Group nesting and the breeding season of the Linnet *Carduelis cannabina* in Finland

JOHAN TAST

The main objectives of this paper are (1) to record some social aspects of the nesting habits of Finnish Linnets *Carduelis cannabina* and (2) to investigate their breeding season. As the ecology of Linnets has been studied in Great Britain by NEWTON (1967, and in prep.), it has been possible to make comparisons with results already obtained.

In Finland the Linnet is at the northernmost limit of its breeding range (e.g. VOOUS 1960). The breeding population is small. MERIKALLIO (1955, 1958) estimated that there are about 2500 pairs breeding in Finland. In southern Sweden Linnets breed in abundance. For example, at Falsterbo in south-western Sweden, more than 70 000 migrating Linnets were observed in the autumn of 1955 (ULFSTRAND 1959), a figure which may be compared with the estimated total Finnish population. In large areas of Europe, including Great Britain, Linnets belong to the most numerous breeding passerine birds. Thus, birds studied by me belong to a border population, while those investigated by NEWTON, on the contrary, belong to populations living in more optimal central parts of the breeding range.

Investigations

The field investigations have been carried out mainly at Tampere (61°30'N; 23°50'E) and its neighbourhood. I have received valuable assistance from several of my pupils.

In addition, many ornithologists have placed their Linnet data at my disposal. I have also made use of the nest-cards collected by Societas Scientiarum Fennica.

ORNIS FENNICA Vol. 47:74—82. 1970

Group nesting

Size of breeding groups. — Mostly Linnets breed in small, loose groups. As examples, the following may be mentioned. In the Messukylä area, an eastern suburb of Tampere, there were in May 1967 two nesting groups, with 4 and 2 breeding pairs, respectively, and 3 pairs bred solitarily. At the Lielahti factories in the western parts of Tampere I have observed the largest group of breeding pairs simultaneously, viz. about ten, in three successive years.

Forming of breeding groups. — As to the mode of forming nesting groups, the following features have become apparent. When settling down to nest, Linnets are assumed to select their breeding sites from at least following stimuli:

1. open terrain
2. a suitable nest-site (e.g. a dense bush or tree, a wood pile)
3. some elevated points for singing males (higher trees, chimney stalks, electric wires)
4. feeding places in vicinity

Apparently there is also a social component involved, as Linnets seem to prefer habitats where there are already other Linnets breeding. I have many times searched for Linnets in suitable habitats without finding any, while in other similar places even in the close vicinity there were several pairs. Often breeding cycles of individual pairs within a nesting group are not well synchronized, there being a discrepancy of even some weeks between pairs nesting close

