

ORNIS FENNICA

SUOMEN LINTUTIETEELLINEN YHDISTYS
ORNITOLOGISKA FÖRENINGEN I FINLAND
TOIMITUS REDAKTION: M. SOIKKELI, E. HAUKIOJA

Vol. 45 N:o 2
1968

THE EFFECT OF THE COLD SPRING 1966 UPON THE LAPWING (*VANELLUS VANELLUS*) IN FINLAND

KARI VEPSÄLÄINEN

Introduction

Finnish Lapwings are wintering mainly in the south-western parts of France and in the Pyrenees (NORDSTRÖM 1963b). As the Lapwing is a species that searches for its food from the soil it is unable to survive on snow covered or frozen terrain. Hence no Lapwings have been observed wintering in Finland.

The spring migration from the wintering places begins in February. During the third week in March the largest part of the North-European stock passes Holland (RINKEL 1940). The first Lapwings usually arrive in southern Finland at the end of March. According to statistics for 1948—65 (v. HAARTMAN *et al.* 1963—66) the earliest, the average and the latest arriving days in Helsinki were February 28th—March 23rd—April 4th. Corresponding days in Kokkola were March 12th—April 7th—April 26th (13 springs) and in Rovaniemi April 5th—April 30th—May 14th (15 springs). The peak in the spring migration occurs on the southern sea coast fairly late, usually around April 20th.

The pioneer groups of Lapwings migrate both in Central- and northern Europe regularly between "winter" and "spring". Changes in weather conditions easily affect the advance of the pioneer groups. A current of warm air quickly induces the pioneers to migrate and a fall in temperature and/or a snowstorm leads to a strong reversed migration (KALELA 1955). PEITZMEIER (1953, Ref. KALELA 1955) tells of a reversed migration caused by a strong snow storm in northern Germany on March 30th, 1952 when more than 10,000 Lapwings migrated over a ten kilometer front in a SW-W direction.

On the southern sea shore in Finland the first Lapwings often orientate back over the sea in the afternoon of their arriving day. Such pioneer groups still migrating or birds that have reached their nesting sites too early are not always able to save themselves by means of reversed migration during a sudden cold period but perish in great numbers (KALELA 1955, v. HAARTMAN *et al.* 1963—66). Likewise in spring when the snow melts very slowly and it is difficult to get food the migration of the

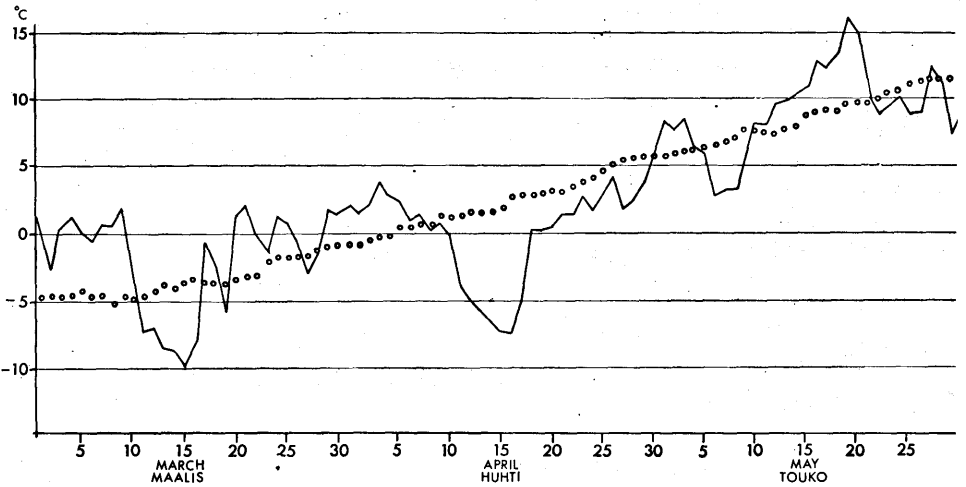


FIG. 1. Daily average temperatures in spring 1966 (continuous line) and in 1881–1960 (dotted line) in Helsinki, Kaisaniemi.

KUVA 1. Vuorokautiset keskilämpötilat keväällä 1966 (yhtenäinen viiva) ja 1881–1960 (pilkkuviiva) Helsingin Kaisaniemessä.

Lapwing is delayed and some individuals perish (e.g. KALELA 1955, p. 72, spring 1954). Hence the behaviour of Lapwings differ from that of other early breeding Finnish waders — Southern Dunlin (*Calidris alpina schinzii*), Ringed Plover (*Charadrius hiaticula*), Curlew (*Numenius arquata*) and Green Sandpiper (*Tringa ochropus*) — whose arrival in spring is depending on the 0° C-isotherm and the thawing of the ground (SOIKKELI 1967, p. 162).

Weather conditions in spring 1966

After March and beginning of April which were somewhat warmer than normal there was a severe cold period in the whole country. Thus the average temperature for April in Helsinki, Kaisaniemi was 2.8° lower and at Turku airport 2.0° lower than during the period 1931–60. During the cold period April 11–17th the minimum temperature in Helsinki, Kaisaniemi was -11.9° and the maximum -0.4° and in Turku

correspondingly -11.3° and 0.2° . Further inland the minimum temperatures were considerably lower, for instance in Tikkurila only 20 km from Helsinki, -18.4° on April 17th. The daily average temperatures in Helsinki, Kaisaniemi in spring 1966 are shown in Figure 1.

In Finland the snow cover was at its deepest — about one meter — by the end of March. Between April 1–10th the snow cover was reduced approx. 20 cm all over the country except in Lapland. As a consequence of a heavy snow-storm during April 12–13th in the beginning of the cold period the snow cover increased by 10–20 cm in southern and south-eastern Finland. Elsewhere in Finland the thickness of the snow cover remained unchanged during the cold period.

The weather became warmer by April 20th but the snow did not start to melt until April 25th in South-Finland (ILMATIETEELLINEN KESKUSLAITOS 1966).

Besides south-eastern Finland snow had also fallen in southern Sweden, the Baltic countries, Denmark and northern Germany during mid April (HILDÉN *et al.* 1966).

