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## On occurrence and ecology of Blyth's Reed Warbler (*Acrocephalus dumetorum*) and Marsh Warbler (*A. palustris*) in Finland

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Blyth's Reed Warbler has been known to belong to Finnish avifauna for quite some time. KIVIRIKKO (1947) reports that this species has been found in South-eastern Finland since 1883 although it has been rare. During the 1940's and 1950's there were a lot of records of this species. On the basis of this material PAATELA & KAILA (1960) have studied the distribution of Blyth's Reed Warbler in Finland. According to them the bird has extended its range very considerably and become more common in Finland. This opinion is shared by HILDÉN & LINKOLA (1962). Later NIEMI (1968) has studied its occurrence in the Heinola area during the years 1961—67. There is no evidence of any increase in numbers in his material and the author tries to explain the annual fluctuations by means of changes in spring temperatures.

The Marsh Warbler is a newcomer to Finnish avifauna. LEIVO (1945) reports this species in Finland in 1944. The distribution of the Marsh Warbler has been dealt with only by TOIVARI and

LINDQUIST (1961) who report that it suddenly appeared in the vicinity of Lappeenranta during the summer of 1960. HILDÉN and LINKOLA (1962) say that the Marsh Warbler has extended its range rapidly in Finland. The authors report some twenty records of the species in Finland and one of fledgling young which indicates nesting. In addition to this NIEMI (1968) has studied its distribution in the Heinola area.

The author of the present paper has observed Blyth's Reed Warblers and Marsh Warblers in the Helsinki area since 1957 and he has found that the activity of bird-watchers has a considerable effect on the number of records. To get a reliable picture of a possible increase in the number of birds this has to be analyzed in relation to bird-watching activity.

PAATELA & KAILA (1960) consider Blyth's Reed Warbler to be similar to the Marsh Warbler in its choice of habitat. VOOS (1960) thinks that there might be some inter-specific competition between these two species. This calls

for special attention to the choice of habitat by Blyth's Reed Warbler and the Marsh Warbler.

Recent years have produced a continuously increasing number of Warbler records from all over Southern Finland. Nests found by the author show that the Marsh Warbler is a bird breeding in Finland. The breeding biology of the Marsh Warbler has previously been dealt with briefly by WALPOLE-BOND (1933) and HUBER (1935). These studies have been carried out in Central and Western Europe and they give a general idea of its breeding biology. The breeding ecology of Blyth's Reed Warbler has previously been described in detail by ERIKSSON (1969 a).

### Material and methods

The present material was collected by means of requests in the ornithological journals *Ornis Fennica*, *Luonnon Tutkija* and *Lintumies*. This material consists of 203 Marsh Warbler records during the years 1944—67 and 631 Blyth's Reed Warbler records in the years 1955—65. Almost without exception these records refer to singing males. Since the records have been supplied by competent ornithologists one may assume correct identification of the species. For a basic analysis the author chose to use records for the years 1955—67 in the case of the Marsh Warbler and 1955—65 in the case of Blyth's Reed Warbler because there was a sufficiently large number of them and, on the other hand, one may assume that there were a sufficient number of records for the Marsh Warbler for 1967 already available at the time of writing.

The variables chosen to indicate the change in bird-watching activity were the annual number of birds ringed in Finland during the period 1955—67. Another variable was the number of bird-ringers active during the basic period in the various zoo-geographical regions and the total number of ringers in the whole country, and the average number of participants at the two April meetings of the (Young Members' Section of the) Finnish Ornithological Society in Helsinki during that period. These variables may be considered to represent the increase in bird-watching activity in Finland fairly well. The methods of analysis and the increase in bird-watching activity in Finland has previously been reported by ERIKSSON (1969b).

The observations of the breeding biology of the Marsh Warbler in Finland are based on five nests. Four of these have been studied by the author. For one nest there are complete records during 1965 from the arrival of the male in the nesting territory until the young left the nest. The material is small but it should give an idea of the type of habitat preferred by the Marsh Warbler in Finland and of its breeding cycle as well as the time of nesting.

The original material is given only in the figures and tables in order to save space. The name of the observer is given in brackets where the record has some special significance.

### Results

#### 1. Records of Blyth's Reed Warbler

A. Before the year 1955. — The survey by PAAATELA & KAILA (1960) contains all known records until the year 1959. Most of the old records between 1883—1944 come from the south-east, east of the present Finnish border. During World War II Blyth's Reed Warbler was found to be very common in Eastern Karelia where KLOCKARS (1944) reports having heard 15 singing males. From the present area of Finland PAAATELA & KAILA (1960) report only three records, two of them from Kuopio and one from Helsinki. For the 1940's there are records of 13 singing males and two nests. During the 1950's the number of records seems to have increased. In all there are 22 records of the species for the years 1950—55. The majority of these records come from Helsinki, Lappeenranta and Kuopio. There are no records for that period from the west coast of Finland. The northernmost records come from almost exactly the latitude 63°N.

B. The years 1955—65. — For this basic period of the research — 11 years — there are records of 631 Blyth's Reed Warblers. Table 1 presents these and their distribution in the zoogeographical regions of Finland as defined by MERIKALLIO (1958). The total number of records per year has risen very sharply. The same rise may be seen to have taken place in all regions with the exception of Pohjanmaa (Pm).

