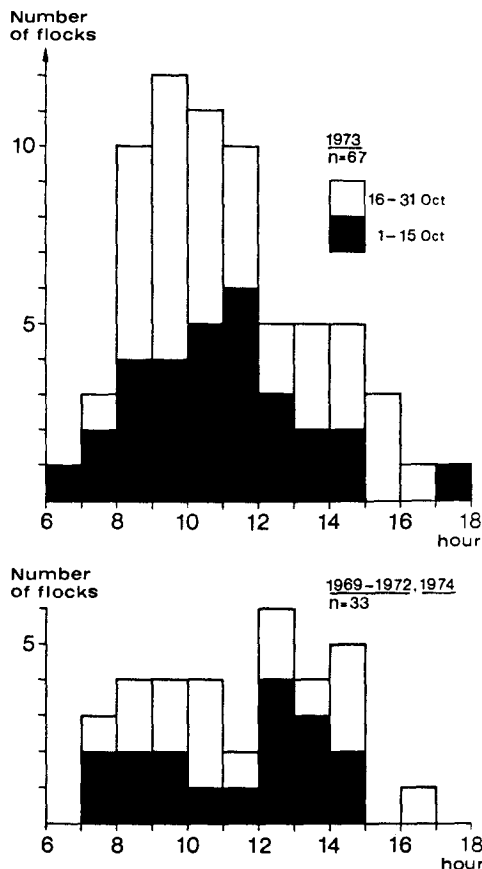


FIG. 2. Distribution of trapping time for 100 flocks of *A. caudatus* in October 1969—1974. Sunrise at Karlstad, close to the study area: Oct. 1 — c. 06.10, Oct. 31 — c. 07.20.

1973 and one flock on 30 Oct. 1973. In September 1969—1974 a total of 12 flocks were ringed and the trapping time noted for eight of them. The flocks were trapped between 08.45 and 15.00 hrs, almost every flock at a different time. Of the 108 flocks for which the trapping time was recorded in September—October, about 87 % were trapped between 08.00 and 15.00 hrs. 6.5 % at 06.00—08.00 hrs and 6.5 % at 15.00—18.00 hrs. During the large-

scale irruption in autumn 1973, a marked diel peak was noted at 08.00—12.00 hrs, when about 64 % of the ringed flocks were trapped. The result from this year differs from the observations in the other five October periods, when about 50 % of the flocks were trapped after midday.

The flocks of Long-tailed Tits normally moved at a low height, following the guiding-lines in the vegetation. Many flocks showed more or less pronounced migratory restlessness, but only a minority was observed migrating out over Lake Vänern. In two peak years, 1963 and 1966, with comparatively extensive observation activity, the migrating minority constituted 15—20 % of the total number of birds recorded. In 1963 most flocks took off at 07—11 hrs and in rather calm weather.

The great majority of the flocks observed in the study area turned back northwards.

On some mornings favourable for passerine migration, early flocks of Long-tailed Tits were noted flying at high altitudes, sometimes hardly visible. It was rarely possible to attract these flocks to the nets, and thus the category "early morning flocks" is probably somewhat underrepresented in Fig. 2.

Seasonal trends in occurrence

The passage periods of the Long-tailed Tit during seven autumns are presented in Fig. 3. Although a late autumn visitor, the species was often recorded during comparatively long periods. In