On April 12th and 13th there was a heavy fall of snow in Estonia. The depth of the new snow cover was 30—50 cm. A cold period, during which temperatures were down to -13° lasted until April 20th (H. Veroman, pers. comm.). On April 14th there was 10 cm of new snow in Lübeck, the highways were covered with ice and slush and the temperature was -1° . In Denmark there was a uniform snow cover (Kauri Mikkola, pers. comm.). According to SVENSSON (1966) the first snow of the second winter came in southern Sweden on April 9th at that time the ground was fairly snowless to north of Stockholm. It snowed heavily in the southern and eastern parts of southern Sweden but only a little in the western parts. On April 14th the maximum temperature in Malmö was -1° , and the snow cover was 16 cm deep. The cold period finished on April 23rd in southern Sweden.

Material and methods

Part of the material is composed of Lapwings sent to the Zoological Museum of the University of Helsinki. The stomach content of these birds were examined. In addition inquiries were sent to about 350 bird-ringers by the Finnish Ringing Office in order to obtain data on the spring migration before, during and after the cold period, and of the number of Lapwings found dead. Further information was obtained from the annual reports sent by the legitimated preparators to the Finnish Nature Conservation Bureau. If the source of the facts is not mentioned the information was gathered through personal communication. I wish to thank all those persons who made possible the publishing of this paper.

The situation before and during the cold period

In spring 1966 the first Lapwings were seen in the beginning of March. The cold period in the middle of March retarded the migration and, owing to high snow drifts and frozen ground Lapwings had difficulties in obtaining food. Composts, dumping grounds and road sides were almost the only places where food was available. Retardation of the migration is clearly shown in the following tabulation indicating the first observation of Lapwing (from south to north) in different localities (compare to the spring of 1967, HILDÉN 1967).

Coastal localities		Inland localities	
Helsinki	7. 3.	Järvenpää	29. 3.
Turku	5. 3.	Karkkila	2. 4.
Pori	20. 3.	Lappeenranta	31. 3.
Kristiina	25. 3.	Lahti	30. 3.
Vaasa	2. 4.	Pälkäne	26. 3.
Kokkola	6. 4.	Tampere	30. 3.
Raabe	2. 4.	Joensuu	3. 4.
Oulu	1. 4.	Lieksa	2. 4.
		Rovaniemi	25. 4.

Great flocks of Lapwing were seen only on the southern coast. Between March 30th and April 7th strong reversed migration was observed mainly on the southern coast. Some examples of reversed migration are given:

Helsinki: April 1st 560 out of 740 observed Lapwings to the south (HILDÉN *et al.* 1966), April 2nd 240 SW+5 W+20 N, April 4th 97 SW+24 NW-NE, April 7th 32 S+1 E.

Lappeenranta, Vainikkala: March 31th until April 3rd altogether 61 S-SE+5 NW-NNE.
Lahti: April 3rd 58 NW-N-E, April 6th 58 S.

Turku: March 31th 81 SE+10 E, April 3rd 563 migrating Lapwings.

April 9—11th migration was very weak, e.g. in Korppoo, Utö (outer archipelago) no migration of Lapwings occurred during this period.

In the beginning of the cold period there were large Lapwing-flocks only on the southern coast, especially in the

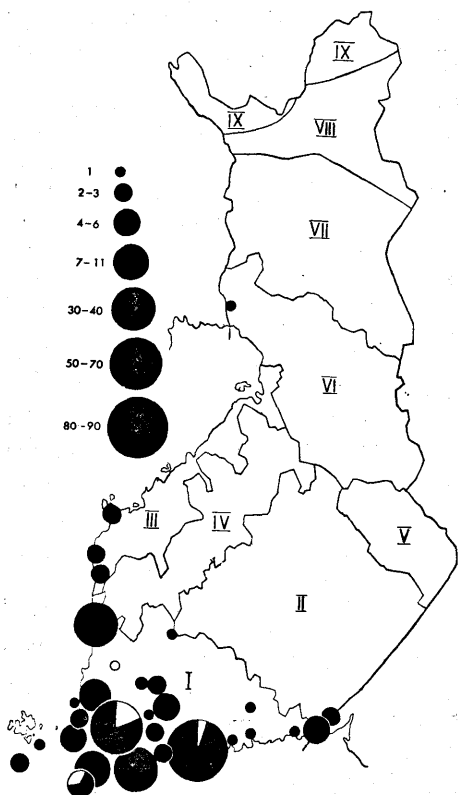


FIG. 2. The numbers of Lapwings found dead in spring 1966. The portion of white in the circles shows the relative share of Lapwings known to have succumbed before the cold period.

KUVA 2. Keväällä 1966 kuolleena löydettyjen töyhtöhyppien lukumäärä. Valkoinen osa ympärystä ilmaisee niiden hyppien subteellisen osuuden, joiden tiedetään kuolleen ennen takatalvea.

vicinity of Turku. Further, north near Oulu (65° N) there were approx. 100 individuals on April 12th. Inland there were very few Lapwings.

Already before the cold period altogether 12 Lapwings were found dead, and many individuals were seen in a very poor condition. Approx. 300 Lapwings were found dead during or after the cold period (Fig. 2). SOIKKELI

(1967, p. 162) has estimated that many thousands of Lapwings succumbed when describing the magnitude of the catastrophe in Finland.

It is noteworthy that the Zoological Museum of the University of Helsinki, whose collection contained only 30 spring specimens from the years 1842—1965, received 19 specimens (1 shot) in spring 1966.

Only a few Lapwings survived the cold period. After the cold night on April 17th only some scores of Lapwings were seen in Turku and likewise in Pori. In Helsinki there were only half a dozen individuals observed.

It was not only the lack of reversed migration during the cold period that was exceptional in Lapwings but also the habitats they were visiting. Most of the Lapwings observed were searching for food on the highways which were often snowless and sometimes without ice cover. A good many stayed on rubbish tips and other places that had lost their snow cover. Peculiar habitats were: 1 Lapwing visiting the feeding-board on a window-sill in Helsinki, 1—2 were observed in Helsinki on non-frozen ground in a park with some spruce (the ground was non-frozen because of central heating-pipes running under the ground); in Virolahti many individuals had one evening sought shelter in the metal cabin of a crane still warm after working hours but were next morning found dead in the cabin that had cooled much more than the surrounding fields. Many flocks (of scarcely 200 ind.) were seen from the very beginning of the cold period hunching passively in the snow or on the ice. Such birds succumbed very soon, e.g. in Helsinki under snowdrifts.

In some other countries of the cold period the catastrophe was still more striking than in Finland: In Estonia over one thousand dead Lapwings were reported by the network of Estonian

ornithologists. Lapwings were seen e.g. in barns and suburb gardens of Tallinn (JÖGI 1967).