The annual increase of the species is well indicated by the linear regression model  $y = 56.7 + 0.074x$  which has a

TABLE 1. The number of Blyth's Reed Warblers recorded in the different zoo-geographical regions of Finland during the years 1955—65. (*Vuosina 1955—65 Suomen eläinmaantieteellisillä alueilla havaittujen viittakerttusten lukumäärät.*)

Zoo-geographical region		Observation period												Total
<i>Eläinmaant. alue</i>		<i>Havainto aika</i>												
		1955	56	57	58	59	60	61	62	63	64	65	66	
Lounais-Suomi	(LS)	5	2	3	6	4	5	14	17	19	16	15	16	122
Järvi-Suomi	(JS)	—	2	1	4	8	21	34	28	69	61	80	96	404
Maanselkä	(Ms)	—	—	—	—	1	11	3	3	10	18	18	26	90
Pohjanmaa	(Pm)	—	—	2	1	—	2	2	—	3	—	—	—	10
Tornio-Kainuu	(TK)	—	—	—	—	—	—	1	—	1	—	1	1	4
Suomenselkä	(Ss)	—	—	—	—	—	—	—	—	1	—	—	—	1
Total														
<i>Yht.</i>		5	4	6	11	13	39	54	48	103	94	114	139	631

statistically very significant coefficient ( $t=8.38$ ;  $p<0.001$ ) and which accounts for 88.7 %. The linear model thus explains the increase in the number of records very well. This is also indicated by the fact that with a second degree model the explanation would be 92.5 %, i.e. not significantly better. The annual increase in the number of Blyth's Reed Warbler has been a linear one. The records for different years and a model calculated on the basis of them is given in Fig. 1.

## 2. Occurrence of the Marsh Warbler in Finland

A. The years 1944—50. — The first Marsh Warbler record from Finland is of 8—17.6.1944 from Pikku-Huopalahti, Helsinki and another from Herttoniemi, Helsinki on 4—9.7. the same year (LEIVO 1945). The following year four singing ♂♂ were found in the Helsinki area, namely Herttoniemi 25—26.6.1945, Hakalehto 22—24.6., Vanhankaupunginlahti 30.5.—10.6., and Leppävaara, Espoo 23.6.—1.7. (LEIVO 1946). A year later the species was found in Mariehamn, Åland between 23.6—16.7.1946 (FRITZÉN 1948) and later once more in Helsinki, Oulunkylä on 9.6.1947 (ANDERZEN 1954). Then, after a lapse of three years a pair, possibly nesting, was observed in Iso-Huopalahti, Helsinki on 26—27.6.1950 (PAATELA 1952). During the years 1944—50 there were thus nine records of this species in Finland.

B. The years 1951—60. — The number of records during this decennium increased to 43. The localities for these are given in Fig. 2. From the Helsinki area there are 18 records, most of them from the year 1960. TOIVARI and LINDQVIST (1961) report the appearance of the species in Lappeenranta. The first five

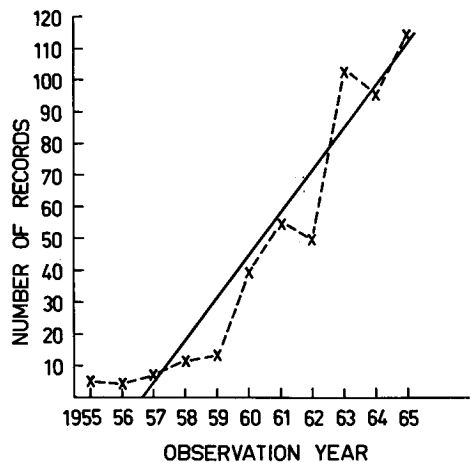


FIG. 1. The number of Blyth's Reed Warblers observed in Finland during the years 1955—65 (— — —) and a linear regression model (————) calculated on the basis of them. (*Suomessa vv. 1955—65 havaittujen viittakerttusten lukumäärä (— — —) sekä havaintojen perusteella laskettu lineaarinen regressiomalli (————).*)

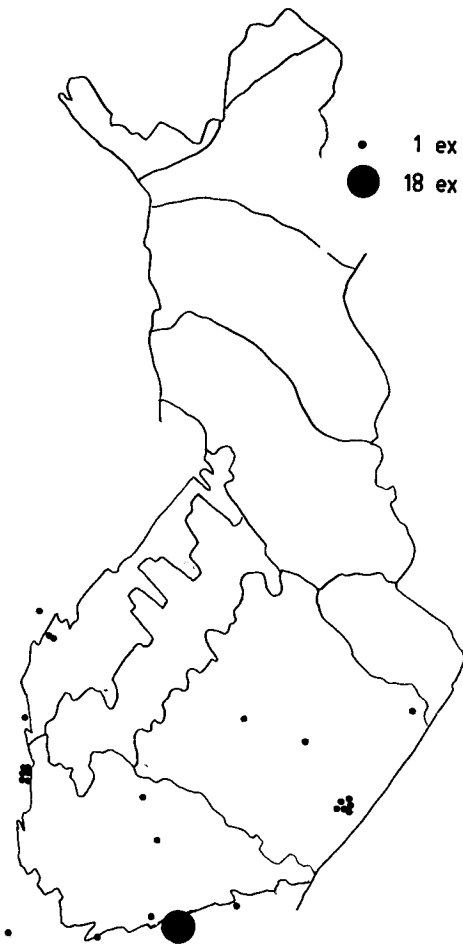


FIG. 2. Occurrence of the Marsh Warbler in Finland during the years 1951—60. (*Lubtakerttusen löytöpaikat Suomessa vv. 1951—60*).

