On the occurrence of the Grasshopper Warbler (*Locustella naevia*) and River Warbler (*L. fluviatilis*) in Finland related to the bird watching activity

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The Grasshopper Warbler is a long-established regular member of Finnish avifauna. KIVIRIKKO (1947) reports that the species has been found regulary in Finland since 1886 albeit as a rarity. HILDÉN & LINKOLA (1962) state that it has been found in Southern and Central Finland regularly but was rare till the middle of the 1950's after which it has clearly become more common. The same authors also claim that the species has extended its breeding range westwards. There is no distribution study of this species in Finland. But ANTIKAINEN (1965) has studied the distribution of the Grasshopper Warbler in Northern Savo and he says that it has become more common and also extended its range in that area during the 1950's and 1960's. He claims that this increase cannot be explained as the result of an increase in bird-watching activity but he does not try to prove this statistically. On the other hand PAATELA & KAILA (1960) have dealt with the distribution of the Grasshopper Warbler in Finland and they have come to the conclusion that it is a southern rather than a south-eastern species in Finland.

The River Warbler has also belonged to Finnish avifauna for a long time. KIVIRIKKO (1947) reports three records from Finland towards the end of the 19th century, but none after that. HILDÉN and LINKOLA (1962) mention almost twenty records of this species. The same authors suggest that the increase in the number of records during the 1950's is mainly due to an increase in the activity of bird-watchers. No exact information exists as to the times of occurrence, distribution and habitat of the River Warbler in Finland.

During the last ten years there have been, however, so many new records of both species that a closer survey of them seems appropriate. Above all it is important to clarify what part the increase in the activity of bird-watchers plays in the increase in the number of records, and also the general nature of a possible trend towards spreading on the part of the species. On the other hand it is also appropriate to survey the records according to time of occurrence, eventual nesting and song habitat, since most of the records are of singing males.

The author's own observations in the Helsinki area together with material collected from the whole of Finland have made it possible to analyse the occurrence of these Warblers in relation to bird-watching activity, and an even more detailed analysis of its distribution seems appropriate.

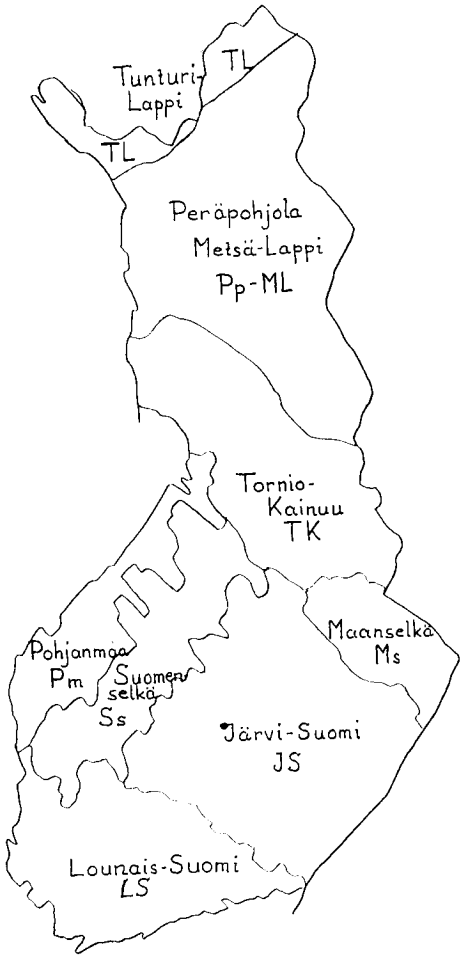

FIG. 1. Zoogeographical regions of Finland according to Merikallio (1958). *(Suomen eläinmaantieteelliset alueet Merikallion (1958) mukaan.)*

Material and methods

The present paper includes all Grasshopper Warbler and River Warbler records from Finland up to and including the year 1966. Previously unpublished records were collected by means of requests made to bird-watchers in the ornithological periodicals *Ornis Fennica, Lintumies* and *Luonnon Tutkija.* Since it seemed probable that the increase in bird-watching activity influenced the number of records, suitable variables to indicate this had to be found. The number of birds ringed each year was taken as an indicator of the situation for the whole of Finland. Another indicator of the change in bird-watching activity was the average number of participants at the two April meetings of the young members section of the Finnish Ornithological Society (in Helsinki). Since bird-watchers are unevenly distributed in various parts of Finland this was shown by the number of ringers active in different parts of the country. The regional division here is the one worked out by MERIKALLIO (1958) (Fig. 1).

Since there are no reliable records of the variables in question before the year 1955 and none later than those for 1965, the basic observation period was established as 1955—1965. From this basic period there are records of 392 Grasshopper Warblers. This material would seem to be sufficient from a statistical point of view. The statistical methods used are explained in connection with the results.

The observation material of River Warblers was collected in a similar way but in this case all records for the year 1967 were also included. In all, there are records of 69 birds, three of which were shot, one captured, one nest with eggs and the rest, i.e. the bulk of the records, are of singing males.

The observation material is considered reliable because the records have been collected from persons who know birds well, and almost without exception have been verified by several observers. Apparently there are no mistakes in the identification of the species, but one drawback is that in many cases there is only one record of each individual bird. The original material is not given in toto but has been limited to that which is contained in the statistical models, figures and tables. The authors of important records are mentioned in brackets only.

