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Regional song dialects of the Ortolan Bunting *Emberiza hortulana* L. in Sweden

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Abstract

During the period 1966-1990 we studied the occurrence of different song dialects of the Ortolan Bunting in Sweden. Song dialects were identified for more than 420 males from about 150 different localities. We found that two regional dialects, one *Northern Swedish* and one *Central Swedish*, were prevailing. The characteristics of these two dialects are shown on *melograms* with one curve for fundamental frequency and one curve for relative sound pressure. The dialects can be identified and the differences clearly heard in the field without technical means. The Northern Swedish dialect is predominant north of the province of Hälsingland and the Central Swedish dialect south of that province. The two dialects meet and "overlap" in Hälsingland. The picture is supplemented by the occurrence of individuals with the foreign dialect, both dialects or a mixed dialect.

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Introduction

The song of the Ortolan Bunting *Emberiza hortulana* L. shows an interesting regional as well as individual variation. In Germany, Conrads & Conrads (1971) described five different regional song dialects of the Ortolan Bunting. Helb (1981) contributed with more information about the distribution of the dialects in Southern Germany. According to Rosenberg (1953), Ortolan Buntings in the region of Lakes Mälaren and Hjälmaren in Central Sweden had songs different from those in the province of Västerbotten in Northern Sweden. These differences in song dialect were later described by Stolt & Åström (1975), who illustrated them by melograms. The differences are found mainly in the stereotyped end phrase of the songs. Briefly, the end phrase has either some short sounds with dominating frequency modulation or one or two long sounds with dominating amplitude modulation.

As emphasized by Lemon (1975), dialects imply, on the one hand, similarities of songs of birds on neighbouring territories, and on the other hand, dissimilarities between birds of different localities. Similarities or conformities are seen principally as a result of copying by young, a process that is limited in most species to a period from the time when the young leave the nest until the following spring. Dissimilarities or individuality arise from a variety of sources. Thus, where dialects occur they result from two opposing tendencies, towards conformity and towards individuality of repertoires.

In other words, a dialect is transmitted to young males by learning the song from old conspecific males. If a dialect is to survive, its individuals must have a strong adherence to previous breeding places. In that way, they will dominate entirely within a region. Consequently, a dialect should have these three characteristics: it is learned, it is transmitted to new generations, and it is nearly universally prevailing in a region.

The function of song dialects is not well understood, although we consider it would be wrong to assume that they have no function at all. For a

long-distance migrant such as the Ortolan Bunting one social function of regional song dialects may be to help the birds, perhaps especially the young individual bird, to recognize their home area.

As far as we know, there has been no earlier study of the distribution within Sweden of any bird song dialect. To clearly separate a regional song dialect from an individual or local variant in the song repertoire we had to study the geographical distribution of the different songs. So the purpose of this study was to document the occurrence of different regional song dialects of the Ortolan Bunting in Sweden and to describe their distribution in the country.

Material and methods

The Ortolan Bunting is locally a rather common species especially in the central and northern coastal areas of Norrland. A map of its distribution in Sweden is given in Fig. 1 (SOF 1990).

The song of the Ortolan Bunting is composed of *strophes* clearly separated by pauses. A complete strophe or song has at least two *phrases*, one initial and one ending, but the latter can be reduced to 1 syllable or 1 element. In Sweden, songs with only

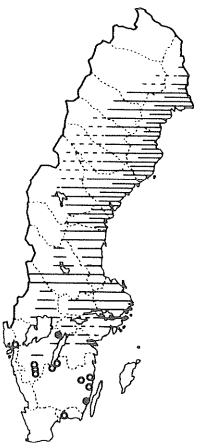

Fig. 1. The distribution of the Ortolan Bunting *Emberiza hortulana* in Sweden (SOF 1990). Dense lines: regular breeding, common. Sparse lines: regular breeding, less common. Dotted lines: irregular breeding or less well known. Filled dot: breeding site used six or more times in 1976-1988. Open dot: ditto less than six times.

Ortolansparvens utbredning i Sverige (SOF 1990). Täta linjer: regelbunden häckning, allmän. Glesa linjer: regelbunden häckning, mindre vanlig. Streckade linjer: oregelbunden häckning eller dåligt känd. Fylld prick: häckat sex eller fler gånger 1976-1988. Öppen prick: dito färre än sex gånger.