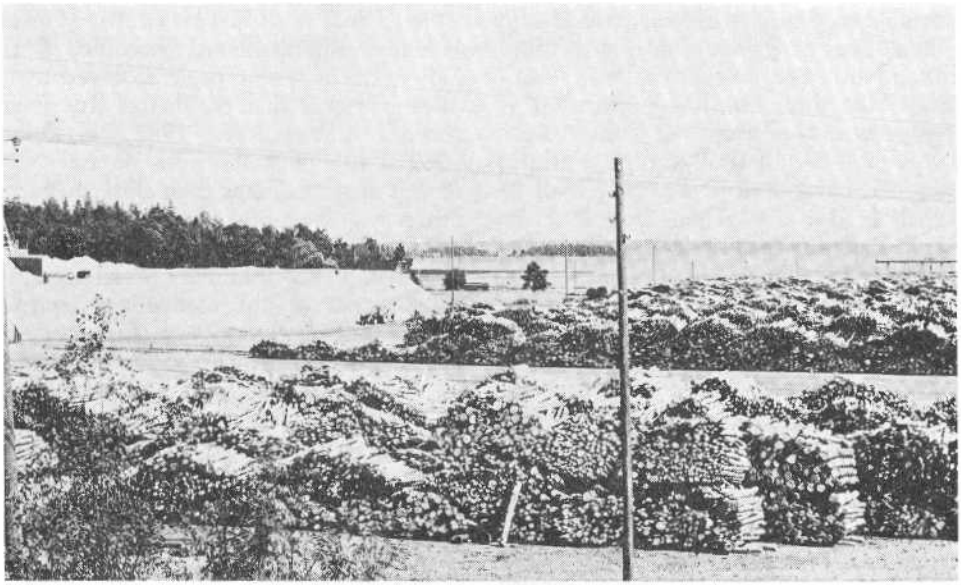

FIG. 1. Part of wood piles at Lielahti factories, Tampere. In these wood piles about ten pairs of Linnets have bred yearly. In the group of wood piles seen in the background there bred 4 pairs in June, 1969. (*Osa Lielahden tehdasalueen puupinoista Tampereella. Näissä pinoissa on vuosittain pesinyt kymmenkunta hemppoparia. Taustalla näkyvässä pinoryhmässä pesi 4 hemppoparia kesäkuussa 1969.*) Photo KARI PIETILÄ.

to one another. This probably means that in a place where one or some pairs have begun their breeding activities, pairs arriving later have joined such a group. In this way even a new breeding habit adopted by some individuals, may have spred among other adult birds, as suggested by the author (TAST 1968, p. 171) when discussing the change in the habitat selection of Linnets in Finland from rural to urbane habitats.

Asynchrony in breeding activities is apparent, for instance, in the following cases.

In the group of 4 pairs at Messukylä in May, 1967, there were two nests in the same spruce hedge close to one another. The laying of the first eggs took place in these nests on approximately April 20 (see pp. 77—78). In a third nest some 50 metres from the first two, egg-laying did not begin until May 10. Thus, in this nest incubation had just started, when the young left the other nests. Obviously this pair settled here drawn by those Linnets which lived there already. The fourth nest of this group was so placed that direct observations could not be made, but breeding in it probably started at the same time as in the two first-mentioned nests.

In nest-card data there are observations of Mr. T. Silvola, Lic. Phil. He found 4 nests at Halinen, in the vicinity of Turku, in May, 1955. In one nest incubation had already begun, when it was found on May 12; the latest possible date of the laying of the first egg is May 7. Three other nests were not yet completed by May 12. In two of the nests first eggs were laid on May 14, but in the fourth nest there were still no eggs on May 16.

In Finland Linnet populations fluctuate greatly from year to year. In my study areas, however, there is one place where the number of breeding pairs has been the same throughout the years I have counted them. In this place, the Lielahti factories, about ten pairs have bred every year in the early summer, nesting mostly in wood piles (Fig. 1). This was so even in 1968, when I was

not able to find any breeding Linnets in other places at Tampere during the first clutch, although a year before I estimated the total breeding population at Tampere to be some 40 pairs (TAST 1968, p. 166). In 1969, on the contrary, some 20 pairs bred at Tampere, half of which lived in the Lielahti area. It seems likely that this locality is the most suitable one for Linnets in my study areas at present, and hence it is the first occupied by them every spring. But it is likely that more than about ten breeding pairs exceeds the carrying capacity of this habitat, and as a consequence, other places are occupied by smaller colonies or single pairs.

Distance between nests. — The nests of individual pairs are often placed relatively close to one another. In Messukylä area there were in May, 1967, two nests in a spruce hedge placed ten metres apart. Similarly, at Lielahti factories in early June, 1969, there were three nests within a distance of about 20 metres in a wood pile group seen in Fig. 1.

And it seems possible that nests may be placed even closer to one another. At Virolahti village, L. Leikkonen found, in a hedge of *Caragana,* four nests in 1961 and in 1969 three nests which were occupied at the turn of June to July.

Although many Linnets breed in small groups, there are not infrequently pairs which breed in isolation. It is interesting to find that most single breeding pairs live in close vicinity to Greenfinches *Carduelis chloris.*

Discussion

Semi-colonial breeding which is characteristic of many species of birds has been discussed by BRAESTRUP (1953) and KALELA (1954). Among Finnish carduline finches, in addition to Linnets, Redpolls *Carduelis flammea* are known to breed in small groups (e.g. PEIPONEN 1962, 1967, HILDÉN 1969). However, simultaneously occupied Redpoll nests have not been observed at a distance closer than 30 metres from one another (PEIPONEN 1962, HILDÉN 1969). Linnet nests may be only 10 metres apart, perhaps even closer to each other.