Results

1. *Occurrence of the Grasshopper Warbler in Finland*

A. Before the year 1940. — KIVIRIKKO (1947) reports that four birds were shot in Räisälä in July 1886. The following year one bird was shot in June in Rantasalmi. A nest with six eggs was found in Pudasjärvi on 17.8.1889. After that the species was recorded in Pyhäjärvi 1903, Kuopio 1903, Hamina 1903 and Lahti 1907. By the year 1940 there were altogether 24 records of Grasshopper Warblers

TABLE 1. Grasshopper Warbler records in the zoogeographical regions of Finland during the years 1955—1965. (*Vuosina 1955—1965 Suomen eläinmaantieteellisillä alueilla havaittujen pensassirkkalintujen lukumäärät.*)

Zoogeographical region *Eläinmaant. alue.*		Records *Havaintoja*											
		1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Total *Yht.*
Lounais-Suomi	(LS)	3	13	8	14	12	12	17	17	17	19	11	143
Järvi-Suomi	(JS)	3	6	6	9	7	13	26	20	34	22	25	171
Maanselkä	(Ms)	—	—	—	—	1	2	1	3	6	17	2	32
Pohjanmaa	(Pm)	5	1	7	5	—	1	4	3	4	7	1	38
Tornio—Kainuu	(TK)	—	—	—	—	—	—	—	1	1	—	1	3
Suomenselkä	(Ss)	3	—	—	—	—	—	—	1	—	—	1	5
Total *Yht.*		14	20	21	28	20	28	48	45	62	65	41	392

in Finland. These are fairly evenly distributed all over Southern Finland: Lounais-Suomi 4, Järvi-Suomi 14, Suomenselkä 1, Pohjanmaa 5. The northernmost records come from a line drawn between Kuopio and Vaasa.

B. The years 1941—1954. — For this period there are in all 45 records which are divided between the various regions as follows: Lounais-Suomi 20, Järvi-Suomi 9, Suomenselkä 3, Pohjanmaa 11, Tornio-Kainuu 1. The northernmost records come from a line between Kuopio and Oulu and the westernmost from Signildskär, Åland during autumn migration on 28.10.1952 (LINKOLA 1954a).

C. The years 1955—1965. — For this basic observation period there are 392 records altogether, most of them referring to singing males. The distribution of these in the various zoogeographical regions is given in table 1. The number of records has risen steadily with the exception of the year 1965. For the various regions the tendency is similar with one exception, Pohjanmaa, where this steadily rising tendency cannot be traced. The annual number of records for the whole of the country and the regression model calculated on the basis of these are given in Fig. 2. The increase in the number of records each year may be indicated by a linear regression model $y = 54.3 + 0.16x$ which is statistically significant ($t = 6.01$; $p < 0.001$) and gives a 73.0 % explanation. The corresponding second degree model has weaker coefficients and gives a 81.2 % explanation, so the increase in the number of records may be considered to be a linear one.

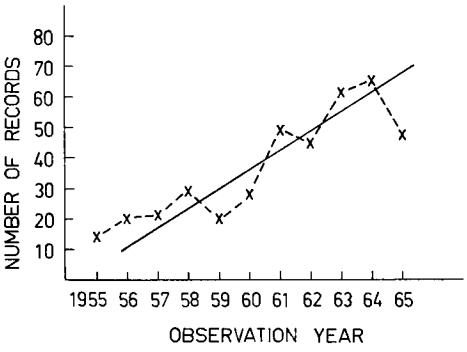

FIG. 2. Number of Grasshopper Warbler records in Finland during the years 1955—1965 (— — — —) and the linear regression model (————) calculated on the basis of these. *(Suomessa vv. 1955—1965 havaittujen pensassirkkalintujen lukumäärä (— — — —) sekä havaintojen perusteella laskettu lineaarinen regressiosuora (————).)*

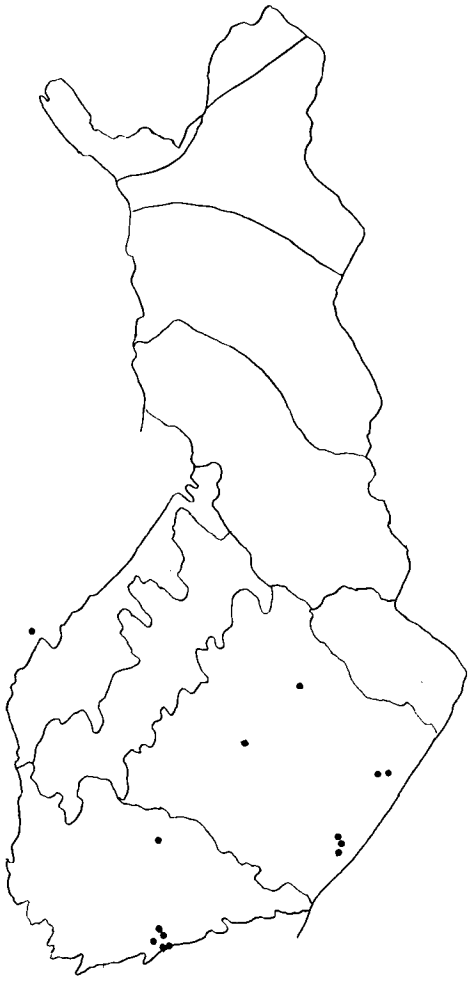

FIG. 3. Records of the River Warbler in Finland during the years 1950—1960. *(Viitasirkkalinnusta vv. 1950—1960 tehdyt löydöt.)*