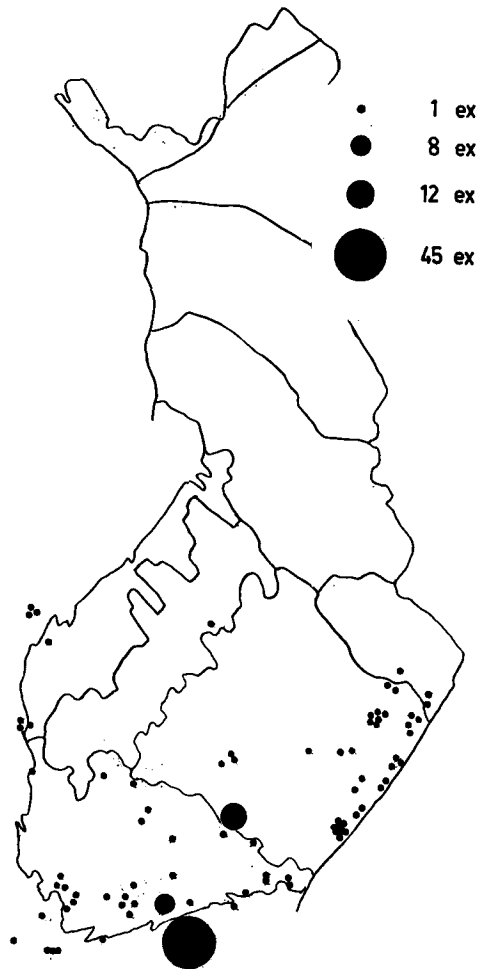


FIG. 3. Occurrence of the Marsh Warbler in Finland during the years 1961—67. (*Lubtakerttusen löytöpaikat Suomessa vv. 1961—67*).

records in the Lappeenranta area are from the year 1960. The westernmost record comes from Kökar 10.6.1959 (R. TENOVUO) and the northernmost ones from Valassaaret, Björköby on 29.5. and 1.6.1960 (O. HILDÉN).

C. The years 1961—67. — During this period there were more than 150 records of Marsh Warblers by several observers. These are given in figure 3. They are particularly numerous in the

Helsinki, Lappeenranta and Heinola areas where bird-watchers are very active. There are also some records from bird-observatories along the coast, from the southern parts of Northern Karelia and from Valassaaret, Björköby (Gulf of Bothnia).

Figure 4 gives the number of Marsh Warbler records each year and the regression model for the annual tendency

to increase, calculated on the basis of these, during the years 1955—67. The annual fluctuation in numbers is well explained by the almost linear second degree regression model  $x=54.6+0.7x-0.01x^2$ , which gives a 87,9 % explanation. The statistical significance of the coefficients is good, with the first degree coefficient  $t=6.1$ ;  $p<0.001$  and with the second degree coefficient  $t=3.3$ ;  $p<0.001$ . The model thus obtained shows the annual tendency fairly well. The changes unaccounted for might possibly be annual fluctuations in the population.

### 3. Increase in observation activity

Bird-watching has increased considerably in Finland during the years 1955—67. The relevant variables, the numbers of bird-watchers in Helsinki, the number of ringers and the number of birds ringed in Finland each year, have risen steeply as reported earlier (ERIKSSON 1969b). The corresponding second degree regression models yield a 94—98 % explanation, which indicates that the delineators are reasonably reliable. The second degree coefficients are small; this indicates that bird-watching activity has increased almost linearly.

### 4. Dependence of the number of records on bird-watching activity

A. The whole of Finland. — If the number of Blyth's Reed Warbler records were dependent on the increase in the number of bird-watchers, there should exist a straight linear relationship between these two variables. When all the records from the whole of Finland are explained by means of the total number of ringers active in the whole country it yields a linear regression model  $y=0.09x-38.5$  which is sta-

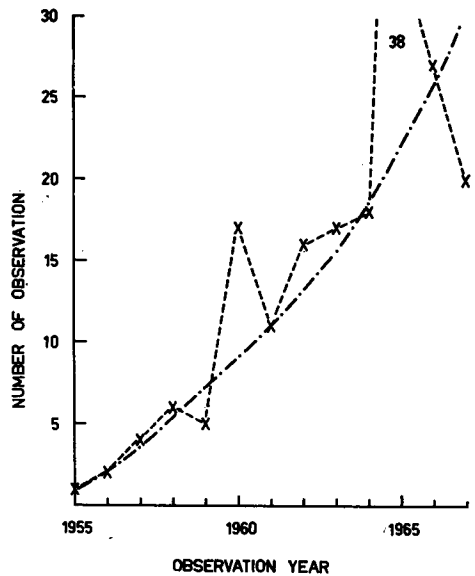


FIG. 4. The number of Marsh Warblers observed in Finland during the years 1955—67 (— — — —) and the regression delineator calculated on the basis of this (— . — . —). (Suomessa vv. 1955—67 havaittujen luhtakerttusten määrä (— — — —) sekä näiden perusteella laskettu regressiokuvaaja (— . — . —).

tistically very significant ( $t=5.1$ ;  $p<0.001$ ) and the explanation is 73.7 %. When the number of participants at the meetings of the Young Members' Section of the FOS is also taken into account the total explanation figure for a linear model rises to 88.5 %.

B. Various zoogeographical regions. — Since bird-watching activity varies from one region to another the number of Blyth's Reed Warbler records for each region was studied in relation to the corresponding number of observers in the area. This yielded the following interrelations and explanations:

Lounais-Suomi (LS)  $y=299.3+32.9x$  53.0 %  
 Järvi-Suomi (JS)  $y=77.1+0.79x$  48.0 %  
 Maanselkä (Ms)  $y=2.7+0.53x$  45.6 %

The effect of random factors seems to be great in the various regions but explanations as good as these indicate that the number of records is very much dependent on bird-watching activity.