In Great Britain, according to NEWTON (1967) Linnets breed socially as do most of the cardueline finches. There nesting groups of Linnets are largest among 9 finch species belonging to the Carduelinae-group, and sometimes up to several dozens of pairs may be involved with some nests only a few yards apart. NEWTON (in prep.) once found as many as 40 occupied nests in an area of gorse *Ulex europaeus* less than two hectares in extent. Group nesting among British cardueline finches is commonest in the Linnet, in the Redpoll and in the Twite *C. flavirostris* (NEWTON 1967).

The differences in the sizes of breeding groups of British and Finnish Linnets, as well as the common occurrence of solitary breeding in Finland, are probably due to the fact that we are dealing with a border population with small numbers of breeding pairs in our country. Reference may be made to corresponding observations of the well-studied Lapwing *Vanellus vanellus.* According to RINKEL (1940) it breeds in Holland almost exclusively in groups, as he saw only once a pair breeding alone during a study period of four years. Although the Lapwing also in Finland mostly breeds in groups, isolated breeding pairs are found relatively often (KALELA 1955).

In Finland single-breeding Linnets are found mostly living close to Greenfinches *Carduelis chloris.* The habitat requirements of the two species are rather similar, but it seems quite possible that there are social aspects involved. When a Linnet pair is searching for a

suitable nesting place, it will choose a place where there are Greenfinches, if no Linnet groups or individual pairs are in the vicinity, in the way corresponding to the well-known case of *Sylvia nisoria,* which, in border areas of its distribution range, often breeds in territories of *Lanius collurio* (e.g. CHRISTIANSEN 1944, SILVOLA & TENOVUO 1958).

Breeding season

Length of the breeding season. — To show the length of the breeding season of Finnish Linnets, the available records, presented according to the date of the first eggs laid, are given in the following tabulation.

There are only a few direct observations concerning the exact date of the laying of the first egg. However, in many cases this date can be estimated fairly accurately, as the Linnets, like most passerine birds, seem to lay one egg a day, and incubation is known to last from 10 to 14 days (e.g. GLUTZ 1962, v. HAARTMAN 1969). On the other hand, considerable errors may arise if the time of egg-laying is estimated on the basis of the date when young birds leave their nests, as the nestling time may vary up to a week (see below, and TAST 1968, p. 175).

First egg laid		Number of nests
April	16—30	13
May	1—15	68
May	16—31	45
June	1—15	34
June	16—30	24
July	1—15	15
July	16—31	7
August	1—15	4
		210

The egg laying of Linnets covers a period of approximately four months. The whole breeding season, including nest building, the total time of egg laying, incubation, and the nestling stage, must be about five months. However, probably no individual pairs breed for so long a time.

Length of the nestling stage. — Finnish observations of egg-laying and incubation agree well with those recorded earlier, but as I have already pointed out (TAST 1968), there is some controversy regarding the length of the nestling stage of Linnets. In Finnish handbooks (e.g. HILDÉN & LINKOLA 1955), it is stated to last some 11 or 12 days; according to GLUTZ (1962) in Swiss broods it has been from 11 to 14 days, and as already reported (TAST 1968, p. 175, v. HAARTMAN 1969, p. 155), there are observations from Finland of as long a period as 17 days. Now, when studying the present Finnish data, different lengths between 11 to 17 days were found. According to NEWTON (in prep.) Linnets are prone to leave the nest prematurely if disturbed, even at the age of only 9 days.

Obviously the great differences in the above-mentioned records are chiefly due to the habits of young Linnets, as they usually do not fly far from their nest but remain in its close proximity for several days, if not disturbed. In many cases it is difficult to decide whether they are still in the nest or whether they have left it. Thus, apparently most existing records of the length of the nestling period of this species are underestimated, as the young are most often disturbed by the observer and leave the nest prematurely. In such circumstances it seems reasonable not to delimit the nestling period too sharply, but give a broader period, e.g. from 11 to 17 days as the length of it.