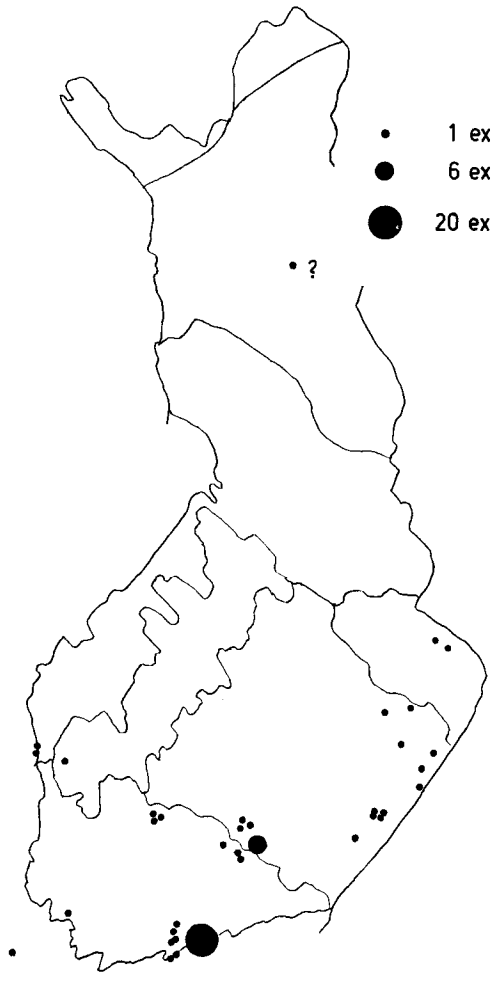

FIG. 4. Records of the River Warbler in Finland during the years 1961—1967. *(Viitasirkkalinnusta vv. 1961—1967 tehdyt löydöt.)*

2. *Occurrence of the River Warbler in Finland*

A. Before the year 1950. — The oldest known record from Finland according to KIVIRIKKO (1947) is of a bird shot in Porvoo on 24.6. 1869. One male is reported to have been shot in Uusikaarlepyy on 21.6.1879 (A. CASTRÉN) and the third old record refers to a nest with two well-incubated eggs, found in Hanhinen, Hailuoto on 27.6.1889 (A. SANDMAN). After these there is a record from Punkasalmi during the summer 1932 (E. LINDEBERG). Again after a long pause a dead bird was found in a net on Fagerö, Sipoo on 29.5.1945, and in the same place a singing male was heard on 5.6.1945 (MARTOLA 1949). The next record of this species comes from Laajalahti, Espoo on 30.5. 1947 (HILDÉN 1954), and after that from Elfvik, Espoo on 26.5.1949 (LINKOLA 1954b). In

all, there are eight records of the species before the year 1950.

B. The years 1950—1960. — During the following 11 years there are 13 records, all of them of singing males. These are given in Fig. 3. Most of these records come from the frequently visited excursion areas around Helsinki and Lappeenranta. The northermost, and also the westernmost record, is from Björköby on 27.6.1958 (Hissa 1962).

C. The years 1961—1967. — Since the year 1960 there have been several records each year, of 56 individuals in all. The localities are shown in Fig. 4. The well explored areas again produce most of the records, Helsinki with its surroundings 26, and Heinola 6. The previously poorly covered area of Northern Karelia was intensely studied by A. Laaksonen and J. Tiussa, who found this species there in nearly 10 different localities. It is to be noted that during this period there is only one record from the well-explored Turku area. The westernmost record is from Kökar on 5.7.1967 (O. Arjamaa and J. Vuokko), but from Åland there are no records. The northernmost record, an unverified press report, is from Pelkosenniemi in Lapland at Midsummer, 1966 (Helsingin Sanomat). It has not been possible to check this record, but the description seems to refer to this species. The fairly well explored areas around Kokkola and Oulu have produced no River Warbler records.

Fig. 5 shows the number of River Warblers observed (x) in various years (y) and the regression models calculated on the basis of these. The statistical model $y = 55.6 + 1.62x - 0.07x^2$ gives a 78.9 % explanation. The coefficients for this model are statistically weak and a more reliable result may be obtained by a linear model $y = 57.1 + 0.75x$ which gives a 74.5 % explanation. Here the coefficient is statistically significant ($t = 5.6$; $df = 11$; $p < 0.001$). On the basis of the results it seems that the number of River Warbler observations has risen very steeply during the observation period 1955—1967 and grown about 10—15 times. There are great fluctuations in the number of records per year. The material is small but during the summer of 1964 it seems that there were more River Warblers than normal, whereas the summers of 1961 and 1965 show a smaller than average number of records. However, it is not possible to get a reliable picture of the development on the basis of this material.