There are also great individual variations between the observers. The material presented by NIEMI (1968) shows that a systematic search leads to a great number of records. Furthermore, the present material includes the 106 singing males found by A Laaksonen and his companions in Maanselkä and Järvi-Suomi during the year 1966, which shows that individual observers may have a great influence on material collected. Anyway, the effect of bird-watching activity on the number records seems to be quantitatively equal in various parts of the country.

C. Effect of observation activity on the number of Marsh-Warbler records. — Since the distribution area of the Marsh Warbler is rather southern the analysis is made for the whole country. The author tried to explain the number of Marsh Warbler records each year by the number of bird-watchers in Helsinki. The linear first degree model thus obtained  $y=0.29x-4.7$  produced a statistically significant coefficient ( $t=5.1$ ;  $p<0.001$ ) and gives an explanation of 70.8 % and 70.2 % respectively. The number of birds ringed produced the model  $y=0.21x-3.5$  with an explanation of 71.0 %. Inclusion of second degree terms did not improve the model. A combined model of the variables, with some rather weak coefficients, gave a 85.1 % explanation. The interrelationship between bird-watching activity and Marsh Warbler records is of the level of 70–80 %. The corresponding explanation figure for the River Warbler (*Locustella fluviatilis*) is more than 95 % (ERIKSSON 1969b). The Marsh Warbler shows great annual fluctuations which tends to weaken the model.

## 5. Differences in population density in Finland

A. Blyth's Reed Warbler. — The interdependence between the number of records and the number of observers can be seen from the figures above. This means that when looking at the density of Blyth's Reed Warblers in different parts of Finland one has to take into account the differences in the number of bird-watchers in the various regions. The average number of records in relation to the average number of observers in each region shows the density of Blyth's Reed Warblers in different parts of the country. The number of records per 100 observers for various regions is as follows:

Lounais-Suomi	(LS)	1.56
Järvi-Suomi	(JS)	28.17
Maanselkä	(Ms)	100.00
Pohjanmaa	(Pm)	0.73
The whole country		4.91

This shows that the population is most dense in the east and southeast of Finland whereas it is very scattered on the west coast.

B. Marsh Warbler. — It is very difficult to describe the distribution of Marsh Warbler. The species is a newcomer to Finland and the active collection of records can give a misleading result. Bearing in mind the very small amount of bird-watching activity in the eastern part of the country, it seems to be reasonable to suppose that the bird has spread into Finland from the south-east.

## 6. Annual fluctuations in populations

It has been noted above (Fig. 1) that the number of Blyth' Warbler records has risen constantly and sharply. The good explanation figure, some 90 %, for the linear model indicates that annual fluctuations account for only about 10 % of total variation. On the other hand

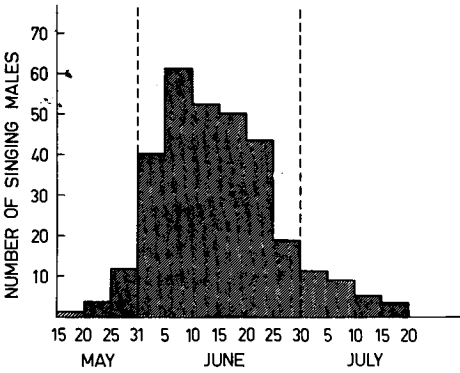


FIG. 5. Number of singing Blyth's Reed Warbler males observed during different periods of the summer. (*Kesän eri vaiheissa havaittujen laulavien viitakerttuskotiraiden lukumäärä.*)

bird-watching activity also has a marked effect on the number of records. This is also a variable fluctuating at random. Thus it is not possible to study annual fluctuations on the basis of this material. It seems rather as if the population remained reasonably constant during the observation period. One might possibly deduce that the population was smaller than normal during the summer of 1962 and larger than normal during 1963. Annual fluctuations seem to be much greater for the Marsh Warbler. Large variations occurred in the years 1960, 1965 and 1967. The species seems to have been extremely abundant in 1960 and 1965, whereas the species was scarce in the year 1967 (Fig. 4).

7. *Times of occurrence*

The majority of Warbler records are of singing males. Figure 5 gives the number of singing Blyth's Reed Warblers for different periods. It shows that the first birds arrive in Finland towards the end of May. The main migration period seems to be in the beginning of June, but spring migration continues until about 20.6. The number of singing birds

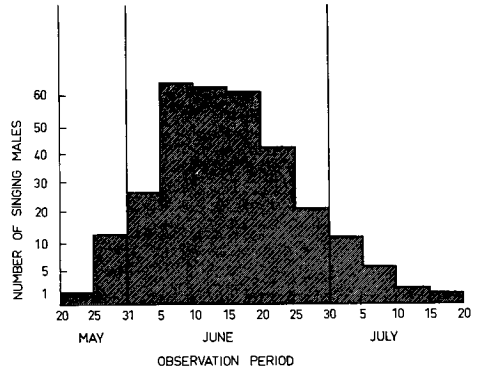


FIG. 6. Number of singing Marsh Warblers observed during different periods of the summer. (*Havaittujen laulavien luhtakerttusten määrä eri havaintojaksoilla.*)

is drastically reduced around 20—25.6., but occasional song may be heard even after the middle of July. ERIKSSON (1965, 1969a) has previously shown that Blyth's Reed Warbler stops singing when incubation starts. This early end to the song period may lead to some birds being unnoticed even in a well-explored area.

The latest records of this species are of birds ringed on passage TALLGREN (1967). Of these ringed birds (n=14) the majority have been caught between 17.7.—17.8. The latest record is of 23.8. This might indicate that the bird migrates in August since there are no Blyth's Reed Warbler records from the observatories later in the autumn.