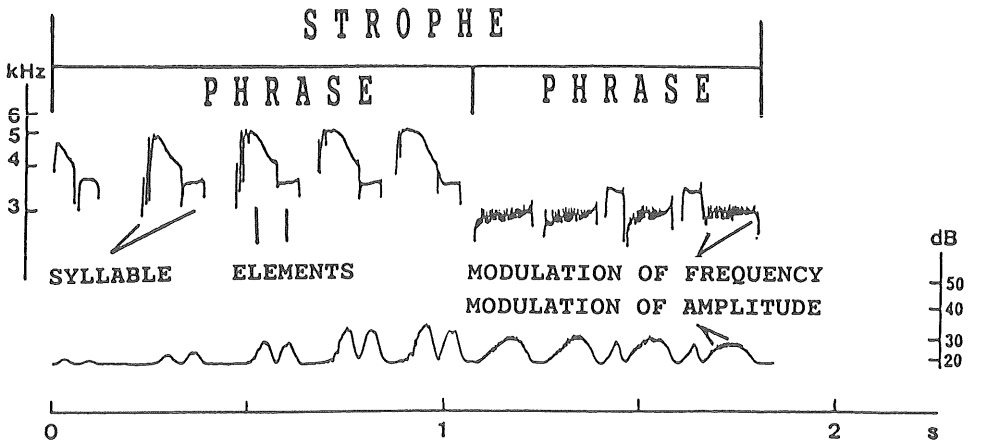

Fig. 2. A melogrammed song strophe of the Ortolan Bunting *Emberiza hortulana* and terms for its different parts. A melogram is a graph with an upper curve for fundamental or first-partial frequency or "pitch" and a lower curve for amplitude or relative sound pressure. Frequency is given in kilohertz (kHz) and amplitude in decibels (dB). Uppland, Vallentuna, 31 May 1978. Recording: Gustav Åström.

Melogrammerad sångstrof av ortolansparv Emberiza hortulana *med engelska termer för strofens olika delar (strof, fras, stavelse, element). Ett melogram är ett diagram med en övre kurva för grundtonfrekvensen eller tonhöjden och en nedre kurva för amplituden eller det relativa ljudtrycket. Frekvensen anges i kilohertz (kHz) och amplituden i decibel (dB). Uppland, Vallentuna, 31 maj 1978. Inspelning: Gustav Åström.*

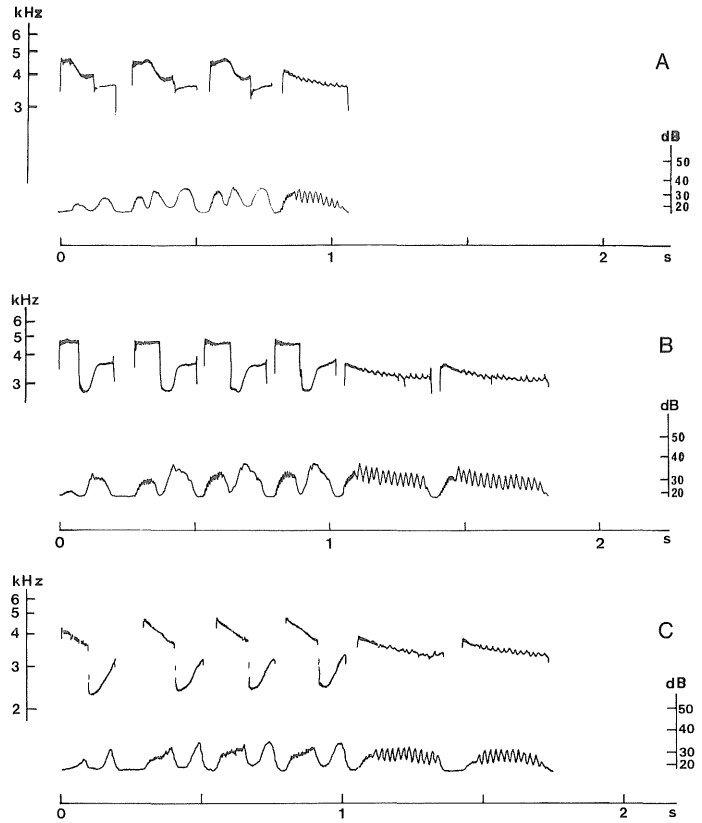

Fig. 3. Song strophes of three Ortolan Buntings *Emberiza hortulana* with Northern Swedish dialect.
A. Norrbotten, Piteå, Risnäset, 27 June 1967. Recording: Gustav Åström.
B. Ångermanland, Nordingrå, Kåsta, 26 June 1975. Recording: Gustav Åström.
C. Hälsingland, Järvsö, 18 June 1982. Recording: Stig Norell.