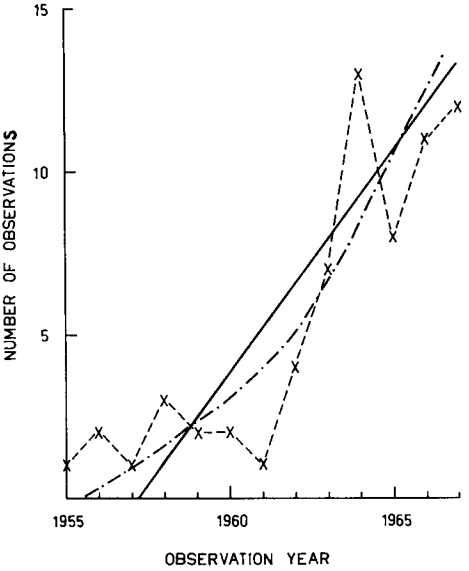

Fig. 5. The number of records of River Warblers during the years 1955—1967 — — — —, and the linear ———— or curvilinear — . — . — . — regression models calculated on the basis of these. *(Viitasirkkalintuhavaintojen lukumäärä vv. 1955—1967 — — — —, ja niiden perusteella laskettu lineaarinen ———— ja kurvilineaarinen — . — . — . — regressiomalli.)*

3. *Increase in bird-watching activity*

A. The whole of Finland. — Bird-watching activity has increased very considerably in the whole of Finland

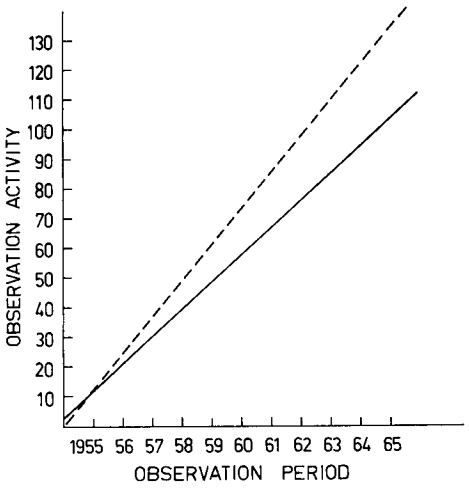

FIG. 6. Regression lines showing the increase in bird-watching during the years 1955—1965. The number of birds (in thousands) ringed in Finland (— — — —) and the number of participants at the meetings of the young members section of the FOS (————). *(Lintuharrastuksen lisäystä vv. 1955—1965 kuvaavien muuttujien regressiosuorat. Suomessa rengastettujen lintujen lukumäärä tuhansina* (— — — —) *sekä SLY:n nuorisojaoston kokouksissa käyneiden jäsenten lukumäärä* (————.)

during the observation period. One indication of this is the steep rise in the number of birds ringed each year. The increase in the number of birds ringed during the years 1955—1965 may be shown by a linear regression model $y = 54.1 + 0.08x$ which is statistically significant ($t = 11.1$; $p < 0.001$) and which yields a 93.4 % explanation. This delineator is given in Fig. 6. A similar indicator of the increase in bird-watching activity may be obtained from the number of participants at the meetings of the young members section of the FOS. An average for the two April meetings was chosen as a representative figure. This development is depicted by a steeply rising regression model $y = 53.7 + 0.11x$ which is statistically very significant ($t = 12.6$; $p < 0.001$) and gives an explanation of 94.5 %. This delineator is also given in Fig. 6. An increase in bird-watching activity for the whole of Finland is shown by the number of ringers active in various parts of the country, which also follows a steeply rising model $y = 52.9 + 0.008x$. The model is statistically significant ($t = 7.84$; $p < 0.001$) and gives a 87.4 % explanation. This model is given in Fig. 7.

B. Various parts of the country. — If we assume that the increase in bird-watching activity has an effect on the number of records, then it is necessary to study the development of bird-watching in different parts of the country. Here we have access to only one variable factor, i.e. the number of ringers operating in each zoogeographical region. The regional development is shown by these models and explanations:

Lounais-Suomi	(LS)	$y = 53.7 + 0.01x$	81.9 %
Järvi-Suomi	(JS)	$y = 52.1 + 0.08x$	65.9 %
Pohjanmaa	(Pm)	$y = 53.1 + 0.06x$	87.4 %
Suomenselkä	(Ss)	$y = 54.2 + 0.43x$	85.9 %
Maanselkä	(Ms)	$y = 57.9 + 0.35x$	36.9 %
Tornio-Kainuu	(TK)	$y = 35.5 + 0.34x$	46.5 %

The intensity of bird-watching activity also seems to be rising steeply in different parts of the country. In Maanselkä and Tornio—Kainuu the development is not as clear-cut as in the other regions because the random variance is greater. But in principle the development seems to be the same for the different regions.

4. *The effect of the number of observers on the number of Grasshopper Warblers recorded*

A. The whole of Finland. — When we try to account for the number of Grass-

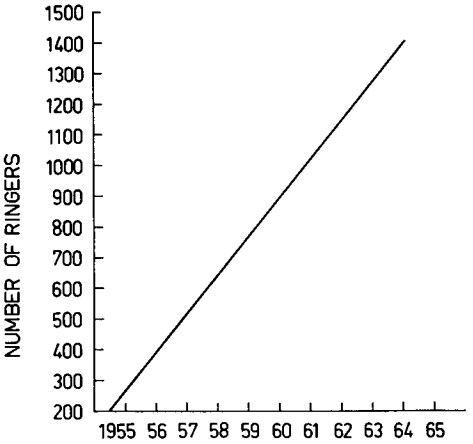

FIG. 7. Regression line showing the number of ringers active in Finland during the years 1955—1965. *(Suomessa vv. 1955—1965 liikkuneiden rengastajien aktiivisuuden lisäystä kuvaava regressiosuora.)*

hopper Warblers recorded during the years 1955—1965 with the variables showing the change in bird-watching activity, we find that a large part of the increase in the number of records may be accounted for in this way. If the number of records is accounted for by the number of ringers operating in the whole of Finland we get a linear model $y = 6.5 + 0.03x$ which is statiscally significant ($t = 3.41$; $p < 0.01$) and gives a 51.2 % explanation. A strong positive correlation exists between the variable factors ($r = 0.71$; $p < 0.01$), between the number of records and the number of participants at the spring meetings in Helsinki. However, observation activity explains only about one half of the total variance found in the material. If the number of observers had an effect on the number of records there should be a linear relationship between the two, and this has been demonstrated to exist.