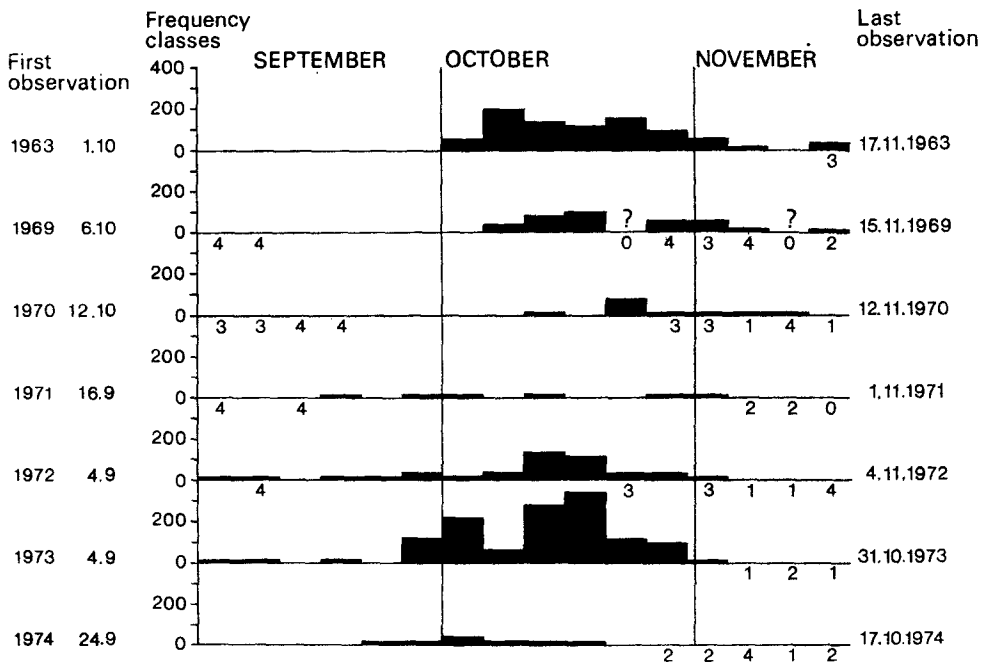


FIG. 3. Duration of passages of *A. caudatus* in 1963 and 1969—1974 and approximate numbers of birds observed in different pentades (frequency classes of 20 individuals). Figures below the horizontal lines show the number of observation days in pentades in which work was interrupted.

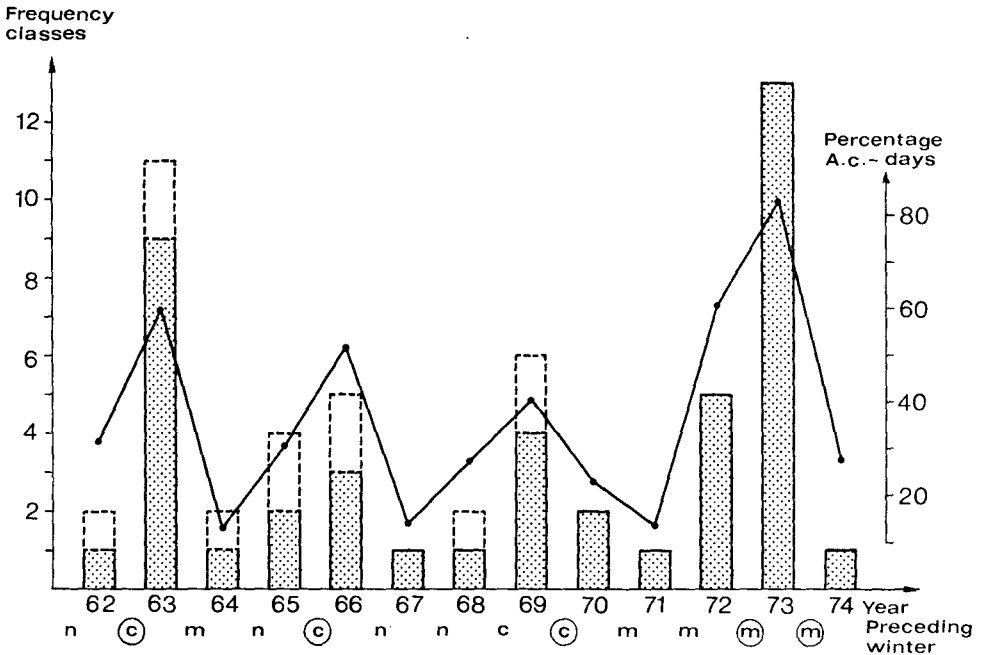


FIG. 4. Frequency of observations of *A. caudatus* in Sept. 25 — Nov. 10 in 1962—1974. Broken lines indicate that the total amount of individuals passing was probably higher than the observed number (further explanation in the text). The curve shows the amount of days with records of *A. caudatus* as a percentage of the total number of observation days in the period. The type of winter in Central Sweden in the preceding year is shown at bottom.

Frequency classes

13	1201—1300	6	501—600
12	1101—1200	5	401—500
11	1001—1100	4	301—400
10	901—1000	3	201—300
9	801—900	2	101—200
8	701—800	1	1—100
7	601—700		

Type of winter in Central Sweden

c within circle	— very cold
c	— rather cold
n	— normal
m	— rather mild
m within circle	— very mild

some irruption years the movement lasted for 1 1/2—2 months and even in years with small amounts of passing birds flocks were recorded during one month.