In southern Sweden (see SVENSSON 1966 and ORVELIUS 1966) the situation differed essentially from that in Finland, Lapwings had established their territories there already in the beginning of April. Near Malmö the clutches were just completed on April 9th when the first snow of the second winter came. No reversed migration was seen in Sweden either but the birds remained near their territories and performed their courtship flights over the snowless highways. As in Finland Lapwings penetrated to extraordinary places in human environments. Many succumbed individuals were reported from southern Sweden, mainly from the snow covered districts.

In Denmark N. O. Preuss (pers. comm.) saw quite a few Lapwings lying around the roads in several parts of Sjælland and knows that this was quite common all over the country.

In Germany (Helgoland and north-western Germany) there were no observations on dead Lapwings in spring 1966 (G. Niethammer, pers. comm.).

The migration after the cold period

After the cold period the first Lapwings began their pioneer flights on April 19th. The first individuals reached the interior of the country around April 20th, although the fields were still mostly covered with snow.

On April 23rd the migration began in Helsinki at 10.15 hrs. and by 13.30 hrs. 134 individuals had passed the observation place, in Turku approx. 130 Lapwings migrated in the same four hours, in Hauho (interior of the country) 3+16 flew to the NE, and on the square of the village of Hauho 20—30 individuals were seen. In Pori only 2+3 migrated N on April 23rd but many flocks of 10—30 individuals were seen on reversed migration. On April 25th the visible migration was still mainly to the south. By April

24th Lapwings were common in eastern Finland; e.g. in Lieksa and between Joensuu—Parikkala and on April 25th in fields of Joutseno, SE- Finland 240—260 individuals.

The intensity of the migration was reduced soon after April 26th on the south-coast. In Turku 5 pairs had settled on snow covered shore-meadows and had showed ground display already on April 22nd. On April 27th the first scraping-nest was observed in Pori and on April 29th individuals showing aerial display and scraping were seen in fields between Helsinki and Lammi.

In the beginning of May the major part of the stock had settled on their breeding grounds on the southern coast. There were, however, still fairly late flocks of Lapwings by the road sides, e.g. May 1st Helsinki—Porvoo 26 individuals.

Stomach analyses and weight determinations

Fourteen of the specimens sent to the Zoological Museum of the University of Helsinki were weighed. Stomachs of 12 specimens were dissected and the contents analysed. All birds were extremely thin.

Sex determination was done from the gonads (P. Krüger). The present author confirmed the determination from plumage characteristics. The results of the stomach analyses of the birds found during the cold period (11 specimens) are summarised in Table 1.

According to COLLINGE (Ref. WITHERBY *et al.* 1948) 89 % of the food of Lapwings is composed of animals and 11 % of plants, 60 % of animal food is insects, 10 % molluscs and 10 % "worms". Also in KUMARI'S (1958) material insects, mainly beetles are predominant. There were gastrolithes — diameter about 3 mm — in 83—94 % of Lapwings examined in each sample by KUMARI (1958).

TABLE 1. The contents of stomachs of 11 Lapwings found dead during the cold period in April 1966. Signs of food present in five stomachs.

TAULUKKO 1. Takatalven kuluessa löytyneen 11 töyhtöbryypän mahalaukun sisältö. Merkkejä ravinnosta viidessä mahassa.

The kind of food Ravinnon laatu	Number Lukum.	Frequency Frekvenssi
Coleoptera, imago	5	3
"Small caterpillar" "Pieni toukka"	1	1
Oligochaeta	5	3
Vegetable matter Kasvijätteitä	*	3
Rubber loops Kumilenkkejä	***	2
Gastrolithes Jaubinkiviä	*	2

The stomach of one bird shot in Espoo before the cold period was full of *Diptera*-larvae (*Muscidae* vel *Calliphoridae*, det. R. Tuomikoski) that shows that the bird had been searching for food on dumping-grounds or dunghills. The contents of other stomachs analysed were so well digested, that — except two little weevils — there was nothing left of beetles but bits of elytra. For the same reason worms and larvae found were difficult to determine. The smallness (at most 3 mm) and small number or absence (in 9 of 11 cases) of gastrolithes and the presence of broken rubber loops in two stomachs was exceptional, obviously strong hunger had so suppressed the threshold for material taken as food that even rubber loops were gulped as if they were worms.

Only in 5 stomachs of the 12 examined were signs of food found. Residues of vegetable matter were scanty, mainly well digested strips of "grass". On the

whole the stomach samples indicate that the exhausted individuals had already long been starving.

The results of the weight determinations are in accordance with the stomach analyses. The lowest, average and highest weights of 7 males in the present material were 111—137—155 gm. and of 7 females correspondingly 123—134—149 gm. DEMENTJEV *et al.* (1951) mentions the values 191—205.3—226.5 gm. for 8 males and for 6 females 180—196.7—210 gm. Twenty two individuals weighed in spring by BANZHAF (NIETHAMMER 1942) were 200—264 grams. The deficit in the weights of the Lapwings from the cold period compared to DEMENTJEV *et al.* (1951) was in males 33 % and in females 32 %. Birds found in such a poor condition were not able to recover even after treatment. The bird that succumbed and the other that was shot before the cold period show that the cold weather arrived when the Lapwings were already in hunger-condition.

The reasons for the cold period-mortality

Lapwings are during spring migration dependent upon finding non-frozen ground without snow cover (KALELA 1955). In spring 1966 when the migration of Lapwings began the landscape was still quite wintry. During some periods the temperatures (Fig. 1) rose so much that great flocks of Lapwings were seen in the southern Finland and some single individuals in the interior of the country.

For Lapwings in poor condition even short periods of cold are fatal, so when the cold period began a large number succumbed during the first days. It is obvious that the extremely cold spring with little chances to find food was decisive in the catastrophe of Lapwings. As the Lapwings were too emaciated to embark in reversed migration, the snow-

storm dramatised the situation because the frost alone was sufficient to freeze the ground for many days. Even if the greatest relative amount of Lapwings survived the cold period in the vicinity of Turku there is no correlation between areas of snowstorm and those of succumbed Lapwings.

As the hungry Lapwings gravitated to snowless road sides many were run over by cars, many individuals however without any marks of collision confirm that the majority simply starved.