Sångstrofer av tre ortolansparvar med nordsvensk dialekt.

two phrases are most common. The initial phrase has some similar *syllables*. The end phrase shows distinct dialect characteristics and usually has either some short similar *elements* and/or syllables or 1-2 long similar elements. Syllables as well as elements are called *sounds*. The dialect differences can be clearly heard in the field without technical means. The structure of a song strophe is shown in Fig. 2.

We began tape-recording Ortolan Bunting songs in 1966 and rather soon we found that two song dialects, one *Northern Swedish* and one *Central Swedish*, were prevailing. Hoping to get song material, both tape-recordings and reports, from all provinces of Sweden we distributed an inquiry with detailed descriptions of the two dialects to more than 300 ornithologists in April 1982. This resulted in tape-recordings of 50 males and reports of 130 males listened to and classified in the field. For reports from the province of Östergötland, reference should be made to Tyrberg & Vuorinen (1983). Together with our own recordings and field observations, the material consists of registrations of the song of more than 420 different Ortolan Buntings from about 150 different localities (Table 1). Songs from 141 males were recorded on tapes. The others were classified only in the field and described in letters.

From the tape recordings songs from 115 males were melogrammed. This enabled us to make accurate measurements and objective comparisons. We utilized melograms since 1968 instead of sound spectograms (sonograms or sonagrams), as we think the former have some advantages over the latter. The melograms were produced by the Mona melody-writer equipment at the Institute of Musicology, University of Uppsala. The name is derived from "monophonic". Mona consists of first-partial analytical equipment. Thus fundamental frequencies are reproduced in a melogram (Bengtsson 1966).

The melograms are written by an Oscillomink on a reeled slip of millimeter-squared paper of 50 m in length. This enables melogram registrations to be very long and continuous. In our melograms, 1 mm

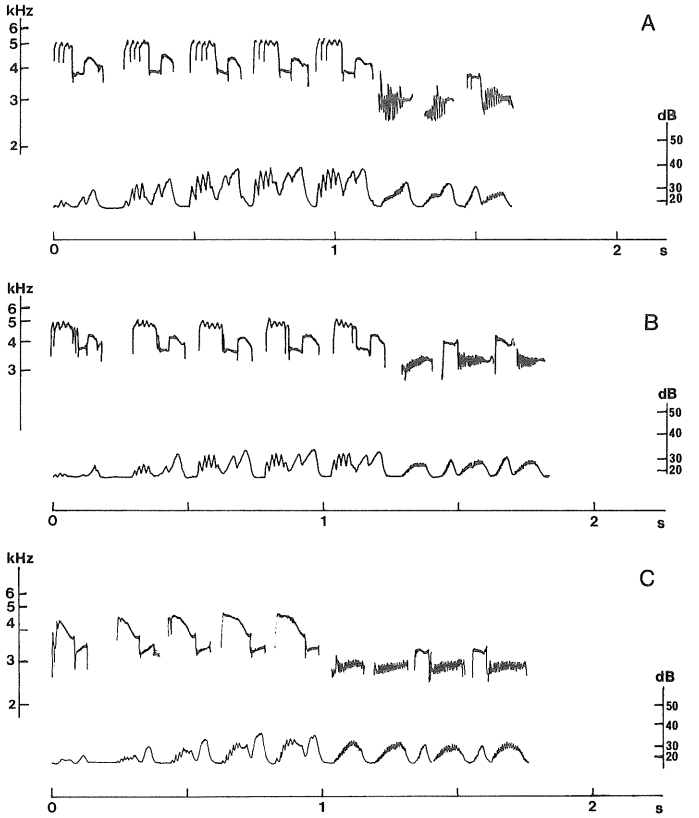

Fig. 4. Song strophes of three Ortolan Buntings *Emberiza hortulana* with Central Swedish dialect.
A. Norrbotten, Boden, Ubbyn/Skatamark, 11 June 1972. Recording: Tord Gustafsson.
B. Värmland, Sunne, 24 June 1975. Recording: Gustav Åström.
C. Uppland, Angarnsjön, Kusta, 30 May 1978. Recording: Gustav Åström.