Considerable differences in the migration start were noted — the first flocks in 1972 and 1973 appeared almost one month earlier than in 1963 and 1969. With the exception of 1971, the majority of the tits always visited

the area in October (Fig. 3). Apart from the data for 1963, the information concerning the termination of migration is uncertain because of the irregular observations in November.

Outside the autumn season, the Long-tailed Tit was a rare visitor at the bird station and by no means an annual one. For the 13-year period 1962—1974, only 17 winter and spring observations were recorded, 7 of them in 1974 (Jan.

-1, Feb. -1, March -3, April -9, May -3). In most cases single birds or very small groups were observed. No Long-tailed Tits were reported during the two periods May 14 — September 3 and November 18 — January 19. Although breeding probably occurs regularly on Hammarön Is., the species has never been found nesting in the study area. In 1973 one pair raised a brood about 3 km NE of the station.

Annual fluctuations

The autumn totals of passing Long-tailed Tits observed in 1962—1974 varied between 50—100 (1967, 1971, 1974) and about 1 300 (1973). In Fig. 4 the totals from the period September 25 — November 10, when most individuals (>95 %) were recorded, are grouped in different frequency classes because no exact numbers are available. In several autumns the total of passing individuals was probably higher than the observed number for reasons mentioned in the description of the field-work. This unknown amount of passing birds is approximately indicated by broken lines in the figure.

Four peak years occurred in 1962—1974. The major peak in 1963 was followed three and six years later by two minor peaks, and the second major peak occurred four years after the preceding low peak. In 1972 the amount of passing Long-tailed Tits was roughly comparable with the numbers recorded in the minor peak years. The major peaks were clearly higher than the minor peaks.

Fig. 4 gives details of the winters in Central Sweden in the study period. The winters preceding three of the four peak autumns were cold or very cold, while in three years with minimum numbers of passing Long-tailed Tits

the preceding winters were normal, mild and very mild.

Discussion

Ringing and recaptures

Because of the high trapping efficiency for the Long-tailed Tit, certainly the highest for any species trapped at the station, the number of ringed individuals in the study area is a comparatively good measure of the relative amount of birds passing each season. In 1973 approximately 64 % of the observed tits were ringed, and the corresponding value in 1972 was 53 %. A much lower trapping efficiency could perhaps be expected for the species before 1972, i.e. before the strategical cutting of vegetation and change of net type. However, in 1969, when several flocks passed the trapping area, the ringing percentage for the birds observed in the autumn up to October 20 was no less. The ringing work was obviously terminated in the middle of the passage period of the Long-tailed Tit in 1969 (see Table 2), which explains the low annual number of ringed birds.

The large-scale ringing of Long-tailed Tits combined with the low number of recaptures at the ringing place indicates that most flocks passed on migration through the study area. The lack of long-distance recoveries a short time after the ringing date means that the migration directions of the flocks are unknown.

Apparently far fewer Long-tailed Tits are normally ringed on more or less isolated islands, or other places extreme for the species, than at bird stations on the mainland coasts or inland in Scandinavia (e.g. Torhamn, Hammarö). Even in a year with large-scale movements, such as 1973, comparatively small numbers were ringed

at Scandinavian bird stations: 45 at Revtangen, 41 at Store Faerder, 53 at Christiansø, 37 at Ottenby and 89 at Falsterbo. On the other hand, 224 individuals were ringed at Hartsö-Enskär the same autumn (NORD 1973).

Compared with the Swedish ringing results, the numbers of Long-tailed Tits ringed at stations along the south-eastern coasts of the Baltic are remarkably high. Within the work of the Estonian Section of Operation Baltic, extensive trapping of the species has been done at Kabli during recent years, and in the three autumns of 1970—1972 about 5 300 birds were ringed (VILBASTE 1971, 1972, VILBASTE & KASTEPOLD 1973). Of about 4 000 migrating individuals observed in 1971, over 2 500 were ringed. The trapping efficiency of about 64 % is the same as the corresponding value obtained at Hammarö in 1973.

Some of the flocks ringed at Kabli moved comparatively fast and were recaptured 8—10 days later at Mierzeja Wislana, Poland, 530 km SW of the ringing place. On average the birds migrated about 50—65 km per day (KASTEPOLD 1972). Possible movements from areas east of the Baltic to Scandinavia are indicated by the recapture of the Kabli bird at Hammarö 650 km WNW of the ringing place.