According to SVENSSON (1966) the catastrophe in southern Sweden was much larger in areas with falls of snow than without. Likewise the destruction was smaller in Central-Sweden than in South-Sweden. Here it must be stressed that when the snow began to fall on April 9th Sweden was snowless to the north of Stockholm, hence the condition for Lapwings were obviously better than in Finland. In southern Sweden Lapwings had established their territories and in places finished egg-laying, hence no reversed migration was observed. As the temperatures were not as low in southern Sweden as in Finland the snowstorm could have contributed decisively to the catastrophe.

In Estonia crows, birds of prey, weasels (*Mustela*), and polecats (*Putorius putorius*) were seen to capture Lapwings in poor condition (JÖGI 1967).

The influence of spring 1966 on Lapwing stocks

Ringers of Lapwings were sent an inquiry in which they were requested to compare the stock for spring 1966 with that of previous years. In the following a summary of the answers is given.

Southwest-Finland

Virolahdi: In the coastal watershed meadows where the stock had arrived before the second winter the number of breeding pairs was considerably smaller than in previous years.

In one observation-area 1965 approx. 10, 1966 approx. 5 pairs (L. Liukkonen).

Hamina and Vehkalahdi: The stock in 1966 was estimated to 2/3rd of that in 1965 (K. Thomasson).

Ruotsinpyhtää: In the small stock no notable changes (J. Excell).

Lahti and Hollola: Area I (2 km field-line) 1965 6, 1966 5 pairs, area II 1965 and 1966 ± the same number, area III (a small field) 1965 1, 1966 1 pair (H. Kolonen), area IV (field-watershed-area approx. 2 ha) 1965 5, 1966 5 pairs, area V (fields) 1965 8—9, 1966 5 pairs (S. Ojala).

Hyvinkää: Area I (a small field) 1965 5, 1966 2 pairs, area II (field) 1961 5, 1962 (2), 1963 3, 1964 5, 1966 2, 1967 5 pairs, area III (field) 1963 6, 1964 (4), 1966 4 pairs (I. Stén).

Riihimäki (approx. 100 ha field on previous bog): 1962 27, 1963 26, 1964 31, 1965 34, 1966 15, 1967 26 pairs (T. Hirvenoja).

Karkkila: Around Pyhäjärvi usually 2—4 pairs, 1966 2 pairs (K. & K. Virta).

Suomusjärvi: Area I (fields) 1965 4—5, 1966 no breeding was observed, 1967 5 pairs, area II (fields 3—4×10 km²) about 40—50 pairs normally, 1966 approx. 5 pairs (in a 1/2 km² area there have been counted 1964 11, 1965 11, 1966 1, 1967 7 pairs), area III (1 km² area on a great raised bog) 1963 1, 1964 6—7, 1965 4—5, 1966 2, 1967 9 pairs, area IV (bog) 1 pair until 1965, thereafter no breeding Lapwings. In addition to these there were other places in Suomusjärvi where breeding of 1—2 pairs was observed until 1965 but which in 1966 and 1967 were empty (O. Paasivirta).

Tvärminne (marsh): 1965 1, 1966 none (I. Stén).

Korppoo, Jurmo (archipelago): The first number in each year indicate that of nests found and the latter pairs that have protected their territories during nesting time: 1962 6+5, 1963 7+"many", 1964 9+4, 1965 5+3, 1966 2+3, 1967 3+approx. 7. Usually the sum of the numbers in each pair = the number of nesting pairs. In 1966, however, nests of the latter 3 pairs were searched for intensively but obviously there were no more nests to be found (O. Kivivuori).

Eckerö, Signilskär (SW-archipelago): 1964 6 (G. Johansson), 1965 6 (N. Saarnisuo), 1966 8—9, 1967-7 pairs (P. Kalinainen).

Yläne (bogs): Area I 1959 2, 1960 3, 1961 2, 1962 5, 1963 8, 1964 4, 1965 4, 1966 1—2, 1967 2 pairs, area II 1962 3, 1963 5, 1964 3, 1965 5, 1966 4, 1967 2 pairs, area III 1961 1, 1962 2, 1963 2, 1964 4, 1965 6, 1967 1 pair (MUSTAKALLIO 1966 and pers. comm.). The summed pairs of 1965 and 1967 15 and 5 respectively.

Pori: On the mouth of Kokemäenjoki-river the population was notably smaller in 1966 than in 1965. The number of breeding pairs was small still in 1967 (P. Kalinainen). On the mouth of Kokemäenjoki in 1965 25 young, 1966 only 6 on the same route (T. Meri), area II 1965 about 34—39, 1966 24—26, 1967 37—42 pairs, area III 1961 almost 10, 1966 none, 1967 in the neighborhood 1—2 pairs (A. Kaukola), in the breeding no great changes in 1966 compared to 1965 (P. Korhonen).

In the whole province of *Satakunta* there were very few breeding Lapwings compared to previous years. The ringing-result per 10 km was below half of normal (altogether 72 young in 1966). Especially the vast coastal meadows of Pori, Preiviiki were exceptionally sparse, in 1967 the stock was still weak there (T. Tuomi).

Ostrobothnia

Kristiina: The population 1966 at the most 10 % smaller than in 1965 (ringed young 1965 84, 1966 61) P.-Å. Johansson).

Tiukka: In 1966 the population 10—20 % smaller than in 1965 (I. Hagback).

Lapua (fields): 1965 12—15, 1966 10 pairs (S. Ojala).

Vaasa (coastal meadow): 1966 the population \pm normal (J.-G. Anderson).

Pietarsaari: No change (R. Blomqvist).

Oulu and adjacent areas: In 1966 fewer Lapwing than normal, however, no catastrophe (H. Kerkelä).

Watershed area of Suomenselkä

In breeding time of 1966 on a journey from *Haapamäki* to *Kärsämäki* by car only 1 pair (I. Stén).

Lake-Finland

Lappeenranta: Area I (60 ha) 1965 25—30, 1966 18 pairs, area II (237 ha) 1965 30, 1967 24 pairs (S. Löfgren & A. Pohjonen).

Tampere: 1965 and 1966 about the same number (J. Vuorinen), the number of nests counted in an area the same in 1965 as in 1966 (J. Syrjänen).

Ylöjärvi: (Nests found in a small area) 1962 14, 1963 8, 1964 13, 1966 12, 1967 13 (M. Lagerström).

Joensuu: The stock was in 1966 very strong, obviously stronger than in 1965 (J. Tiussa).

Watershed area of Maanselkä

Lieksa: No notable changes in 1966, e.g. on a bog-area the same number of Lapwing as before (E. Lappi).