Onset of breeding and number of broods. — The earliest date hitherto known of the first egg laid by Finnish Linnets is April 23. There are altogether 3 such breeding records, two of which are from Turku, in south-western Finland, and the third is from Oulu, the northernmost locality in the world where Linnets are known ever to have bred.

However, I have two observations from the vicinity of Tampere in 1967 of nests where first eggs were laid even earlier. There were nestlings in both of them on May 11. One of the nests was left by the young in the evening of May 17, by which time the other nest was already empty. Even when the fact that young Linnets remain for some time in the vicinity of the nest is taken into account when considering the length of the nestling stage, the first eggs cannot have been laid at a later date than April 20, and it could have taken place even some days earlier.

Linnets are migratory birds in Finland, although there are some records of them also from winter time. The first linnets arrive in southern Finland usually at the turn of March and April. First singing males are met with in their breeding grounds almost immediately after their arrival. In 1967 the first specimens were seen at Tampere on March 28 (see also HILDÉN 1967). Thus, there was at most a time lag of about a fortnight before the start of nest building, if it is assumed that the birds whose breeding I observed where among those returning first from their winter quarters.

The majority of first clutches is laid in early May. Among those started in late May there are (1) first nests of pairs which have migrated later and hence begin breeding later (last migrating Linnets in the spring have been observed at Signildskär Bird Station in the Åland Islands yearly in mid-May), (2) repeat nests of pairs which have been unsuccessful in their first nesting attempts, and (3) second nests of pairs which have begun their breeding as early as April.

Some observations indicate that there exists an overlap between broods. Birds have been seen building a second nest, while still feeding the young belonging to the first brood. OAKES (1952) probably made an extreme observation, as he found a second nest of a pair of Linnets already with three eggs at the time when the young left the first. This English Linnet pair raised two broods within a space of 60 days. In such instances the distance between successive nest-sites cannot be great. However, on the other hand, there are observations of Linnets breeding later in the season in areas fairly far from places where they were found nesting in the early summer (TAST 1968).

Present data suggest that probably all Finnish Linnets breed twice a season. Theoretically, there could be even more broods, but as the breeding success of Linnets seems to be rather poor (almost half of the nests I have investigated have been lost due to predation), most observations concerning late breeding may be of repeat nests.

Comparison with other Finnish passerine birds

v. HAARTMAN (1969) has recently published his extensive summary of the nesting habits of Finnish passerine birds, and hence it is possible to compare the breeding biology of different species. There are some 90 passerine bird species regularly breeding in our country. The breeding season of the Linnet is among the longest of Finnish passerines, as there are no more than four such species, whose breeding is known to extend over a longer period than that of the Linnet, viz. *Loxia curvirostra, L. pytyopsittacus, Turdus merula,* and *Passer domesticus.* The breeding seasons of the Linnet and the Redpoll are of approximately equal length.

The onset of breeding of Linnets takes place early in the spring. Among data given by v. HAARTMAN (op. cit.) there are records of first eggs laid at an earlier date than that of the first Linnets, of the following 14 species: *Corvus corax,*

C. corone, C. frugilegus, Nucifraga caryocatactes, Perisoreus infaustus, Pica pica, Parus cristatus, Aegithalos caudatus, Certhia familiaris, Turdus merula, Carduelis chloris, Loxia curvirostra, L. pytyopsittacus, and *Passer domesticus.* All of these species are either residents or partial migrants in Finland. About half of Finnish resident passerine bird species start their breeding later than first Linnets.

In the following the onset of the breeding of Linnets will be compared with three other migratory passerine species. Two of them, viz. the Siskin *Carduelis spinus* and the Chaffinch *Fringilla coelebs* are related to the Linnet, and arrive at Helsinki almost simultaneously with the latter. According to HILDÉN (1960) the mean dates of the arrivals of the first individuals are for the period of 1948—1959 27.3. for the Linnet, 28.3. for the Siskin, and 29.3. for the Chaffinch. The fourth species included in the comparison is the Sky Lark *Alauda arvensis* which is the first migratory species to arrive in southern Finland in the spring. According to HILDÉN (op. cit.) the mean date of its arrival at Helsinki is 14.3., i.e. two weeks before first Linnets.

In the following tabulation the nests of these four species are grouped on the basis of whether first eggs were laid in April or later. Data are from v. HAARTMAN (1969).