B. Various parts of the country. — Since we found that observation activity accounts for about only half of the variation present in the material it seems reasonable to assume that the effect of observation activity varies between different parts of the country. This led the author to explain the increase in the number of Grasshopper Warbler records in the different zoogeographical regions by means of respective regional increases in the number of observers. The regression models and explanations for the most important regions are as follows:

Lounais-Suomi	(LS)	$y = 231 + 29.6x$	22.0 %
Järvi-Suomi	(JS)	$y = 58.4 + 2.6x$	64.1 %
Maanselkä	(Ms)	$y = 5.3 + 0.16x$	2.4 %

With the exception of Järvi-Suomi it looks as if the increase in the number of observers would give a poor explanation for the increase in the number of Grasshopper Warbler records.

5. *The effect of observation activity on the number of River Warbler records*

At the beginning the number of records (y) can be accounted for by the number of birds ringed (x). The regression model thus obtained $y = 5.98—0.18x + 0.0016x^2$ gives an explanation of 80.1 % with reliable coefficients. Correspondingly the number of birds observed (y) is accounted for by means of the variable factors showing changes in observation activity in Helsinki (x). This produced the model $y = 3.48 + 0.15x—0.0002x^2$ explanation 78.3 %. When the number of records was accounted for by means of all the variable factors relating to observation activity the total explanation obtained was 95.7 %. This indicates that the increase in observation activity almost completely accounts for the increase in River Warbler records during the years 1955—1967.

6. *Density of Grasshopper Warbles in the various regions*

Since the number of observers doubtlessly has an effect on the number of records the distribution of the Grasshopper Warbler in Finland has to be studied bearing this in mind. The following table gives the number of records in relation to the number of observers, i.e. the number of birds per 100 observers in each region:

Lounais-Suomi	(LS)	2.1
Järvi-Suomi	(JS)	15.6
Pohjanmaa	(Pm)	2.8
Maanselkä	(Ms)	49.9
The whole country		3.9

This table shows that the Grasshopper Warbler is clearly a southeasterly species in Finland. This effect is even more accentuated by the fact that a major part of the Lounais-Suomi records come from the eastern coastal part of the area. The well-explored Turku area has produced only a few records of Grasshopper Warblers. Similar statistical analysis on the density of River Warblers would be misleading, because the material is rather small.

7. *Habitats of Grasshopper Warbler and River Warbler*

Most of the Grasshopper Warblers observed in Finland have been near reedbeds in lush, marshy meadows with occasional lonely bushes. The actual reedbeds, and dense Phragmites stands in particular, are also often frequented by the Grasshopper Warbler. Generally these reedbeds border on bushy meadows so one might not consider these two habitats as separate ones. Another preferred habitat is grain fields. 231 of the records provide a description of the habitat and they are divided as follows:

Meadows with bushes	62.4 %
Reed-beds	29.8 %
Grain fields	7.8 %

Most of the birds heard singing in grain fields were in the southeast of the country so there seem to be regional differences in this respect.

The singing River Warbler males found in Finland have preferred the same type of biotope fairly consistently. Usually the dominant trees in the biotope are the two species of alder. (*Alnus glutinosa* and *incana*), birch (*Betula*) or high willow (*Salix*). The singing positions are restricted to clearings with dense undergrowth. The undergrowth normally consists of meadowsweet (*Filipendula*), raspberry (*Rubus*) and thickets of various umbellifers (*Umbelliferae*). Only once has a singing male been found in a reedbed, but even there the bird visited a nearby alder-belt every now and then. A similar change of biotope by a singing male has been recorded in Sweden by FREDGA and PERSSON (1961). HILDÉN and LINKOLA (1962) claim that the River Warbler in Finland sticks to shores and brook dales. But the present material includes several records away from water, on the edge of a field, in backyards of houses, etc. It looks as though the biotope is not so much determined by its location as by its nature: dense undergrowth, a dense and lush growth of trees with a border effect towards a semi-open landscape. This type of biotope is often found near water, but the presence of water doesn't seem to be essential.

Usually the males sing in the undergrowth or on the lower branches of bushes, but the author has twice found a male sitting some 5—6 metres above ground while singing.

8. *Nesting in Finland*

The Grasshopper Warbler has been a regular breeder in Finland for a long time already. KIVIRIKKO 1947, HILDÉN & LINKOLA 1962 and ANTIKAINEN 1965 report more than a dozen nests from Finland, the oldest one dating from the end of last century. However, these nest records are so lacking in detail that they give no material for a more detailed analysis. But there are so many nesting records that the Grasshopper Warbler may be assumed to be a fairly common breeder in Finland. Normally observers have not paid any

attention to possible nesting and, since the species usually builds its nest in thickets, it may be difficult to observe it there because of its skulking habits. The scarcity of nesting records may, therefore be deceptive. In Laajalahti, Helsinki where the Grasshopper Warbler has been observed annually at least for the past twenty years several young birds have been caught in July—August during the summers 1966—1968 and one nest was even found there in 1968 (H. Miettinen, T. Tallgren *et al.*). On the basis of these observations it seems reasonable to assume that the population in Finland does not consist of single males only.