Daily flock number and flock sizes

In the study area, observations of flocks of Long-tailed Tits were usually scattered over several days, often only one flock being recorded each day, and accordingly the percentage of *A. caudatus* days is an acceptable measure of the intensity of the autumn passage. This method of describing relative annual fluctuations is demonstrated with the curve in Fig. 4.

The present differences in flock size

are in accordance with observations from other places in Fennoscandia. Twenty autumn flocks at Revtangen varied in size between 6 and 25 birds (BERNHOF-T-Osa 1964), 7 flocks at Rauma, on the Finnish west coast, contained 11—28 birds, and the flocks passing Signilskär normally consisted of 5 to 16 birds (LINKOLA 1961). From Sweden, DURANGO (1941) reported 36 flocks containing 3—17 individuals. Most of the small flocks with 3—7 birds were recorded in March—April. Flocks of 40—50 or more birds have been observed on very few occasions in Scandinavia.

Diel patterns of migratory activity

The literature contains little information on the diel patterns of migratory activity in the Long-tailed Tit. On one occasion (Oct. 6, 1966) 200 individuals passed an observation point at the Falsterbo Peninsula between 09.00 and 13.00 hrs (PERSSON 1972). With exception of 1973, the species usually occurred irregularly throughout the day at Hammarö (Fig. 2), apparently resembling the Willow Tit *Parus montanus* on passage through the study area (EHRENROTH 1973). The results show the importance of trapping and observation during all the hours of daylight for obtaining a reliable measurement of the amount of migrating individuals.

The concentration of passing flocks to a clear peak in the morning in 1973 is of special interest. Similar trends have been demonstrated for *Parus major*, *Parus caeruleus* and *Parus ater* at Col de Bretolet, an alpine pass in Switzerland (WINKLER 1974).

Seasonal trends in occurrence

Writing on the migration of the Long-

tailed Tit at Falsterbo, ULFSTRAND (1962) remarked that "the movements tend to be late and of short duration". The migratory periods at different Scandinavian bird stations in 1972 and 1973 ranged between 16 days (at Store Faerder 1973) and about two months (at Ottenby 1972). The onset of the autumn movement in 1973 varied widely between stations: Hammarö Sept. 4, Torhamn Sept. 8, Ottenby Sept. 16, Hartsö-Enskär Sept. 23, Falsterbo Sept. 30, Store Faerder Oct. 1, Revtingen Oct. 6 and Christiansø Oct. 8. At the Swedish stations migration terminated in late October.

At Finnish bird stations the average dates for the start, peak and termination of autumn migration in the Long-tailed Tit were calculated as Oct. 5, Oct. 20 and Nov. 10, respectively (HILDÉN 1974). This makes an average migratory period of about one month and a week. The corresponding value for the seven periods at Hammarö presented in Fig. 3 is about one and a half months.

Near Archangel in the Soviet Union, the migratory periods of the Long-tailed Tit in 12 autumns in the period 1945—1959 varied from 8 to 70 days, averaging one month and almost one week. In six autumns migration started in mid-September, and during the other six seasons the first birds appeared at the beginning or middle of October (V. Y. B a r o v s h c h i k o v a, according to BIANCHI 1967).

Although recording was incomplete in the study area in November, the material indicates that when migration started early it finished early, and vice versa. The possible relation between the start of breeding and the onset of autumn migration is worth a closer study.

Annual fluctuations

The investigation at Hammarö shows that several considerable autumn movements of the Long-tailed Tit occurred in the inland of Central Sweden during the period 1962—1974. The fluctuations in the numbers of passing individuals recorded in the study area support the general view that *A. c. caudatus* is a typical irruption bird (cf. LINKOLA 1961, SVÄRDSON 1957, HILDÉN 1974).

The numbers of observations missed in certain years are of course difficult to evaluate exactly, especially for the years 1962 and 1964, and therefore the broken lines in Fig. 4 are chiefly intended to indicate the possible passage of flocks each autumn outside the observation periods. But although the material for several years is somewhat uncertain, it is possible to recognize characteristic trends in the annual fluctuations, and these are paralleled by the curve showing the frequency of days with records of Long-tailed Tits calculated as a percentage of the total number of observation days in the period September 25 — November 10.