	April	May—August
C. cannabina	5	33
C. spinus	2	47
F. coelebs	1	372
A. arvensis	1	64

The laying of the first eggs in April seems to be exceptional among the species other than the Linnet. In my data there are 13 records of Linnet nests with their first eggs laid in April.

From facts presented in this subsection the conclusion can be drawn that Linnets are the first birds of Finnish migratory passerines to begin their egg-laying.

Discussion

According to NEWTON (in prep.) in Great Britain first eggs are laid from mid-April onwards, i.e. the breeding of English Linnets starts at approximately the same time as in Finland. Yet, there is a difference of 10 latitudes between Oxford (52°N), the study area of Newton, and my study areas.

Only one bird species is known to me with no regional differences over large areas in the start of nesting activities. SVÄRDSON (1958) compared the dates of first eggs laid by the Black-headed Gull *Larus ridibundus* in Scandinavia and continental Europe, e.g. Germany, and he was able to show that breeding starts at approximately the same time everywhere in Europe, viz. in the latter half of April. In Scandinavia the Black-headed Gull is two or three weeks earlier than the Common Gull *L. canus.* The Black-headed Gull has spred northward in Europe during the last hundred years invading Finland during this period. The Common Gull, on the other hand, is an old inhabitant both of Scandinavia and Finland. SVÄRDSON (op. cit.) interpreted the unusually early breeding of Black-headed Gulls in the following way: photoperiodicity is known to be a proximate factor determining breeding time in birds, and there has not yet been time enough for natural selection to adjust the breeding time of Black-headed Gulls to Scandinavian conditions.

Linnets almost totally disappeared from Finland in the 1920's and 1930's, and since the 1940's they have reoccupied their former distribution range (TAST 1968). Thus, their very early onset of breeding here could be explained on the same basis as that of the Black-headed Gull: our Linnets originate from continental Europe, and have not

yet had time enough to change the start of their breeding activities to correspond to our conditions.

According to NEWTON (in prep.) in Great Britain some Linnets may lay eggs in the first half of August, i.e. at the same time as in Finland. This is also unexpected, as usually breeding ceases earlier among birds living in the southern parts of the breeding range. This fact also supports the view presented above that Linnets have not yet adjusted their breeding to Finnish conditions.

However, many Linnets cease their nesting activities much earlier. According to NEWTON (1968, and in prep.), in Britain many Linnets have already begun moulting as early as the middle of June, and these birds have at that time regressed gonads. This may hold true for Finnish Linnets, too, although direct observations are lacking. Reference may be made to observations made at Falsterbo Ornithological Station in southwestern Sweden where Linnets are seen almost regularly in small numbers migrating even during the summer months from June onwards (RUDEBECK 1950, ULFSTRAND 1959, MATHIASSON 1962). These birds must be either adults which have finished breeding for the season before migration or they are yearlings leaving for the south almost immediately after learning to fly.

Probably most Linnet pairs cease breeding after rearing two broods both in Great Britain and Finland. Apparently most of the rather many late nests found are of pairs whose first nesting attempts have not succeeded. Further investigations are needed to show whether some pairs in good food circumstances may raise three broods a season.

Acknowledgements

I wish to thank Professor Olavi Kalela for stimulating discussions and valuable criticism of the manuscript.

My best thanks are due to Dr. Martti Soikkeli for sound and helpful criticism.

I am much in the debt to Dr. Ian Newton, who kindly gave me a draft of his paper on British Linnets before publication with permission to quote from it. Dr. Newton also discussed observations of the length of the nestling stage with me.

In my field work I have had valuable assistance from several of my former and present pupils. Among them special mention may be made of the following: J. Gustafsson, J. Halonen, I. Hanski, M. Hietala, K. Paavola, and K. Pietilä.

Many ornithologists have placed their Linnet data at my disposal. In this paper I have treated observations of the following: E. Helle, P. Helo, H. Hongell, P. Jalkanen, P.-Å. Johansson, J. Kangas, A. Komonen, A. Korpinen, E. Lappi, S. J. Lehtonen, L. Leikkonen, H. Mikkola, V. Peiponen, P. Rajala, S. I. Saarinen, A. O. Salonen, P. Sandell, T. Stjernberg, and V. V. Vaarna. I wish to express my warmest gratitude to all of them.