The transition zone of Tornio-Kainuu

Sotkamo: Area I (coastal meadow) 1965 5, 1966 1 pair, area II (fields) 1965 1, 1966 2 pairs, area III (fields) 1965 none, 1966 1 pair, area IV (damp brook-edges) 1965 none, 1966 3 pairs. The number of breeding pairs did not decrease in other places in Sotkamo (E. Kaakinen).

Rovaniemi and the neighbouring areas: Lapwings came to Lapland in 1966 in larger numbers than ever before. New nesting sites were occupied (A. Komonen).

In spring 1966 the breeding stock of Lapwing was smaller than in previous years in Finland. However the decrease in numbers took place only in certain regions (Fig. 3). In southwestern Finland great reductions in the breeding stock were observed. Few exceptions were noted near the border of Lake-Finland, only small reductions in the vicinity of Lahti and the stock was of the same magnitude as before in Tampere and nearby regions. On the other hand, in the east the catastrophe area reached the southeasternmost Lake-Finland (Lappeenranta). Near Turku the only estimation available suggests that the stock was unchanged and in the westernmost archipelago of Finland the small number of breeding pairs exceeded that of previous years. In southern Ostrobothnia there were only small decreases and between Vaasa and Oulu the stock was normal. In the data for northern Ostrobothnia near Oulu it seems that the stock suffered only a small reduction in the year 1966.

From the interiors of the country the observations are scanty but the stocks in Lake-Finland were in spring 1966 as normal and locally even larger than before. In the watershed region of Suo-

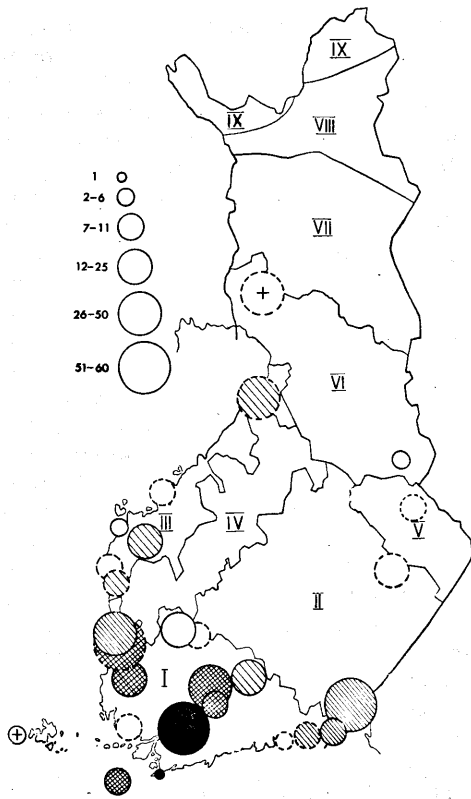


FIG. 3. The reduction in numbers of breeding pairs in spring 1966 compared to spring 1965 (or 1964): black = 76—100 per cent, cross-hatched = 51—75 %, densely striped = 26—50 %, sparsely striped = 11—25 %, and white circle 0 ± 10 %. + indicates increased number of pairs. The size of the circle indicates the number of breeding pairs in 1965 (or 1964) in each observation area; broken circle = the number of breeding pairs unknown. Zoogeographical regions: I = South-western Finland, II = Lake-Finland, III = Ostrobothnia, IV = watershed region of Suomenselkä, V = watershed region of Maanselkä, VI = the transition zone of Tornio-Kainuu.

KUVA 3. Pesivän kannan pieneneminen keväällä 1966 verrattuna v:een 1965 (tai 1964): musta = 76—100 %, ristiviivoitus = 51—75 %, tiheä poikkiviivoitus = 26—50 %, harva poikkiviivoitus = 11—25 % ja valkoinen ympyrä = 0 ± 10 %. + = parimäärä noussut. Ympyrän koko ilmaisee pesivien parien määrän v. 1965 (tai 1964); katkonainen ympyrän kehä = parimäärä ei tiedossa.

menselkä the only observation indicates a very low number of breeding pairs.

To the regions near the arctic circle Lapwings came in larger numbers than ever before and populated new breeding grounds.

The decrease in number of breeding Lapwings occurred in those regions where many Lapwings were observed, and died, before and during the cold period of 1966.

In southern Sweden in those regions where snow fell during the second winter upon birds in their breeding grounds large reductions in the numbers of breeding pairs were observed in spring 1966. In all Scania the stock was strongly reduced, in places by as much as 80—90 %. In Öland and Kalmar the stock was reduced to 10 % of the normal, and in Gotland the number of breeding pairs was at its highest 25 % of that in normal years (SVENSSON 1966). So the catastrophe was still larger in southeastern Sweden than in Finland.

In many Estonian localities the size of the breeding Lapwing population was not the half of that in previous years, in places (near Viljandi) the reduction was approx. 90 % (JÖGI 1967). Over most Denmark there were notably less Lapwings breeding in 1966 compared with for instance 1965 (N. O. Preuss, pers. comm.).

In northwestern Germany, i.e. in Oldenburg and Ostfriesland, the spring 1966 had no notable effect upon the Lapwing stock (G. Niethammer, pers. comm.).

Discussion

As there are no studies on the reductions of Lapwing stocks after earlier catastrophes in Finland I will in the following make an attempt to compare the reductions in spring 1966 to those in previous years with the help of ringing data.

TABLE 2. Lapwings and Curlews ringed during 1956—66 and the number of Lapwings recovered by May 31th the following year (in 1965 by April 30th) (NORDSTRÖM 1958 to 1966, NORDSTRÖM & STÉN 1967 and Zool. Mus. of Univ. of Helsinki, pers. comm.).

TAULUKKO 2. Vuosina 1956—66 rengastettujen töyhtöhyppien ja kuovien sekä kunkin seuraavan vuoden 31.5. (v. 1965 30.4.) mennessä saapuneiden töyhtöhyppälöytöjen määrät (NORDSTRÖM 1958—66, NORDSTRÖM & STÉN 1967 ja Helsingin Yliopiston Eläinmuseo, *benk. ilm.*).