Comparison of the annual variation in the records of Long-tailed Tits passing Hammarö with observations at other Swedish bird stations, shows that most of the peaks were noted in the same years. The total numbers ringed in Sweden (Table 2) indicate peaks in the years 1962, 1966, 1969 and 1973. However, large-scale migration may sometimes occur in more restricted areas, as in 1963. Besides the major peak recorded at Hammarö in this year, about 180 birds visited Revtingen (BERNHOF-OSA 1964), and at Örudden, south of Stockholm, 198 birds were observed migrating southwest during six days in October (A r n e L u n d b e r g pers. comm.); but no irruption

was reported from Finland (HILDÉN 1974) and only three flocks appeared at Falsterbo (Roos 1965). Comparatively few Long-tailed Tits were ringed in Sweden in 1963, but that year hardly any ringing work was performed at Hammarö.

According to LACK (1954), the proximate factor causing big emigrations of irruptive species may be the large number of individuals, and the ultimate factor food shortage. Although information on the food choice of the Long-tailed Tit is incomplete, the species is regarded as mainly insectivorous, thus differing in its diet from most other irruptive passerines in northern Europe (cf. ULFSTRAND 1963). If food shortage is the ultimate factor causing large-scale migration of the species, it is still unknown on which basic food the populations are dependent (cf. SVÄRDSON 1957).

An important factor for the population development in several bird species wintering in northwestern Europe is the weather. During severe winters the number of Long-tailed Tits may be greatly reduced over large areas (LACK 1954, HILDÉN & KOSKIMIES 1969). After a hard winter one might expect a small number of breeding pairs and correspondingly few flocks on the autumn migration. But the observations at Hammarö do not support this assumption.

The 1959 irruption in northwestern Europe

Many of the Long-tailed Tits involved in the large-scale movement reported in 1959 from the northwest part of the Soviet Union were supposed to originate from the Vologda Region, the southern part of the Archangel Region and areas further to the east. The

flocks normally flew in a westerly or southwesterly direction, but occasionally also to the northwest (BIANCHI 1967). Apparently the majority of the flocks moved through Estonia and continued southwestwards. From Mtezh, close to the Estonian border, MESHKOV (1963) reported a remarkable mass movement — 13 375 individuals passed the observation place, most of them during the two first days in October. According to VEROMAN (1965), the species occurred in large numbers at several places in the southeast of the Baltic area, e.g. Puise and Rybachi. Mass movements of the Long-tailed Tit along the southeast coast of the Baltic were also observed in different autumns during the first half of the 20th century, e.g. at Ventes-Ragas (Windenburg) (DROST & SCHÜZ, according to DURANGO 1941). Probably the individuals of *A. c. caudatus* occasionally recorded in the British Isles (WITHERBY et al. 1943) originated from flocks following this important migration route.

The 1959 irruption was recorded in several places in Fennoscandia also, although the number of birds was much smaller. Many flocks passed Signilskär (LINKOLA 1961), and in the Kalix area the Long-tailed Tit was observed almost daily during the autumn migration, flying south-southwest in flocks of about 10 to 20 birds (LUNDBERG 1960). One individual ringed at Rybachi on 11 October 1959 was recaptured 8 days later at Falsterbo (PAEVSKII 1973), which indicated that some flocks invaded Sweden from the south.

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Selostus: Pyrstöiaisen syysvaelluksista Keski-Ruotsin sisämaassa

Pyrstöiainen todettiin jokavuotiseksi vaeltajaksi 13 syksynä (1962—74) Hammarön lintu asemalla Vänerin pohjoisrannalla. Yhteensä n. 4000 yks. havaittiin tänä aikana, mutta määrä vaihteli vuosittain jyrkästi: vähimmillään 50—100 (1967, 1971, 1974), enimmillään 1300 (1973). Esiintymisessä toistui huippu aina 3—4 vuoden välein, kahden suurimman vaelluksen väli oli 10 vuotta.

Pääosa (80—85 %) linnuista vaelsi lokakuun aikana (kuva 3). Syksyinä 1969—74, jolloin rengastettiin kaikkiaan 1264 yks., nähtiin kahtena kolmasosana havaintopäivistä yksi ainoa parvi (taul. 3). Pyyntiteho oli hyvä, sillä 55—60 % havaituista

linnuista saatiin verkkoihin. Rengastetuista yksilöistä keskim. vain 2.3 % kontrolloitiin alueella myöhemmin. Useimmissa parvissa oli 6—17 lintua (taul. 4), ja pääosa niistä ohitti havaintopaikan klo 8—15 (kuva 2).