Figure 6 gives the number of singing Marsh Warblers during various periods of the summer. The earliest record from Finland is of 24.5.1965 from Hiittinen (J. HOLLSTEN). There are 11 records for late May so the first individuals seem to arrive in Finland between 25—31.5. The number of records reach a peak at 10.6. which probably indicates the main migration period. Late arrivals of birds at the observatories, Aspskär 16.6.1961 (O. STENMAN) and Valassaaret 25.6.

1963 (HALTTUNEN 1963), suggest that spring migration continues all through June. The song ceases gradually from the middle of June to the middle of July. Latest records from Finland are from Lappohja on 26.7.1962 (T. STJERNBERG) and from the nesting area in Helsinki on 28.7.1965 (K. ERIKSSON). So far there are no records for August.

## 8. Nesting in Finland

PAATELA & KAILA (1960), HILDÉN & LINKOLA (1962), ERIKSSON (1965, 1969a) and NIEMI (1968) report some 15 records of Blyth's Reed Warbler nests found or definite evidence of nesting in Finland. The present author has described the breeding ecology of this little known species in more detail in another paper (ERIKSSON 1969a), so it is not dealt with here. The nests found in Finland are mostly from Lounais-Suomi, Järvi-Suomi and Northern Karelia. According to ERIKSSON (1965) roughly half of the males seem to be nesting.

The first observation indicative of nesting dates from the year 1950 when there was apparently a pair of Marsh Warblers at Iso-Huopalahti in Helsinki (PAATELA 1952). There were almost 10 such records from Helsinki, Lappeenranta and Heinola before nesting was verified in 1960 when a brood of fledglings was observed in Helsinki (K. VEPSÄLÄINEN). During the summer of 1965 the author began to observe six males which led to three nests being found. Altogether five nests have been found in Finland so far and the following data have been obtained from them.

*Marsh Warbler nests found.* — 1. Helsinki, Vanhankaupunginlahti: The nest was in a Pussy Willow (*Salix caprea*) but one side of it was attached to a branch of a Black/Red Currant (*Ribes nigrum/rubrum*) bush. Height above ground 70 cm. Inner diameter approximately 40 mm and inner depth appr. 40 mm, outer diameter appr. 100 mm and outer height appr. 110 mm. When found on 21.6. there

were 4 eggs in the nest. The following day there were 5 eggs. The nest and eggs were destroyed on 29.6. General colour of the eggs was a distinct greenish white with olive brown and lilac grey spots. The greenish tint was more prominent in this clutch than in the others and the spots were concentrated around the blunt end of the egg which is usual for the species. The eggs were weighed and measured.

2. Helsinki, Vanhankaupunginlahti: This nest was in a thicket of Meadowsweet (*Filipendula ulmaria*) some 65 cm above ground. Inner diameter of the nest cup was 42 mm, inner depth 40 mm, outer diameter appr. 80 mm and outer height appr. 90 mm. The male arrived in the territory on 18.6. The bird had been ringed elsewhere earlier and the brought here. On 19.6. he already had a mate. Nest-building started on 21.6. and the nest was completed on 23.6. The first egg was laid on 25.6. and the clutch of four eggs was complete by 28.6. The first two young from eggs 1 and 2 hatched on 9.7., the third egg hatched on 10.7. and the fourth on 11.7. The young left the nest on 21.7. The general colour of these eggs was white with a slight greenish hue. The greenish brown or lilac grey spots were large and concentrated around the blunt end. The eggs were weighed and measured.

3. Helsinki, Laajasalo: This nest was supported by two stems of Reed (*Phragmites communis*) and one of Yellow Loosestrife (*Lysimachia vulgaris*) some 60 cm above ground. Inner diameter of the nest cup was 46 mm and depth 47 mm, outer diameter appr. 70 mm and height appr. 80 mm. When found on 11.7. there were 4 eggs in the nest. On 14.7. there were still the four eggs, and on 16.7. they were all newly hatched. Three young left the nest on 28.7. The eggs were weighed and measured. They were greenish white with greenish brown spots at the blunt end almost completely covering the basic colour.

4. Kristiina, (P.-Å. Johansson): The nest was supported by Stinging Nettle (*Urtica dioica*) and Raspberry (*Rubus idaeus*) hanging some 25 cm above ground. When found on 11.7. there were two eggs and one newly hatched young in the nest. The next visit to the nest was made on 16.7. when one of the eggs was still unhatched. The young were still in the nest on 19.7. The unhatched egg was of the usual type, greenish white with large spots concentrated around the blunt end.

5. Helsinki, Vantaanniemi (R. Tuokko): This nest was in a thicket of Stinging Nettle (*Urtica dioica*). When found on 22.6. it was already completed, but the first egg was laid on 24.6. The clutch of four eggs was complete on 30.6. No later records are available.



## 9. Nesting habitats

A. Blyth's Reed Warbler. — It is very difficult to classify the habitats frequented by Blyth's Reed Warblers. The figures below of those records where the habitat was described (227) mya, however, give a general idea of the habitats most preferred by the birds:

Meadows with bushes	55.5 %
Young light deciduous forest	26.4 %
Apple orchard	16.3 %
Reed-bed	1.8 %

By far the most preferred habitat is a bushy meadow. This means the dryish edge of a field, road, shore or any other open area where the undergrowth is dense and where there are a few scattered bushes. The young light deciduous forest refers to a copse of birch or alder bordering a field or some other open area, with scattered trees and dense undergrowth. The apple orchard habitat is a garden with semi-wild apple trees or berry bushes some 10 metres apart and again with dense undergrowth. All these habitats are fairly open and have dense undergrowth. There are only four records from reed-beds and in each case it was a bed with sparse reed-stems and with a dense undergrowth of lush grass.