Sångstrofer av tre ortolansparvar med mellansvensk dialekt.

in horizontal direction corresponds to about 0.01 second. Unlike a sonagram, the melogram has a curve for amplitude or the total (unfiltered) relative sound pressure. The amplitude scale has five relative values at 10 dB apart. In a sonagram, strong amplitude variations are indicated only by a larger number of black frequency markings. A melogram distinctly reflects the rapid changes of fundamental frequencies and has an invaluable amplitude curve.

The tape-recorded strophes of the Ortolan Buntings were carefully listened to and classified. All different *strophe types* in a male's repertoire (with different syllables or elements between them) and each of the *strophe variants* (with varying number of similar syllables or elements) of 115 males recorded on tapes were copied and melogrammed. If possible, loud recorded songs were selected for copying. Thus the basis for the measurings was a clear melogram for each variant from each strophe type of a male's recorded song.

We were able to utilize the amplitude curve to great advantage when measuring the length of a strophe and its parts and pauses. As a rule, the first sound (syllable or element) of a song is the weakest. Sometimes it is very weak and then the frequency curve starts a little earlier than the corresponding amplitude curve (Fig. 5A). Consequently, we measured only the part of a sound distinctly heard in the field.

Results

Characteristics of the song and song dialects

The end phrase of the *Northern Swedish* song dialect (Fig. 3) usually has 1-2 long and somewhat falling sounds with dominating modulation of the amplitude or relative sound pressure. These final sounds or elements are 0.2-0.5 s in length. They often have 10-13 high sharp complete peaks in the amplitude curve. The number of sounds in the strophes with two phrases is usually 3-5 in the first phrase and 1-2 in the second. The average length of the most common melogrammed songs consisting of 4+1 or 4+2 sounds (syllables and/or elements) is 1.4 s

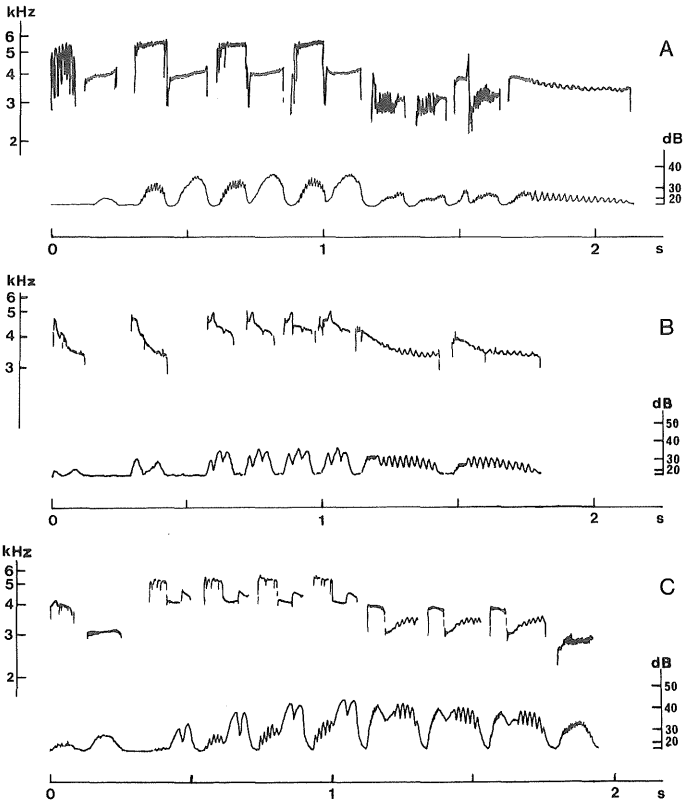

Fig. 5. Song strophes of the Ortolan Bunting *Emberiza hortulana* with more than two phrases.
A. A mixed-dialect strophe with the end phrases of two different dialects, the Central and Northern Swedish dialects, respectively. Norrbotten, Piteå, Långnäs, 12 June 1980. Recording: Gustav Åström.
B. Northern Swedish dialect. Strophe with three phrases. Norrbotten, Piteå, Långnäs, 8 July 1966. Recording: Gustav Åström.
C. Strophe variant from Västergötland, Falköping, Forentorp, 26 May 1982. Recording: Gustav Åström

Sångstrofer med mer än två fraser. A. En ortolansparvstrof av blanddialekt med slutfraser från två olika dialekter, den mellansvenska respektive den nordsvenska dialekten. B. Nordsvensk dialekt. C. Avvikande sång från Forentorp, Västergötland.