Year Vuosi	Lapwings/Curlews Hyppiiä/Kuoveja	Recoveries Löytöjä
1956	361/172	3
1957	609/286	4
1958	644/315	10
1959	705/363	6
1960	754/370	9
1961	784/362	27
1962	1323/471	60
1963	1105/358	27
1964	1587/355	33
1965	1366/268	34
1966	1058/239	28

The number of breeding Lapwings has increased intensely in last decades. After the studies of KALELA (1955) the breeding area has extended to Lapland (KOMONEN 1963) and simultaneously Lapwings have settled in new biotopes (KOMONEN 1963 and SEISKARI 1956). The increase in number of breeding pairs is clearly visible in the increase of Lapwings ringed annually (Table 2). In order to eliminate the effects of the enlarged ringing activity the numbers of ringed Lapwings in Table 2 are shown together with those of Curlews. The number of ringed Lapwings has generally risen steadily year after year. In these circumstances a decrease in the number ringed compared with the previous year will indicate a decrease in number of breeding pairs or poor success in breeding time.

The winter 1962/63 was extremely hard in South-Europe. The number of

recovered Lapwings was over twofold compared to the expected (% of recoveries 2.1, NORDSTRÖM 1963b). The number of Lapwings ringed next year was 84 % of that in the previous year. In winter 1963/64 Lapwings were reported from very southern districts but the number of recoveries was about normal. In spring 1964 the stock was, estimated from ringing data, larger than ever before. The winter 1964/65 was harder than normal and the following spring the stock was 86 % of that in 1964 (estimated from ringing data). Compared to the reduction in breeding stock caused by the hard winters mentioned above the catastrophe of the cold period in 1966 was clearly larger. The number of Lapwings ringed in 1966 was only 77 % of that in 1965. It must be stressed that the cold weather during the winters 1962/63 and 1964/65 obviously reduced the stock in the whole country but the cold period in spring 1966 only the stock in a part of Finland, mainly the southwest.

In Sweden there was a reduction of 55 % in the number of Lapwings ringed in 1966 compared to 1965. This decrease is mainly due to the reduction in the Lapwing stock, partly also to the fact that Swedish ringers had been advised to restrict ringing of Lapwings among other species common in Sweden (1965; 1406 Lapwings ringed, 1966; 627. Recoveries in 1965 were 39, in 1966 65; average % of recoveries was 2.6) (S. Österlöf, pers. comm.).

The effects of large mortalities upon Lapwings have often been slighter and of shorter duration than upon many other species, e.g. after the hard winters 1939—42 (v. HAARTMAN *et al.* 1963—66), and the effects of the winter 1962/63 was visible only the following spring after which the numbers ringed rose heavily.

According to RINKEL (1940, p. 145) the Lapwing is a very social species:

"mature one-year-old birds and older birds, which have not yet bred, as a rule visit the place of their parents in spring; if, however, this breeding place is entirely occupied, they wander and try to find a territory or a male with a territory in the neighbourhood. In this they partly succeed, e.g. by founding new 'colonies'." In this way expansion of the species takes place. It is possible that after catastrophes normally non-breeding individuals are left which are able to occupy the best breeding grounds temporarily left uninhabited. Hence a reduction in the number of breeding pairs is less visible than with many other species. Due to this a decimation in the Lapwing stock would possibly be clearest visible in suboptimum biotopes. True, SVENSSON (1966) mentions that the reduction of Lapwing stocks were most considerable in small populations on suboptimum biotopes in southern Sweden after the cold period in 1966. In Finland the reduction was clearest seen in coastal meadows (e.g. Pori and Virolahti) and in fields (e.g. Riihimäki and Suomensjärvi), i.e. in traditional optimum biotopes. This shows that the catastrophe in 1966 was obviously one of the largest to breeding Lapwings in Finland. Only from the spring 1927 are there data of even larger reductions, according to LILIUS in 1927 Lapwings were absent from their former nesting sites in Tuusula, Province of Uusimaa. In Southwest-Finland in the Längelmävesi-district KALELA (1938) did not even in 1928—29 find a single pair breeding in his areas of study where Lapwing formerly had been numerous.

In the best biotopes (in the fields of Suomensjärvi and Riihimäki) the number of pairs was almost the same in the spring 1967 as in 1965, on the coastal meadows in Satakunta the stock had largely recovered by 1967 but was in many places still smaller than in 1965. Many small populations (1—2 pairs, e.g.

Suomensjärvi) in bogs and fields became destroyed in spring 1966 and were still empty in 1967. Therefore, one can deduce that the settling of old emptied localities takes place in the same order as establishing entirely new areas (see KALELA 1955 for the expansion of Lapwings).

Factors affecting the stock of Lapwings

The large mortality during the cold period in 1966 explains well that a decrease took place in local stocks of Lapwings that spring. The reductions were concentrated in those areas where many Lapwings were found dead during the cold weather.

In addition a part of the stock was still on migration in southern districts where many Lapwings succumbed during the cold period. From ringed individuals recovered abroad during the cold period all were marked as young: 1 in southern Häme, 3 in Satakunta and 1 in southern Ostrobothnia. The recoveries came from Sweden (3) and U.S.S.R. (2, one from Estonia) (NORDSTRÖM & STÉN 1967 and Zool. Mus. of Univ. of Helsinki, pers. comm.). These few recoveries, plus those two from Finland (one ringed on the southern coast and the other in Hailuoto off Oulu) confirm that in mid-April the southern stock had not completely arrived at their breeding grounds but a part was still on migration. Lapwings that succumbed on the southern coast probably belonged to the stock of South-Finland.

As the size of the stocks of Lake-Finland in the interior of the country remained unchanged and those of northernmost areas (Lapland) increased it seems as if inland and northern stocks had migrated later than the southern stock and were in the beginning of the cold period sufficiently far south to successfully escape the second winter.

The situation in the spring 1927 was like that in 1966, dead individuals were also found in western breeding areas as a result of bad weather in late March and beginning of April (KALELA 1955, pp. 33—34). DROST & SCHÜTZ (1940, p. 166) give an account of a cold period in Rossitten and adjacent localities (at that time East Prussia) when many Lapwings starved after the ground had frozen. This resulted in very low numbers of breeding pairs in the catastrophe area in spring.

A change in the breeding population is affected by many factors, mortality, birth rate, emigration and immigration. In the following factors are examined that perhaps in addition to the mortality caused by the cold period gave rise to the local decreases in the stocks in spring 1966.

Even if spring is generally the most critical period for the Lapwing (KALELA 1955) the effects of the hard winters of 1962/63 and 1964/65 in southern Europe must be considered as a possible factor still affecting the stock in spring 1966. As Table 2 depicts each winter has affected only the ringing numbers of the following spring and hence can hardly have reduced the stock of Lapwings in 1966.