B. Marsh Warbler. — Nest number 1. was situated in a low copse of Sycamore (*Acer*), Birch (*Betula*) and Pussy Willow (*Salix*) with dense undergrowth (*Rubus idaeus*, *Chamaenerion angustifolium*, *Milium effusum* etc.). At nest-site number 2. the dominant vegetation consisted of *Phragmites communis*, because the nest was on the edge of a reed-bed beside a meadow. The reed-bed itself was not very dense but there was a dense undergrowth of *Lysimachia* and *Filipendula*. Nest-site number 3. what was formerly the sea-bed. Willow bushes dominated the vegetation here. Between the bushes there were stands of *Phragmites* and the undergrowth consisted of *Lysimachia vulgaris* and *Milium effusum*. Nest-site number 4. was in an open deciduous wood with Birch and with an undergrowth of Stinging Nettle and Raspberry thickets. Nest-site number 5. was in a Willow shrub with Nettle thickets as undergrowth.

The Marsh Warbler nests found in Finland have been supported on three or four sides by the undergrowth some 25—70 cm above the ground. The nest site itself is very similar to that of Blyth's Reed Warbler (ERIKSSON 1965, 1969a). The inner diameter of the nest is 40—46 mm and depth 40—46 mm, with an outer diameter of 70—90 mm and outer height 70—110 mm. The structure of the nest is also similar to that of Blyth's Reed Warbler although the suspending loops are not as distinct. The nests found in Finland are built of fibres torn from the husk of Nettle and Reed, mixed with dry straws and lined inside with flower-heads of Reed, horsehair and seed hair of Rose-bay (*Chamaenerion angustifolium*). Building materials are very similar to those used by Blyth's Reed Warbler.

## 10. Time of breeding

As the author has reported previously (ERIKSSON 1969a) with the Blyth's Reed Warbler the first egg is laid 11—21.6. The incubation time is 12—14 days. The average number of young is 4—9 and they stay in the nest 11—13 days. The young leave the nest 7—25.7.

On the basis of the scant Finnish nesting records the first Marsh Warbler egg is laid between 17.6.—2.7. and the young hatch between 4.7.—16.7. Each egg is incubated for 13—14 days and the young remain in the nest for 11—12 days. In Finland the young normally leave the nest during the last week of July.

## 11. General observations on breeding biology

Marsh Warbler nest number 2. was situated only 7 metres from a nest of *Acrocephalus dumetorum*, but no territorial fighting or aggressive behaviour was observed between the two species (ERIKSSON 1969a). The main features of the breeding cycle, i.e. construction, incubation, feeding, cleaning and the part played by each sex very closely resemble those of the other *Acrocephalus* species (see BROWN and DAVIES 1949, KLJUVER 1955 and RAITASUO 1958). A

striking difference is the fact that the female of the Marsh Warbler also sings, which the author was able to verify at two nests with colour-ringed birds. The song was similar to that of the male but less powerful. When nesting starts the song activity of the male is reduced and song ends almost completely when feeding starts. No more detailed records are available.

Despite a special search nothing indicative of a second brood was found in the vicinity of the nest which was destroyed. The disappearance of the Marsh Warblers from Finland by August might indicate that they raise only one brood a year. Both species resemble each other also in this respect. The broods seem to survive well.

## Discussion

The present material shows that the number of Blyth's Reed Warbler records increased linearly during the research period 1955—65. At the same time bird-watching activity also increased linearly to almost the same extent. Since the number of records may be explained almost completely by means of a linear regression model where the variables showing the increase in bird-watching activity are used as explanatory factors, this tendency to increase must be considered apparent. The result differs from the claim by PAATELA & KAILA (1960) that Blyth's Reed Warbler had extended its range considerably to the west. According to VOOUS (1960) Blyth's Reed Warbler has not extended its range anywhere else recently, and on the other hand we know that it was common in Karelia already in 1940—44 (KLOCKARS 1944). This is in accordance with the author's interpretation that the increase in birdwatching activity and an increased ability to identify the bird have led to the increase in the number of records. If there has been expansion to

the west it must have taken place before the year 1955, possibly during the 1930's, but that is difficult to prove reliably any more.

NIEMI (1968) says that the annual fluctuations in Blyth's Reed Warbler population are great with this species. The present results indicate that the annual fluctuations are small although it looks as though the population was smaller than usual in 1962 and larger than usual in 1963. This coincides with the material presented by NIEMI (1968). The numbers of records for other years are in accordance with the calculated linear model. According to the material the spring migration of Blyth's Reed Warbler takes place between 20.5.—15.6. The interpretation presented by NIEMI that annual fluctuations depend on May and June temperatures seems artificial since random variation caused by individual differences between observers is great. On the other hand one should look at the temperatures during migration for an eventual explanation. The minimum temperatures during the time the young remain in the nest might also influence the following year's population through breeding success. But the great random variation in the material so far does not give any ground for an analysis like this.

The centre of distribution of the species in Finland clearly seems to lie in the south-east since the density in relation to the number of observers in Northern Karelia is some 70—100 times greater compared to that in South-western or Western Finland. When the effect of observers is taken into account there does not seem to have been any changes in the distribution of the species. Blyth's Reed Warbler has not yet been found in Åland neither have records from the west of the country increased since those published by PAATELA & KAILA (1960). These authors claim that a majority of Blyth's Reed Warblers found

in Finland are single males. The present author thinks, as he has stated before (ERIKSSON 1965) that a great part, possibly half of the singing birds observed, are nesting birds.