(n=24) and 1.6 s (n=29), respectively. The number of these strophes corresponds to 42% in all (n=126).

The *strophe variants* melogrammed from 61 males varied from 0.7-2.0 s and their number of sounds from 2+1 to 6+1 (n=63) and from 2+2 to 9+2 (n=63). The longest songs, 2 s in length, had either 4+2 or 9+2 sounds. Six of these males sang the two dialects alternately.

The *Central Swedish* song dialect (Fig. 4) has quite another end phrase with dominating modulation of the frequency. The number of syllables in the end phrase is usually 3-4 and at least the last ones commonly begin with a higher and shorter element. This element is very hard to hear in the field, but can be clearly heard if a recording is played at half speed. The number of sounds in the melogrammed strophes with two phrases is usually 4-5 (variation: 3-6) in the first phrase and 3-4 (variation: 1-7) in the second. The number of sounds in the strophes varied from 4-11.

The *strophe variants* melogrammed from 60 males (n = 138) varied from 0.8-2.3 seconds. The average length of the most common variants (41 % in all) with the following number of sounds is

4 + (2 + 1) = 7	1.4 s	(n = 13)
4 + (2 + 2) = 8	1.6 s	(n = 14)
5 + (2 + 1) = 8	1.6 s	(n = 17)
5 + (2 + 2) = 9	1.8 s	(n = 12)

The first figure in brackets indicates the number of single elements and the second one the number of syllables with double elements in the end phrase. See Fig. 4 C, where the final phrase has (2 + 2) sounds. The longest strophe, 2.3 s in length, had 4 + (2 + 5) = 11 sounds. In this dialect it sometimes but rarely happens that the order of the phrases is transposed, so that the end phrase comes first.

The males with Northern and those with Central Swedish dialect melogrammed had up to 3 and 2 *strophe types* with up to 5 and 5 (7; only one individual) strophe variants, respectively. Song strophes with *more than two* phrases are uncommon. Only 17 % or 20 out of 115 males with tape recorded songs sometimes sang such strophes. Examples are

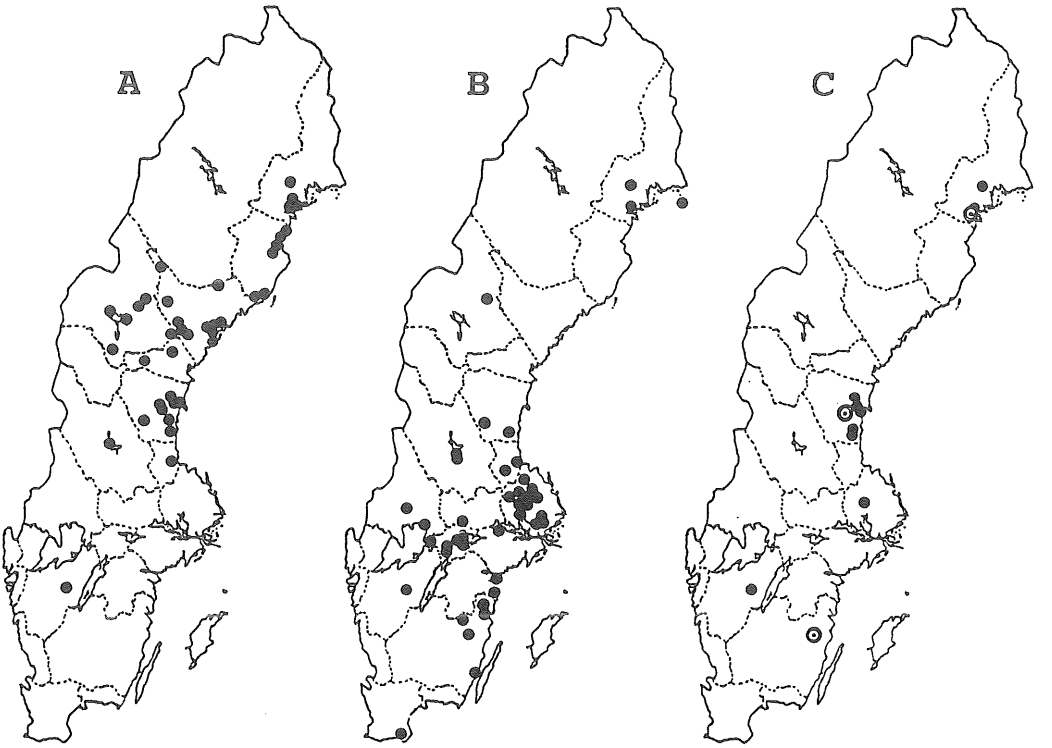

Fig. 6. The maps indicate observations of Ortolan Buntings *Emberiza hortulana* with Northern Swedish song dialect (A) and Central Swedish song dialect (B). Each symbol represents one or more observations. Map C indicates localities where males sang both dialects (●) or a mixed dialect with the end phrases of both dialects in the same strophe (○).