DROST & SCHÜTZ (1940) pay attention to the strong reversed migration that obviously besides the high mortality reduced the breeding stock in spring 1940. KRAAK *et al.* (1940) mention that when the migration is forcibly delayed by bad weather an "abbreviated" migration may take place. To this phenomenon a possible breeding in more southern districts than normally is associated. This concerns chiefly one year old birds; the site tenacity of those that have already bred is, as in other wader species, very strong (KRAAK *et al.* 1940). In spring 1941 the migration of Lapwings was so delayed in Finland. This resulted in a considerable reduction in the breed-

ing stock that year (KALELA 1955, p. 34).

In 1966 the late April and beginning of May were climatically very favourable for the migration of Lapwings. It seems that the Lapwings of northern Finland migrated to their nesting sites at the last moment in the beginning of May and hence no "abbreviation" took place in the migration of the northern stock (cf. e.g. the observations from the vicinity of Rovaniemi). KALELA (1955, pp. 37—38) has in the same manner interpreted the data of TÖRNROOS (1955) concerning the late migration of the Lapwing population from Hailuoto (near Oulu) in the spring 1954 when the beginning and middle of April were unfavourable for migration but late April and beginning of May on the contrary very favourable.

One cannot, however, discard the possibility of "abbreviated" migration in the stock of southern Finland in spring 1966. In the southwesternmost archipelago (Eckerö, Signilskär) more Lapwings bred there than usual and some of the pairs did not arrive until late May, and even in Turku where the cold period caused high mortalities the estimated number of breeding pairs, on the only locality studied, remained normal. Hence the possible "abbreviated" migration concerned the stock of the southern coast and the southernmost inland as a large number of these Lapwings migrated back to the south before the cold period (cf. the data on p. 35). The normal settling of these Lapwings at their nesting sites would have occurred in mid-April — the time of the cold period in 1966 (compare to DROST & SCHÜTZ 1940).

The interval between the laying of each egg is in Lapwings 25—45 hours (LAVEN 1941, p. 36). In Finland the time of incubation is on average 24 days. The average day for egg-laying is May 3rd in southern Finland, and ob-

servations on egg-laying initiated on April 20th are not uncommon (v. HAARTMAN *et al.* 1963—66). In southern Finland one rarely finds eggs of Lapwings after June 10th (KALELA 1955), i.e. the egg-laying normally starts on May 12th at the latest.

In spring 1966 the egg-laying began in Lappeenranta, Vainikkala between May 1st and 4th (5 nests, S. Löfgren). In Tampere the nesting was 9—10 days later than normal (J. Syrjänen), in Hollola incubation began in one nest containing 3 eggs on May 4th when the temperature was -0°C (S. Ojala). In Korppoo, Jurmo (Gulf of Finland) one pair incubated its three eggs in the beginning of June (O. Kivivuori). In Pori the first young hatched on May 30th (later than average, M. Soikkeli) and T. Tuomi ringed the first young on June 2nd (i.e. the egg-laying must have begun about May 3rd). In Riihimäki the young of two pairs did not hatch until July 14th and 16th (T. Hirvenoja), that means egg-laying began in these clutches about June 15th and 17th; these probably were late repeat broods.

The observations above show that the cold period in 1966 delayed the nesting of Lapwings considerably.

Delayed breeding is often associated with flocks of mature Lapwings that stay together during the breeding period and then leave for the south without nesting. LENSKI (Ref. PUTZIG 1938, p. 129) gives an account of a flock of about 50 Lapwings which in the unfavourable spring of 1935 stayed in East Prussia until June. The birds started their migration without nesting. SANDGREN (1917) mentions a corresponding incident from Scania, southern Sweden.

Small flocks were observed in southern Finland until the beginning of May in 1966 but there are no records of flocks staying together until May—June. In some localities pairs were seen that had established and protected territories

but did not nest; e.g. in Korppoo, Jurmo only two of five pairs present were nesting (O. Kivivuori). In the mouth of river Kokemäenjoki in Pori some of the pairs present probably did not nest, and likewise some of the breeding pairs seemed to have fewer young than normal (T. Meri).

In southern Finland the ploughing of the fields in spring is carried out in the nesting time of the Lapwings, and hence many nests are destroyed (v. HAARTMAN *et al.* 1963—66). In normal springs some of the nests in fields are saved when the clutches hatch in time. The later the breeding occurs the larger the number of field nests that are exposed to danger. A clutch layed later than normally remains easily unrepeated if destroyed, as the nesting disposition in Lapwings apparently is contemporaneous in birds in southern Finland and those in Holland. Hence the potential nesting period in Finland, because of the later spring migration is of much shorter duration than elsewhere (cf. KALELA 1955, pp. 28—29). This may, in addition to the other factors discussed above, partially have resulted in the small number of breeding Lapwings in spring 1966.

One can deduct that a very cold period during spring migration, besides directly reducing the number of sexually mature, potentially breeding, Lapwings, may result in a series of events each increasing the effect of the catastrophe on a breeding Lapwing population and retarding the revival of the population.

Summary

A severe cold period occurred in all Finland between April 11th and 17th 1966. In the beginning of this period a snow-storm covered southern and southeastern Finland and a large area in the Baltic, northern Germany, Denmark and southern Sweden.

In this paper on Lapwings the situation before, during and after the cold period are described, and the effects on the breeding stock are estimated. Stomachs of succumbed Lapwings were analysed.

The poor possibilities for the Lapwings to obtain food in the early spring were decisive to the catastrophe during the cold period. The cold weather in mid-April encrusted the few snowless spots and exhausted the emaciated Lapwings.

The mortality in April 1966 resulted in a strong decrease in the stock in those regions where the Lapwings had arrived in large numbers before the beginning of the cold period. In the zoological region of Southwest-Finland and southeastern parts of Lake-Finland the stock suffered reductions of 30—60 percent — in places over 90 % — compared to the previous year, while in most Lake-Finland the stock remained as before or in places grew even larger. To Lapland Lapwings arrived in larger numbers than ever before.

The revival of stocks occurred in large populations in optimum localities already in 1967, while in small populations, especially in suboptimum localities, the stock was still in 1967 weak, or wholly absent.

Acknowledgments

I wish to thank Prof. Olavi Kalela, Dr. Olavi Hildén, and Dr. Martti Soikkeli for critical reading of the manuscript.

Selostus: Huhtikuussa 1966 sattuneen takatalven vaikutus töyhtöhyppäkantaan Suomessa.