PAATELA & KAILA (1960) as well as VOOUS (1960) claim that Blyth's Reed Warbler prefers shores. The present material indicates that it prefers semi-open areas covered with dense undergrowth. These are often found near shores, but this is by no means typical of the species because it may be found in fields, clearings and gardens as well.

The material clearly shows that both the Marsh Warbler records and bird-watching activity have increased equally during the period 1955—67. The variables chosen to indicate bird-watching activity may be criticized for several reasons. One might argue that a species may increase in number along with an increase in bird-watching activity without there being any real connection between the two. On the other hand spotting birds singing at night depends on the type of terrain, the available means of transport etc. Furthermore, it may also be claimed that a few efficient bird-watchers find the same number of birds as a larger group of more inefficient ones. But despite these sources of error it seems probable that the number of night-singing birds observed depends to a great extent on the number of bird-watchers. The variables chosen to indicate bird-watching activity, namely the number of birds ringed each year and the number of active bird-watchers in Helsinki offer a 70 % explanation for the regression model representing the increase in the number of Marsh Warbler records. The increase in the number of bird-watchers explains to a large degree the increase in the number of Marsh Warblers. But deviations from the calculated model remain unexplained. In 1960 and 1965 there were more records than usual. This probably indicates that

there were sudden extensions of the range during certain years. TOIVARI and LINDQUIST (1961) report that the Marsh Warbler was unexpectedly found in the Lappeenranta area during the year 1960 for the first time, and that there were several birds in the area. The species was also more numerous than usual during that year in Helsinki. Similarly there was a distinct increase during the year 1965 in Helsinki, Heinola and Lappeenranta, and Marsh Warblers were found in many new localities. The actual extension of distribution when the Marsh Warbler arrived in Finland took place during as early as the 1940's. Judging on the basis of the small number of bird-watchers the Marsh Warbler may have been fairly numerous during certain years in the early stages. The species reached its present distribution in Finland during the 1950's, but new centres are being formed continuously and the Marsh Warbler fills in the gaps in its distribution rapidly by expanding during good years such as 1960 and 1965. The northernmost limit of distribution does not seem to have changed since the 1950's.

According to NIEMI (1968) Marsh Warblers were scarce during the year 1965, although taken for the whole of the country they were exceptionally numerous. It seems reasonable to think that only the temperature of the migration period or that of the period when the young are in the nest could have any bearing on the distribution of the species. Random variation in the material has so far made it impossible to get an accurate idea of the development.

The majority of the Finnish records are of singing ♂♂ which gives a one-sided view of the occurrence of this species. The Marsh Warbler continues its song well into the breeding season, which is not the case with the closely related Blyth's Reed Warbler (ERIKSSON 1965), although the time spent

singing is reduced. This makes it more difficult to know which males have not found a mate. Observation of males during the summer of 1965 led to three nests being found in the author's own excursion area where half of the singing males did nest.

The Marsh Warbler seems to choose its nesting territory in an area of tall vegetation where a few trees, high bushes or grasses dominate the landscape. The essential thing is that these should be situated in dense undergrowth. This kind of habitat is often found on old shores, next to fields, in gardens, yards etc. The main thing is that the bird should be able to reach its nest unnoticed. The nest is probably never situated as openly as that of Blyth's Reed Warbler (ERIKSSON 1969a).

The author has heard ♀♀ at many Marsh Warbler nests perform a soft subsong which is also reported by ARMSTRONG (1963). There is no record of such behaviour with Blyth's Reed Warbler. The Marsh Warbler continues its song decreasing it gradually during the period of incubation whereas Blyth's Reed Warbler stops singing when nest-building starts (ERIKSSON 1965). In other respects the breeding biology of the Marsh Warbler in Finland seems to resemble that of the populations of Great Britain (WALPOLE-BOND 1933) and Germany (HUBER 1935).

VOOUS (1960) considers that the Marsh and Blyth's Reed Warblers form a pair of sibling species and that they possibly compete with each other. The nests of the two species found next to each other in Finland and the overlapping of their breeding ranges, however, seem to contradict this assumption. In accordance with this are the ecological differences observed. The author's earlier experience of both these species (ERIKSSON 1965) as well as the present material indicate that there is a difference between them in the choice of

habitat despite the fact that they may breed next to each other and their breeding territories may even overlap. The Marsh Warbler seems to stick to taller and denser vegetation. In addition to this the two species also differ as to the timing of migration and nesting, with the Marsh Warbler being about 7—12 days later. Furthermore, they also differ as to singing habits since the Marsh Warbler sings all through the nesting period whereas Blyth's Reed Warbler stops singing soon after nesting starts (ERIKSSON 1965, 1969a). On the basis of these facts it seems doubtful whether there is any actual competition between these two species.