The River Warbler nest mentioned earlier, which was found by A. Sandman in Hailuoto in 1889, is the only record of nesting in Finland. The nest was not collected and the record is a fairly old one. It must be taken with some reservation, since the species at that time was rather unfamiliar to Finnish bird-watchers.

There have been 2—3 singing males in one particular biotope in Helsinki four years in the 1960's. Twice a singing male has been found in the same biotope in Heinola and Northern Karelia. The author has made a careful study of the birds in the Helsinki area during the summers of 1965—1967 but never was any hint of actual nesting found neither are there any other reliable records of nesting in Finland. Young birds have never been trapped in the well-explored area around Helsinki where the bird is a regular summer visitor.

9. *Times of occurrence*

Most of the Finnish Grasshopper Warbler records refer to singing males. Figure 8 gives the number of singing males during different periods of the summer. This material shows that the first individuals arrive in Finland around

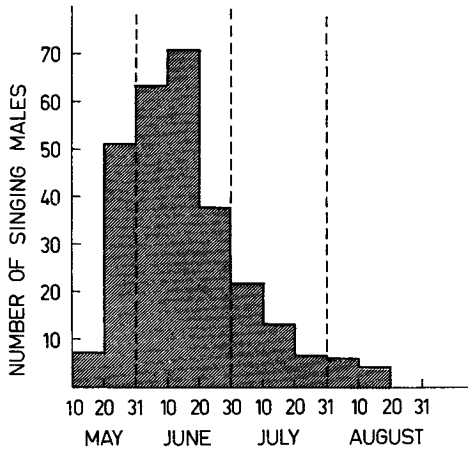

FIG. 8. The number of singing Grasshopper Warblers observed during different periods of summer divided into thirds of a month. *(Kesän eri vaiheissa havaittujen laulavien pensassirkkalintujen lukumäärä kuukausikolmanneksittain.)*

20.5 and that the main migration occurs around the end of May — early June. Most of the birds stop singing about 20.6., but the song period continues until early August. The Grasshopper Warbler often raises two broods which may be the reason for the long song period. The length of the song period also makes it easier to find the Grasshopper Warbler than other nocturnal song birds. On the other hand the daily song period is shorter than that of the other nocturnal singers (HOLOPAINEN, KANTONEN & SORJONEN 1967).

Since most River Warblers were observed only once or twice it is difficult to get a good idea of the end of the song period. Figure 9 gives all the records during the 1960's grouped into thirds of a month. The observations have been more consistent in the Helsinki area and they form the core of the material. But only such records are included of which the exact date is known. On the basis of this material the River Warbler seems

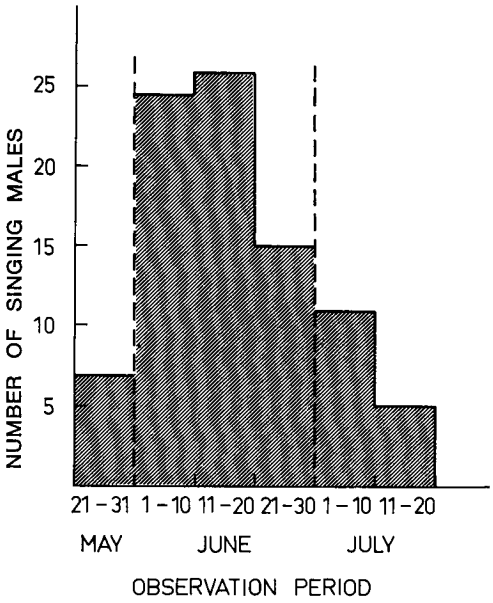

FIG. 9. The number of singing River Warblers observed in the thirds of a month. *(Laulavista viitasirkkalinnuista tehtyjen havaintojen määrä kuukausikolmanneksittain.)*

to return to Finland in spring during the last third of May. The earliest song records are from Helsinki 26.5.1949 (M. LINKOLA *et al.*), 28.5.1964 (K. CASTRÉN and E. v. BOEHM), and from Nurmijärvi 26.5.1951 (J. SALO) and Turku 24.5.1966 (P. SANDELL).

Most of the birds seem to arrive in Finland during the first third of June. During the second third there is only a small rise in numbers. The birds continue their song until Midsummer, but song is frequently heard until the second third of July. The latest song record for the species comes from Helsinki on 6.8.1967 (P. PAAVILAINEN). This species has not been trapped during autumn migration at our bird observatories so the latest records is of a bird ringed at Kristiina on 14.8.1963 (P-Å. JOHANSSON).

Discussion

The material shows convincingly that the number of Grasshopper Warbler records has increased and this seems to have happened in a linear manner. On the other hand bird-watching activity has also increased very strongly and apparently in a similar way in different parts of the country. The results indicate that the number of records depends very much on the number of observers, although this explains only about 50 % of the variation in Grasshopper Warbler records.