Kartorna visar observationer av ortolansparvar Emberiza hortulana *med nordsvensk sångdialekt (A) och mellansvensk dialekt (B). Varje symbol representerar en eller flera observationer. Karta C visar platser där ortolansparvar sjöng båda dialekterna (●) eller en blanddialekt med båda dialekternas slutfras i en och samma sångstrof (○).*

given in Fig. 5. Song strophes of both dialects have sounds with frequencies between 5-6 and 2-3 kHz. The highest frequencies in the initial phrase are usually higher than those in the final phrase. Frequency range is 1-3 kHz. It is generally larger in the first phrase than in the end phrase.

Nearly all of the Ortolan Buntings sang exclusively one of the dialects. Only 14 individuals sang both dialects alternately.

Three Ortolan Buntings recorded on tapes sang at times a mixed dialect (Fig. 5A). In their song the characteristic end phrases of both dialects were included in the same strophe, which was terminated by the end phrase of the Northern Swedish dialect.

Distribution

The Northern Swedish dialect is predominant north of the province of Hälsingland and the Central Swedish dialect south of that province (Figs. 6A, B; Table 1). The two dialects meet and "overlap" in Hälsingland. This picture of the distribution is generally valid, but it should be supplemented with the occurrence of individuals which sang the foreign dialect, both dialects or a mixed dialect (Fig. 6C).

In the province of Norrbotten the Northern Swedish dialect is predominant, but the following observations supplement the picture. Since 1966 the Central Swedish dialect was found in the area of Piteå in at least 1967, 1980 and 1983 for six (1+4+1) individuals, but not in the years 1984 and 1990 although it was searched for. It was also heard on Haparanda Sandskär in 1983. Two individuals sing-

Table 1. Number of localities and Ortolan Buntings *Emberiza hortulana* with registered song dialect in different provinces. The numbers of Ortolan Buntings recorded on tape are given in brackets. N = Northern Swedish song dialect. C = Central Swedish song dialect.

Antal platser och ortolansparvar med registrerad sångdialekt i olika landskap. Siffrorna inom parentes anger antalet ortolansparvar med inspelad sång. N = nordsvensk sångdialekt. C = mellansvensk sångdialekt.

Province *Landskap*	Number of Localities *Antal platser*	Number of Ortolan Buntings *Antal ortolansparvar*			Years *År*
		N	C	N and C	
Norrbotten	23	51 (21)	6 (5)	4 (3)	1966-1990
Västerbotten	7	12 (6)	-	-	1969-1988
Jämtland	10	16 (8)	2 (1)	-	1968-1983
Ångermanland	14	24 (11)	-	-	1975-1983
Medelpad	4	6 (3)	-	-	1978
Hälsingland	17	19 (11)	4 (3)	7 (7)	1980-1984
Dalarna	4	1	3 (1)	-	1982,1989
Gästrikland	7	1 (1)	34 (11)	-	1975-1990
Värmland	3	-	4 (3)		1975-1983
Västmanland	1	-	1	-	1983
Uppland	30	-	103 (21)	1 (1)	1966-1985
Närke	9	-	22 (4)	-	1969-1983
Södermanland	3	-	6 (3)	-	1982
Västergötland	3	3 (3)	2 (2)	2 (2)	1966-1982
Östergötland	12	-	77	-	1982-1983
Småland	6	-	9 (8)	-	1982-1984
Skåne	1	-	2 (2)	-	1983
Total	154	133 (64)	275 (64)	14 (13)	1966-1990

ing both dialects occurred near Boden in 1972 as well as near Piteå in 1980.

The two dialects meet in the province of Hälsingland. During 1983 and 1984 they were both found at Edsbyn and Söderala, where only one out of seven males sang both dialects. Within an area about 60 km broad to the north of these places, 17 males singing only Northern Swedish dialect and 6 males singing both dialects were found. When being recorded on tapes, these six males sang mostly the Northern Swedish dialect.