This study has been aided by grants from the Emil Aaltonen Foundation and the Nationl Research Council for the Sciences.

Summary

Linnets *Carduelis cannabina* breed in small loose groups, which in Finland usually consist of less than ten pairs. However, pairs breeding in isolation, are also found relatively often. These live almost regularly in close vicinity to Greenfinches *Carduelis chloris*. This may be due to the similar habitat requirements of the two species, but probably there are social aspects involved. When Linnets are searching for a suitable habitat, they prefer such places where there are already other Linnets breeding and join a colony, but if no Linnets are to be found, Greenfinches may be chosen. Within a Linnet colony there is no good synchrony in the breeding activities of individual pairs.

The breeding season of Linnets is longer than of almost all of our regularly breeding passerine bird species, about 90 days, extending from mid-April to early September. The earliest date of first eggs laid is April 20. First eggs are not laid at an earlier date in Great Britain than in Finland. The same holds true also for the termination of the breeding season. Observations of first eggs laid in the

latest clutches are from the first half of August. In fact, there appear to be no regional trends in the timing of the breeding season of the Linnet over large areas of Europe. Linnets have reoccupied Finland quite recently and, apparently, natural selection has not yet had time to adjust the breeding time to Finnish conditions.

Linnets breed twice a year here; theoretically there could be even more clutches. The nestling stage of Linnets may vary from 11 to 17 days. Obviously most existing records are biassed, giving a rather low figure, as the young are prone to leave the nest prematurely if disturbed e.g. by the observer.

Selostus: **Hempon pesimisryhmistä sekä lisääntymiskaudesta Suomessa**

Hempot pesivät sosiaalisesti pieninä hajanaisina ryhminä, jotka meidän maassamme muodostuvat tavallisesti alle 10 parista. Kuitenkin myös yksittäin pesiviä pareja tavataan verraten usein. Nämä asustavat miltei säännöllisesti viherpeippojen läheisyydessä. Tämä johtuu osittain siitä, että kyseisten lajien biotooppivaatimukset ovat melko samanlaiset, mutta ilmeisesti asiaan on vaikuttamassa myös sosiaalisia piirteitä vastaavalla tavalla kuin kirjokertun pesimisessä lähellä pikkulepinkäisiä. Kun hemppopari etsii sopivaa pesimispaikkaa, se valitsee mieluimmin sellaisen, missä on jo saman lajin yksilöitä, mutta ellei muita hemppoja ole lähistöllä, kelpaa viherpeippo lajikumppanin "korvikkeeksi". Usein hemppokolonioissa yksittäisten parien lisääntymistoiminnat eivät ole synkronisia.

Hempon lisääntymiskausi on pisimpiä Suomessa pesivien noin 90 varpuslintulajin joukossa. Se alkaa huhtikuun puolivälissä, ja poikasia on tavattu pesissä vielä syyskuun alkupuolella. Aikaisin havainto ensimmäisen munan munimisesta on huhtikuun 20. päivältä. Ensimmäiset munat ilmestyvät pesiin samoihin aikoihin myöskin Brittein saarilla. Samoin lisääntymiskausi päättyy samanaikaisesti Englannissa ja Suomessa; myöhäisimpien pesueiden ensimmäiset munat munitaan elokuun alkupuoliskolla. Näyttää ilmeiseltä, ettei hempon pesinnän ajoittumisessa ole alueellisia eroja suurimmassa osassa Eurooppaa. Hempot ovat uudelleen asuttaneet meidän maamme äskettäin, ja ilmeisesti luonnon valinta ei ole vielä ehtinyt vaikuttaa siten, että lajin pesintä-aika olisi sopeutunut Suomen oloihin.