Almost half of the variance remains unexplained. This may be assumed to be a result of e.g. annual fluctuations in population, but a linear model explained 73 % of the annual fluctuations so no clear annual peaks can be seen. It may be assumed that the Grasshopper Warbler was more numerous than usual during the summers of 1961 and 1963 and scarcer than usual during the summers of 1959 and 1965. Because of the great variation the present material is not suitable for a detailed and reliable analysis. The material presented by NIEMI (1968) for the years 1962—1967 is in agreement with the present material as far as annual fluctuations are concerned. But the authors' explanation that the annual population changes depend on the May and June temperatures seems to be somewhat artificial. Mean temperatures for June are roughly similar to those recorded in this material but as half of the spring migration according to this material takes place during the month of May it is difficult to understand the link between the temperature and the number of birds observed. On the other hand the influence of individual observers on the whole material is considerable so that it seems difficult to believe that NIEMI's (1968) fairly limited material would give any ground this kind of treatment.

Compared to the rise in bird-watching

activity the rise in the number of Grasshopper Warbler records is less steep. This may be the main reason why only about half of the variance can be explained by the number of observers. It might mean that the species is slowly decreasing in numbers. VOOUS (1960) reports that the Grasshopper Warbler has extended its range northwards this century and that it has established itself as a breeding bird in Sweden but not in Denmark. It may be assumed that an increase in bird-watching activity could partly explain the many new records in Sweden. If such an expansion has taken place it must have happened during the 1920's and 1930's, because there has been no such tendency from 1955—1965. The results contradict the views expressed by HILDÉN & LINKOLA (1962) and ANTIKAINEN (1965). One possible explanation why the number of records was smaller than expected could be the fact that the Grasshopper Warbler is such an old and common species that not everybody has bothered to report their own records. If the number of records were to agree with the increase in the number of observers there would need to be a 70 % increase in the total number of records. It does not seem probable that the observers would have withheld this many records but the decrease in the number of records is factual.

When the number of records is related to the number of observers the south-eastern distribution of the Grasshopper Warbler in Finland becomes evident, with about twenty times as many birds per observer in Maanselkä as in Lounais-Suomi. This result contradicts the claim by PAATELA & KAILA (1960) that the Grasshopper Warbler is a southerly species in Finland. The present results also indicate that the Grasshopper Warbler prefers grain fields as a habitat, especially in south-eastern Finland. The reason for this might be the scarcity of bushy meadows, which are favoured most, and, furthermore, the greater population density which forces some of the males into less favoured habitats.

The occurrence of River Warbler is quite different. The results show that the River Warbler also seems to have become much more common during the years 1955—1967. However, the number of records may be explained almost completely by means of the variable factors relating to observation activity, which clearly indicates that the increase in the number of records of this species in Finland does not indicate a real increase in the number of birds. It is not possible to get a good idea of yearly population changes on the basis of this material nor is it sufficient for actual distribution analysis. But the scarcity of records from the well-explored western coast and SW Finland indicates that the centre of distribution lies in the SE.

The weakness of this study is how well the variables chosen for the study reflect the real change in observation activity. It can be argued that night excursions have become more popular with bird-watchers and also an increase in the number of cars has made it easier for bird-watchers to get around. Also a species as loud in song as the River Warbler, which can be heard at a distance of 300—500 metres, may be found in a frequently surveyed area as easily by 5 as by 50 observers. Anyhow the variables for observation activity seem to be so consistent and the explanation so reliable that the conclusion that the increase in the number of birds is only an apparent one seems to be correct. In support of this there is also the fact that according to available literature there is no record of an expansion trend with this species anywhere else.

The song activity of the River Warbler seems to last well into the middle of the summer, which could indicate that the birds have not found a mate. Despite extensive searches nothing indicative of

nesting has been found in the areas of regular occurrence. This probably means that the River Warbler is a regular but non-breeding summer visitor to Finland and that there have not been any changes in its distribution.

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Summary

All Grasshopper Warbler records from the whole of Finland have been collected by means of requests up to and including the year 1966. All previously published records are also included in this material. The increase in bird-watching activity in recent years is indicated using three variables the number of birds ringed in the whole of the country, the number of ringers active in different parts of Finland, and the number of participants at the meetings of the young members section of the Finnish Ornithological Society. Since the most valid material for all the variables covered the years 1955—1965 that period was chosen as the basic observation period. For this period there are 392 Grasshopper Warbler records from Finland. The material shows that the number of records during this period increased in a linear manner. At the same time bird-watching activity has also increased linearly and steeply on the part of all the variables. There is a statistically significant correlation between the number of records and increased bird-watching activity, but this increase can explain only some 50 % of the variance in the material. It is found that the number of Grasshopper Warblers has increased less than expected which might indicate that in fact the species is gradually decreasing, contrary to general belief. Considering the distribution of bird-watchers it seems that the population of Grasshopper Warblers is at its strongest in the south-east of the country. The most preferred habitat seems to be bushy meadows but in the southeast quite a lot of the birds seem to frequent grain fields. No annual population fluctuations can be verified statistically on the basis of this material. Neither is it possible to demonstrate that these have any connection with the spring and summer temperatures.

The River Warbler also seems to have become much more common in Finland during the 1950's and 1960's. The total observation material consists of 69 records in all. By means of the variables reflecting bird watching activity the author explains the increase in the number of River Warbler records and the expansion trend is found to be only apparent and a result of the increase in observation activity. The centre of distribution in Finland lies in the SE but it is not possible to establish this statistically. The River Warbler arrives in Finland towards the end of May. The active song period normally ends around Midsummer, but singing males may be heard until August. Singing males have been recorded between 24.5.—6.8. According to observations in the field and the present material it seems as though the males couldn't find a mate although on several occasions the bird has been found in the very same biotope in consecutive years.