Three Ortolan Buntings, at times singing a mixed dialect, were recorded on tape (Figs. 5A and 6C). The first one was found near Piteå, Norrbotten, in 1980. It sang mostly Northern Swedish dialect. The second was found at Gummervallen, Hälsingland, in 1983. It sang both dialects. The third was found near Vena in the province of Småland in 1983. It sang mostly Central Swedish dialect.

There are indications that the Northern Swedish dialect has become increasingly dominating in some parts of Norrland since the 1960's, while the Ortolan Buntings with Central Swedish dialect have really diminished strongly in number in central and especially in southern parts of Sweden.

Discussion

In regions with populations with a relatively large number of individuals the dialects were strikingly uniform, as in the provinces of Ångermanland and Uppland with Northern and Central Swedish dialects, respectively (Table 1, cf. Stolt & Åström 1983). These circumstances indicate that the Ortolan Bunting males, after leaving winter quarters, usually return to their home areas. Ringing recoveries reveal that they have a strong home tenacity (Conrads 1986, Stolt 1977).

We found that the two Swedish dialects have different regional distributions, but at times single or a few individuals with the foreign dialect or both dialects are found, especially in the coastal region of southern Norrbotten. These small populations may have been founded as a result of prolonged spring migration from Central Sweden and perhaps from

Singing Ortolan Bunting. *Sjungande ortolansparv.* Photo: Björn-Eyvind Swahn/N

Finland. Near Oulu we recorded in 1968 the song of two males, which proved to be the same as the Central Swedish dialect. However, part of these small populations may also be remainders from earlier times, when judging from indications this dialect might have been dominating at least in the coastal areas of southern Norrbotten.

At Falköping in the province of Västergötland where the remaining population was small, in the province of Värmland near Rudskoga in 1982 and near Sunne in 1975, we found a song with a full and different end phrase, probably another dialect, which sometimes was followed by an additional element (as in Fig. 5C). At Falköping the birds were grouped together in a restricted habitat that seemed optimal. In such a small isolated population with an element of foreign birds, mere chance may influence which of the individuals that will return to the area the next year and carry on their dialects.

The Northern and Central Swedish dialects are, as far as we know, different from the regional dialects in Germany. Another difference between them is that German dialects generally have sharp boundaries and consequently no transitional zones where Ortolan Buntings sing two dialects alternately (Conrads & Conrads 1971).

The Central Swedish dialect is similar to the Wendland dialect in Northern Germany described by Conrads & Conrads (1971) with respect to its strict division in two phrases and the number of syllables in each phrase, but the elements in the syllables seem different. A detailed comparison of these two dialects would be of interest. Conrads & Kipp (1980) found in Northwestern Germany a temporary occurrence during 1977-1979 of Ortolan Buntings with the Northern Swedish dialect on a moor with recent clearings in the birch growth.

Foreign dialect, two dialect and mixed dialect

singers in a small population in Northwestern Germany were studied by Conrads (1976). Two foreign dialect singers sang unchanged songs for 2-3 consecutive years and it may be assumed that the dialect once learned remains stable. This presumption is supported by later observations (Conrads 1986).

A male singing two dialects alternately may have learnt his home dialect during his first summer and the other one in a "foreign" area during the next spring. Such a male will at times probably sing a mixed dialect. If a male was born very late in the season he may learn his first dialect during the next spring in his home area or somewhere else. In the latter case the male may learn two dialects if, for example, it settles down and counter-sings against another male which sings two dialects alternately.

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Sammanfattning

Regionala sångdialekter hos ortolansparv Emberiza hortulana *L. i Sverige*

Ortolansparvens regionala sångdialekter har i Tyskland studerats av bl a Conrads & Conrads (1971), som beskrev fem olika dialekter. Att svenska ortolansparvar sjunger olika i Västerbotten jämfört med Mälar-Hjälmartrakterna har omnämnts av Rosenberg (1953). Skillnaderna har vi beskrivit i ett tidigare arbete (Stolt & Åström 1975).

Ortolansparvens sång består av strofer, som är tydligt åtskilda av pauser. En fullständig sångstrof har minst två fraser, en inledande och en avslutande, men den senare kan reduceras till 1 stavelse eller 1 element. I Sverige är tvåfrasiga strofer de allra vanligaste. Den första frasen består av några likartade stavelser. Den dialektala slutfrasen har i regel antingen 1-2 långa "toner" eller några korta, likartade stavelser. Skillnaden mellan de olika dialekternas slutfraser kan man utan tekniska hjälpmedel höra ute i fält. Hur en sångstrof är uppbyggd framgår av Fig. 2, där ett *melogram* presenteras.