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#### Summary

Blyth's Reed Warbler is an old species in Finland but records before the 1940's are rather scarce. The number of records has increased very considerably during the 1950's and 1960's which has been interpreted by some authors as a sign of an extension of range and an increase in population. The present paper contains all the records collected from bird-watchers by means of requests up to and including the year 1966. These, together with published records, make a total of 631 records for the period 1955—1956. Since the number of records may be assumed to depend on the number of observers, and since there has been a considerable increase in the activity of bird-watchers, the material was treated in relation to the development in bird-watching activity. A linear model explains more than 80 % of the total variation in the material in terms of the increase in bird-watching. This shows that contrary to views expressed previously there was no real increase in the number of birds during the research period. If there were any increase it might have happened during

an earlier period, say the 1930's. No annual fluctuations in the population may be reliably proved on the basis of the present material because of its great random variation, but the species seems to have been less common than usual in 1962 and more common than usual during the summer of 1963. In Finland Blyth's Reed Warbler seems to prefer semi-open meadows bordering a forest. The proximity of a shore is by means necessary. The available nesting records seem to suggest that a greater proportion of the singing males than expected nest. Nesting has generally not been observed since the male stops singing when incubation starts and the observers may have thought that the birds have disappeared. Relating the number of observers in each region makes it evident that Blyth's Reed Warbler is an easterly and south-easterly species in Finland. The spring migration of Blyth's Reed Warbler seems to take place around the turn of May—June and autumn migration occurs mainly during the first half of August.

The Marsh Warbler is a newcomer to Finnish avifauna. There are records of 203 birds altogether, the majority of them of singing ♂♂. There are five nesting records. At one nest the complete breeding cycle was recorded. On the basis of these observations it was found that the Marsh Warbler differs considerably from the closely related Blyth's Reed Warbler as to choice of habitat and song activity. The increase in the number of records may be explained to a large degree by the increase in bird-watching activity but during some years the Marsh Warbler seems to have extended its range with a sudden burst. This happened during the years 1960 and 1965. The northern limit for this species in Finland seems to have been established. Since the breeding ecology of the Marsh Warbler is little known all the observations concerning Finnish nests are reported in this paper.

#### Selostus: Viitakerttusen ja luhtakerttusen esiintymisestä ja ekologiasta Suomessa.

Viitakerttunen on Suomen linnustossa vanha laji, josta kuitenkin tunnetaan ennen 1940 lu-

koa verraten niukasti löytöjä. Löytöjen määrä on 1950- ja 1960-luvuilla tavattoman voimakkaasti lisääntynyt, mikä on tulkittu merkiksi levinneisyysalueen laajenemisesta ja lajin yleisty-  
misestä. Tähän tutkimukseen on vetoomusten avulla kerätty lintuharrastajilta kaikki lajia koskevat havainnot vuoteen 1966 asti. Julkaisu-  
tiedot mukaanluettuna käsittää aineisto vv. 1955—65 631 havaintoa. Koska havaintojen määrän voi olettaa olevan lintuharrastusaktiivisuudesta riippuvaisen ja viime aikoina on tapahtunut nopeata lintuharrastuksen vilkastumista pyrittiin havaintoaineistoa käsittelemään suhteessa tapahtuneeseen kehitykseen. Havaintoaineistossa esiintyvistä vaihtelusta voidaan lineaarisella regressiomallilla selittää yli 80 % lintuharrastuksen lisäyksestä johtuvaksi. Tämä osoittaa, ettei tutkimusaikana ole vastoin esitettyjä käsitteitä tapahtunut lajin mainittavaa yleistymistä. Mikäli yleistymistä on tapahtunut, se lienee peräisin vanhemmalta ajalta, ehkä 1930-luvulta. Selviä vuosittaisia kannanvaihteluita ei voi luotettavasti osoittaa suuren satunnaisvaihtelun vuoksi, mutta laji näyttää olleen niukka kesällä 1962 ja runsas kesällä 1963. Laji näyttää suosivan Suomessa puoliavoimia niittyjä käsitteitä tapahtunut lajin mainittavaa yleistymistä. Mikäli yleistymistä on tapahtunut, se lienee peräisin vanhemmalta ajalta, ehkä 1930-luvulta. Selviä vuosittaisia kannanvaihteluita ei voi luotettavasti osoittaa suuren satunnaisvaihtelun vuoksi, mutta laji näyttää olleen niukka kesällä 1962 ja runsas kesällä 1963. Laji näyttää suosivan Suomessa puoliavoimia niittyjä, jotka rajoittuvat metsään. Rannan läheisyys ei ole mitenkään välttämätön. Tiedossa oleva pesimäaineisto viittaa siihen, että oletettua suurempi osa laulavista koiraista on pesiviä. Pesintää ei ole yleensä seurattu, mutta koiras lopettaa laulun haudonnan alkaessa ja lintujen uskotaan kadonneen paikalta. Kun havaintojen lukumäärä suhteutetaan havainnoitsijoiden määrään, tulee lajin itäinen ja kaakoinen levinneisyys varsin selvästi esille. Viitakerttusen kevätmuutto näyttää osuvan melko tarkoin touko—kesäkuun vaihteeseen ja syysmuutto sattuu pääosaltaan elokuun alkupuolis-  
kolle.

Luhtakerttunen on linnustossamme uusi tulokas. Kaikkiaan on lajista tehty havaintoja 203 yksilöstä, joista valtaosa laulavista ♂♂. Aineisto käsittää viisi pesälöytöä. Yhdeltä pesältä on seurattu koko pesimäkierto. Havaintojen perusteella on todettu lajin selvästi poikkeavan lähisukuisesta viitakerttusesta mm. biotoopin valinnassa ja lauluaktiivisuudessa. Todettu yleistymisen voidaan suurelta osalta se-

littää kasvaneella lintuharrastuksella, mutta eränä vuosina laji on hyppäyksen omaisesti laajentunut alueittain. Tällaisia vuosia ovat olleet 1960 ja 1965. Lajin pohjoisraja näyttää meillä jo vakiintuneen. Koska lajin pesimäekologia on verraten huonosti tunnettu, on meiltä löydettyistä pesistä esitetty kaikki talteensadut tiedot.

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