Selostus: **Pensassirkkalinnun** (*Locustella naevia*) **ja viitasirkkalinnun** (*L. fluviatilis*) **esiintymisestä Suomessa suhteessa lintuharrastusaktiivisuuteen.**

Tutkimusta varten on kerätty havainnoitsijoilta vetoomusten avulla koko Suomesta tunnettu havaintoaineisto pensassirkkalinnuista vuoteen 1966 asti. Myös kaikki julkaistut havainnot on mukana. Viime aikoina tapahtunutta lintuharrastuksen lisäystä on kuvattu kolmella muuttujalla: koko maassa rengastettujen lintujen lukumäärällä, maassa liikkuneiden rengastajien määrällä sekä SLY:n nuorisojaoston kokouksissa käyneiden jäsenten lukumäärällä. Koska luotettavin havaintoaineisto eri muuttujien osalta oli saatavissa vuosilta 1955—1965, on tuo ajanjakso valittu varsinaiseksi tutkimus-

aineistoksi. Ajanjaksolta on tiedossa havainnot 392 yksilöstä. Aineisto osoittaa pensassirkkalinnusta tehtyjen havaintojen lukumäärän lisääntyneen tutkimusaikana lineaarisesti. Samaan aikaan on myös lintuharrastusaktiivisuus lisääntynyt lineaarisesti ja jyrkästi kaikkien muuttujien osalta. Tehtyjen havaintojen lukumäärän ja harrastusaktiivisuuden välillä vallitsee tilastollisesti vahva riippuvuus, mutta harrastuksen lisäyksellä voidaan selittää vain noin 50 % havaintoaineistossa esiintyvästä vaihtelusta. Todetaan lajin lukumäärän lisääntyneen odotettua vähemmän, mikä osoittanee, että laji vastoin yleistä käsitystä on hiljalleen taantumassa. Kun havainnoitsijatiheyden erilaisuus otetaan huomioon todetaan pensassirkkalintukannan olevan selvästi vahvemman maan kaakkoisosissa. Lajin suosituin biotooppi on pensaikkoinen niittyalue, mutta kaakkoisosissa maata laji näyttää verraten usein esiintyvän myös viljapelloilla. Selviä vuotuisia kannan vaihteluita ei aineistosta voi tilastollisesti osoittaa eikä myöskään näiden mahdollista yhteyttä kesän tai kevään lämpötiloihin.

Myös viitasirkkalintu näyttää 1950- ja 1960-luvuilla yleistyneen erittäin voimakkaasti. Suomesta tunnettu havaintoaineisto käsittää 69 löytöä. Harrastusaktiivisuutta kuvaavilla muuttujilla selitettiin viitasirkkalinnusta tehtyjen havaintojen lukumäärää, jolloin todettiin havaittu leviämistendenssi vain näennäiseksi ja havaintoaktiivisuuden lisäyksestä johtuvaksi. Esiintymisessä voidaan havaita kaakkoisen painopisteen olemassaolo, jota tilastollisesti ei voi osoittaa. Laji saapuu meille toukokuun lopulla. Aktiivinen laulukausi päättyy yleensä juhannuksen tienoilla, mutta laulua voi kuulla aina elokuuhun asti. Laulavista koiraista tehdyt havainnot sattuvat 24.5.—6.8. väliseen aikaan. Tehtyjen havaintojen ja tiedossa olevan aineiston perusteella näyttävät koiraat jäävän parittomiksi, vaikka laji joissakin tapauksissa on useasti esiintynyt peräkkäisinä vuosina täsmälleen samalla biotoopilla.

References

ANTIKAINEN, E. O. 1965. Pensassirkkalinnun, Locustella naevia (Boddaert), leviämisestä Pohjois-Savoon. Ornis Fenn. 42:89—94.

FREDGA, K. & PERSSON, S. 1961. Några anteckningar om en flodsångare (Locustella fluviatilis) vid Hosjön försommaren 1960. Vår Fågelvärld 20:211—214.

HILDÉN, O. 1954. Tiedonantoja. Ornis Fenn. 31:25.

HILDÉN, O. & LINKOLA, P. 1962. Suuri lintukirja. — Helsinki.

HISSA, R. 1962. Tiedonantoja. Ornis Fenn. 39: 159.

HOLOPAINEN, I. J., KANTONEN, P. & SORJONEN, J. 1967. Pensassirkkalinnun (Locustella naevia) vuorokautisesta laulurytmiikasta. Ibid. 44:109.

KIVIRIKKO, K. E. 1947. Suomen linnut I. — Porvoo.

LINKOLA, P. 1954a. Tiedonantoja. Ornis Fenn. 31:25.

— 1954b. Tiedonantoja, Idib. 31:50.

MARTOLA, H. R. 1949. S.L.Y:n toimintaa vv. 1943—1948. Ibid. 26:61.

MERIKALLIO, E. 1958. Finnish Birds. Their distribution and numbers. Fauna Fennica 5:1—181.

NIEMI, R. 1968. Satakielen sekä Locustella- ja Acrocephalus-lajien esiintymisestä Itä-Hämeessä. Ornis Fenn. 45:84—88.

PAATELA, J. & KAILA, L. 1960. On the Expansion of Blyth's Reed Warbler (Acrocephalus dumetorum) into Finland. Ibid. 37:1—11.

VOOUS, K. H. 1960. Atlas of European Birds. — Amsterdam.

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