Hempolla on täällä yleisesti 2 poikuetta vuodessa; teoreettisesti on mahdollista, että poikueita olisi enemmänkin. Pesäpoikasaika on 11—17 vrk. Ilmeisesti useimmat tiedot (esim. käsikirjoissa) pesäpoikasvaiheen pituudesta ovat aliarvioituja, koska hempon poikaset hyvin herkästi lähtevät pesästä ennenaikaisesti, jos niitä häiritään. Toisaalta, jos poikaset saavat olla rauhassa, ne voivat istua useita vuorokausia pesän läheisillä oksilla. Tällöin on monesti vaikea tarkoin määrittää sitä ajankohtaa, milloin pesäpoikasvaihe on loppunut.

References

BRAESTRUP, F. W. 1953. Fuglenes Verden. — København.

CHRISTIANSEN, C. F. 1944. Hvad er Aarsagen til Sociabiliteten mellem Høgesanger (Sylvia n. nisoria, Bechst.) og Rødrygget Tornskade (Lanius c. collurio L.). Dansk Ornith. For. Tidskr. 38:13—25.

GLUTZ VON BLOTZHEIM, U. 1962. Die Brutvögel der Schweiz. — Aarau.

HAARTMAN, L. von. 1969. The nesting habits of Finnish birds. I. Passeriformes. Comm. Biol. Soc. Scient. Fenn. 32:1—187.

HILDÉN, O. 1960. Kevään ensimmäiset muuttolinnut. Luonnon Tutkija 64:51—56.

— 1967. Muuttolintujen saapuminen Suomeen 1967. Lintumies 3:54—58.

— 1969. Über Vorkommen und Brutbiologie des Birkenzeisigs (Carduelis flammea) in Finnisch-Lappland im Sommer 1968. Ornis Fenn. 46:93—112.

HILDÉN, O. & P. LINKOLA. 1955. Suuri Lintukirja. — Helsinki.

KALELA, O. 1954. Über den Revierbesitz bei Vögeln und Säugetieren als Populationsökologischer Faktor. Ann. Zool. Soc. Vanamo 16, 2:1—48.

— 1955. Die neuzeitliche Ausbreitung des Kiebitzes, Vanellus vanellus (L.), in Finnland. Ibid. 16, 11:1—80.

MATHIASSON, S. 1962. Fågelsträcket vid Falsterbo år 1958. Vår Fågelvärld 21:26—41.

MERIKALLIO, E. 1955. Suomen lintujen levinneisyys ja lukumäärä. — Helsinki.

— 1958. Finnish birds. Their distribution and numbers. Fauna Fennica 5:1—181.

NEWTON, I. 1967. The adaptive radiation and feeding ecology of some British finches. Ibis 109:33—98.

— 1968. The moulting seasons of some finches and buntings. Bird Study 15: 84—92.

OAKES, C. 1952. The birds of Lancashire. — London & Edinburgh.

PEIPONEN, V. 1962. Über Brutbiologie, Nährung und geographische Verbreitung des Birkenzeisigs (Carduelis flammea). Ornis Fenn. 39:37—60.

— 1967. Südliche Fortpflanzung und Zug von Carduelis flammea (L.) im Jahre 1965. Ann. Zool. Fenn. 4:547—559.

RINKEL, G. L. 1940. Waarnemingen over het gedrag van de Kievit (Vanellus vanellus (L.)) gedurende de broedtijd. Ardea 29: 108—147.

RUDEBECK, G. 1950. Studies on bird migration. Vår Fågelvärld. Suppl. 1.

SILVOLA, T. & R. TENOVUO. 1958. Kirjokertun (Sylvia nisoria) pesiminen ja levinneisyys Lounais-Suomen saaristossa. Ornis Fenn. 35:129—140.

SVÄRDSON, G. 1958. Biotop och häckning hos skrattmåsen (Larus ridibundus). Vår Fågelvärld 17:1—23.

TAST, J. 1968. Changes in the distribution, habitat requirements, and nest-sites of the linnet, Carduelis cannabina (L.), in Finland. Ann. Zool. Fenn. 5:159—178.

ULFSTRAND, S. 1959. Fågelsträcket vid Falsterbo år 1955. Vår Fågelvärld 18:131—162.

VOOUS, K. H. 1960. Atlas of European birds. — London.

Address of the author: Kilpisjärvi Biological Station, Helsinki University, P. Rautatiek. 13, Helsinki 10.