Kirjoituksessa tarkastellaan töyhtöhyppien saapumista Suomeen keväällä 1966, tilannetta takatalven aikana ja sen jälkeen sekä havaitun tuhon syitä ja vaikutusta kantaan. Suomessa vallitsi ankara pakkaskausi 11—17.4.1966. Kauden alkuun sattunut lumimyrsky peitti alleen eteläisen ja kaakkosen Suomen sekä lisäksi laajan alueen Baltiassa, pohjoisessa Saksassa, Tanskassa ja eteläisessä Ruotsissa.

Ratkaisevaa takatalven tuhon suuruuden kannalta oli alkukevään heikko ravintotilanne. Takatalvi pakkasineen, joka kovetti maankuoren harvoilta päivipaikoilta, tappoi heikossa fysiologisessa tilassa olleet hyypät.

Kevätkuolleisuus vaikutti ratkaisevasti niiden alueiden töyhtöhyppäkantoihin, jossa hyyppiä oli runsaasti takatalven alkaessa (kuvat 2 ja 3). Lounais-Suomessa ja kaakkoisessa Järvi-Suomessa kanta kärsi 30—60 prosentin — paikoin yli 90 % — tappioita edelliseen vuoteen verrattuna, kun taas suurimmassa osassa Järvi-Suomea kanta oli entisen suuruinen tai paikoin jopa kasvanut.

Kannan elpyminen tapahtui suurissa populaatioissa parhailla biotoopeilla miltei entiselle tasolle jo v. 1967, kun taas useat pienet populaatiot, etenkin heikoilla biotoopeilla, eivät vielä tällöin olleet elyneet.

References

- DEMENTJEV, G. P., MEKLENBURTSEV, R. N., SUDILOVSKAJA, A. M. & E. P. SPANGENBERG 1951. Ptitsi Sovjetskojo Sojusa, III. — Moskva.
- DROST, R. & E. SCHÜTZ 1940. Von den Folgen des harten Winters 1939/40 für die Vogelwelt. Vogelzug 11:161—191.
- v. HAARTMAN, L., HILDÉN, O., LINKOLA, P., SUOMALAINEN, P. & R. TENOVUO 1963—66. Pohjolan linnut värikuvin, I. — Helsinki.
- HILDÉN, O. 1966. Muuttolintujen saapuminen Suomeen 1966. Lintumies 2:28—30.
- 1967. Muuttolintujen saapuminen Suomeen 1967. Lintumies 3:54—58.

- HILDÉN, O., LAINE, L. & S. VUOLANTO 1966. Lintukevät 1966 Helsingissä. Lintumies 2:19—27.
- ILMATIETEELLINEN KESKUSLAITOS [THE FINNISH METEOROLOGICAL OFFICE] 1966. Kuukausikatsaus Suomen sääoloihin. — Helsinki.
- JÖGI, A. 1967. Möödunud talve ja kevade ilmastiku mõjust lindudele. Eesti Loodus, pp. 118—120.
- KALELA, O. 1938. Über die Regionale Verteilung der Brutvogelfauna im Flussgebiet des Kokemäenjoki. Ann. Zool. Soc. Vanamo 5, 9:1—297.
- 1955. Die neuzeitliche Ausbreitung des Kiebitzes, *Vanellus vanellus* (L.), in Finnland. Ibid. 16, 11:1—80.
- KOMONEN, A. 1963. Töyhtöhyypän, *Vanellus vanellus* (L.), esiintymisestä Pohjois-Suomessa. Luonnon Tutkija 67:96—101.
- KRAAK, W. K., RINKEL, G. L. & J. HOOGHEIDE 1940. Oecologische bewerkiging van de Europese ringgegevens van de Kievit (*Vanellus vanellus* (L.)). Ardea 29:151—175.
- KUMARI, AINO 1958. Rabakurvitaliste tootumisest. — Ornitoloogiline Kogumik, I (ed. E. KUMARIÄL pp. 195—215. — Tartu.
- LAVEN, BRUNHILDE 1941. Beobachtungen über Balz und Brut beim Kiebitz (*Vanellus vanellus* (L.)). Journ. f. Ornith., Erg. bd. 3:1—64.
- LILIUS, F. O. 1927. Mitteilung. Ornis Fenn. 4:88.
- MUSTAKALLIO, P. 1966. Lounais-Suomen suolinnustossa tapahtuneista muutoksista. Ibid. 43:70—76.
- NIETHAMMER, G. 1942. Handbuch der deutschen Vogelkunde, III. — Leipzig.
- NORDSTRÖM, G. 1958—1966. Die Vogelberingung in Finnland im Jahre 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, and 1964. Mem. Soc. F. Fl. Fenn. 33: 69—108, 34:2—48, 35:2—63, 36:32—106, 37: 166—253, 39:4—128, 40:5—176, 41:110—238 and 42:55—163.
- 1963b. Einige Ergebnisse der Vogelberingung in Finnland in den Jahren 1913—1962. Ornis Fenn. 40:81—124.
- NORDSTRÖM, G. (†) & I. STÉN 1967. Die Vogelberingung in Finnland im Jahre 1965. Mem. Soc. F. Fl. Fenn. 43:105—220.
- ORVELIUS, A. 1966. Fågelkrönika 1966. Fåglar i Blekinge 1966. Medd. nr. 3 fr. Torhamns fågelstation, pp. 3—9.
- PUTZIG, P. 1938. Der Frühwegzug des Kiebitzes (*Vanellus vanellus* L.), unter Berücksichtigung anderer Limicolen. Journ. f. Ornithol. 86:123—165.
- RINKEL, G. L. 1940. Waarnemingen over het gedrag van de Kievit (*Vanellus vanellus* (L.)) gedurende de broedtijd. Ardea 29: 108—147.
- SEISKARI, P. 1956. Töyhtöhyypän, *Vanellus vanellus* (L.), kohosuopesintä. Ornis Fenn. 33:28—33.
- SOIKKELI, M. 1967. Breeding cycle and population dynamics in the dunlin (*Calidris alpina*). Ann. Zool. Fenn. 4:158—199.
- SVENSSON, S. 1966. Tofsvipan och aprilvädret 1966. Medd. fr. Skånes Orn. Förening 5:61—72.
- TÖRNROOS, V. 1955. Töyhtöhyypän, *Vanellus vanellus* (L.), esiintyminen Hailuodossa v. 1951—54. Ornis Fenn. 32:59—61.
- WITHERBY, H. F., JOURDAIN, F. C. R., TICEHURST, N. F. & B. W. TUCKER 1948. Handbook of British Birds, IV. — London.