Material och metoder

Alltsedan 1966 har vi spelat in och avlyssnat sjungande ortolansparvar med avseende på deras dialekter. I april 1982 distribuerade vi en enkät, tillsammans med en detaljerad beskrivning av dialekterna, till mer än 300 ornitologer. Vår förfrågan resulterade i bandinspelningar av 50 hannars sång och rapporter om 130 avlyssnade hannar med fastställd dialekt. Hela materialet omfattar sångregistreringar av mer än 420 olika ortolansparvar från omkring 150 olika platser (Tabell 1). Sammanlagt har 141 hannars sång blivit inspelad på band. Från dessa inspelningar har 115 individer fått sina *stroftyper* (med sinsemellan olika stavelser eller element) och *strofvarianter* (med varierande antal likartade stavelser eller element) kopierade och sedan melogrammerade. Med hjälp av melogram kan man göra noggranna mätningar och objektiva jämförelser. Ett melogram återger tydligt snabba grundtonsförändringar och har en ovärderlig amplitudkurva.

Resultat

Den *nordsvenska* dialekten (Fig. 3) har i slutfrasen vanligen 1-2 långa och svagt fallande "toner" med dominerande *amplitud*modulation eller med andra ord variation i ljudstyrka.

Den *mellansvenska* dialekten (Fig. 4) har en helt annan slutfras, där stavelsernas *frekvens*modulation dominerar. Antalet stavelser i slutfrasen är vanligen 3-4 och åtminstone de sista börjar vanligen med ett högre och kortare element.

Av de studerade ortolansparvarna har nästan alla sjungit enbart den ena dialekten. Endast 14 hannar sjöng omväxlande båda dialekterna. Tre hannar sjöng emellanåt en *blanddialekt* (Fig. 5A). De påträffades utanför Piteå 1980, på Gummervallen 1983 och nära Vena 1983.

Den nordsvenska dialekten dominerar helt norr om Hälsingland och den mellansvenska söder därom (Fig. 6A, B; Tabell 1). Det finns dock individer, som sjunger den för området främmande dialekten, de som sjunger båda dialekterna och individer som sjunger en blanddialekt (Fig. 6C).

I Hälsingland möts de två dialekterna. Under åren 1983-84 fanns bägge i trakterna av Edsbyn och Söderala. Där sjöng endast en av sju hannar båda dialekterna. I ett ungefär sex mil brett område norr därom påträffades 17 hannar som sjöng nordsvensk dialekt och 6 hannar som sjöng båda dialekterna. Vid inspelningarna sjöng dessa sex hannar under större delen av tiden den nordsvenska dialekten.

Det finns tecken på att den nordsvenska dialekten har blivit alltmer dominerande i vissa delar av Norrland sedan 1960-talet, samtidigt som ortolansparvar med mellansvensk dialekt har minskat starkt i antal i Svealand och framför allt i Götaland.

Diskussion

De svenska dialekterna har så vitt vi vet andra slutfraser än de tyska. En annan skillnad är att dialektområdena i Tyskland nästan alltid har tydliga gränser. När en individ en gång har lärt in en dialekt, synes den stå kvar på repertoaren oförändrad (Conrads 1976, 1986). Utbredningsbilden för de två regionala sångdialekterna tyder på att ortolansparvshannarna på våren vanligtvis återvänder till sina hemtrakter. Ringmärkningsfynd bekräftar detta (Stolt 1977, Conrads 1986).

Att ortolansparvar med mellansvensk dialekt har påträffats norr om Hälsingland kan vara en följd av förlängd vårflyttning från Svealand. Till södra Norrbottens kustland skulle de kunna komma även från Finland. Nära Uleåborg spelade vi 1968 in två hannars sång, som visade sig helt överensstämma med den mellansvenska dialekten. De små norrbottniska populationer med mellansvensk dialekt som påträffats kan också vara rester från den tid då den mellansvenska dialekten kanske var helt dominerande åtminstone i södra Norrbottens kustland. Under de tre senaste decennierna har ortolansparvar med mellansvensk dialekt minskat kraftigare i antal än de med nordsvensk.