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Long-term constancy of two rain-call dialects of the Chaffinch *Fringilla coelebs* in Finnish and Russian Karelia: a consequence of site-fidelity?

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According to old Finnish ornithological literature, two different rain-call dialects of the Chaffinch existed in eastern Finland at the end of the 19th century and the beginning of the 20th century. In this work I studied the current existence and range of distribution of different rain-call dialect areas in Finnish and Russian Karelia. Rain-call vocalization is strongly connected to breeding time and uttered only by males. However, males sang the full song five times as often as they uttered the rain-call in Finland and three times as often as they uttered the rain-call in the Karelian Isthmus. The proportion of rain-call of all vocalizations (song and rain-call) increased from morning towards evening and from spring to the middle of summer. Males that uttered the "hüit" dialect sang the real song relatively more often than males that uttered the "krik" dialect. In the study area of about 60 000 km^2, there were only two large dialect areas. The "hüit" dialect occurred in the northwestern part (eastern Finland and the northern part of the Karelian Isthmus) and "kriek" occurred in the southeastern part (central and southern parts of the Karelian Isthmus and on the eastern coast of Lake Ladoga) of the study area. The rain-call dialects were not related to specific habitat types. The two dialects occured both in coniferous and deciduous forests. Between the two dialect areas is a 50 to 180 km wide sympatric zone in which both dialects were found and where every year some males uttered "hybrid" calls and some were also bilingual. The sympatric zone, where both dialects occurred, was biased northwards from the line where both dialects were equally common (50%). The two dialect areas seemed to have remained rather constant for least 120 years. The strong persistence presumably results from the strong site-fidelity of the adult breeders and from the weak dispersal rate of yearlings (+1 year old).

1. Introduction

The Chaffinch (*Fringilla coelebs*) is an interesting species among songbirds in that it has a song with considerable variation but no real song dialects (e.g. Slater et al. 1984, Catchpole & Slater 1995). On the other hand, the Chaffinch is well-known by its mosaic distribution of rain-call dialects (e.g. Marler 1956, Thielcke 1969, Bergmann et al. 1988, Baptista 1990). Only males utter the rain-call during the breeding season, but the exact function of this call is not known. Kivirikko

(1926) considered the rain-call to be an attraction call. According to Korbut (1995), however, the rain-call is used during disturbances near the nest; and Poulsen (1958) considered it to be an alarm call. It is also related to weather (rain or cold) (Bergman 1953, Poulsen 1958) or said to be a substitute for song (Detert & Bergmann 1984). The rain-call dialects can be classified into two main dialect groups, a whistle-like "hüit" and a trill-like "rülsch" rain-call group, both of which include several different variations (see e.g. Thielcke 1969, Baptista 1990). In Finland the prevailing dialect is "hüit" (Kivirikko 1926, von Haartman et al. 1963–72, von Haartman & von Numers 1992). However, already as early as 1880 Schulman (1883) heard in eastern Karelia the voice of a Chaffinch which somewhat resembled the voice of the Brambling (*Fringilla montifringilla*). In 1917 Räsänen (1924) observed a trill-like "krik" version of the rain-call dialect on the Karelian Isthmus and called the singers "Karelian Chaffinches"(*Fringilla coelebs f. karelica*). Later, however, the idea of a subspecies was abandoned, and the "krik" rain-call is now considered to be no more than a variation of the "rülsch" rain-call dialect. Soon after Räsänen, the "Karelia Chaffinch" was also reported by Hortling (1927) from Virojoki, Vyborg and Lake Äyräpäänjärvi (nowadays called Oz. Rakovoe) on the Karelian Isthmus and by Merikallio (1929) at Lake Äyräpäänjärvi. Hytönen (1937) observed several "Karelian Chaffinches" on the northeastern corner of Lake Ladoga in 1937 near the area where Schulman made the first observation of the "rülsch" dialect in 1880. According to Salo and Soikkeli (1983), one kind of "rülsch" dialect also occurred on the island of Nauvo, 30 km southwest of Turku but in Turku the dialect is "uid". Recently von Haartman and von Numers (1992) reported a trill-like "rrüp" rain-call of the Chaffinch in a rather large area of the archipelago of southwestern Finland. They also have data indicating that the "rrüp" rain-call was heard in that area of the Finnish archipelago over 55 years ago.

In species that have only a single song type or a very small repertoire, we often find sharp dialect boundaries between dialects (e.g. Marler & Tamura 1962, McGregor 1980, Bjerke & Bjerke 1981, Barker & Cunningham 1985, Catchpole & Slater 1995). It is also known that dialect boundaries may change with time but can also persist in much the same place for many years (Baptista &

Table 1. Time and main localities where the material was collected.

Area	Coordinates	Data collected
SE Finland:		
Parikkala	61° 33′ N, 29° 30′ E	between 1 April and 31 July in 1993–1998
Joensuu	62° 36′ N, 29° 42′ E	between 1 April and 31 July in 1993–1998
Karelian Isthmus and Russian Karelia:		
Äyräpäänjärvi	60° 37′ N, 29° 23′ E	29 and 30 May 1991 24 and 25 April 1993 27 and 28 April and 17 and 18 June 1994 20 to 22 April, 21 and 31 May and June 1 1995 29 and 30 April, 5 to 7 and 28 May, 9 to 11 June and 4 and 5 July 1996 between 24 April and 19 June 1997
Värtsilä	62° 11′ N, 30° 38′ E	17 May 1995 and 27 May 1996
Sortavala	61° 12′ N, 30° 38′ E	17 May 1995 and 27 May 1996 and 6 June 1997
Lahdenpohja	61° 32′ N, 30° 13′ E	18 May 1995, 27 May 1996 and 6 June 1997
Kurkijoki	61° 17′ N, 29° 51′ E	20 May 1995, 27 May 1996 and 6 June 1997
Käkisalmi	61° 03′ N, 30° 12′ E	20 May 1995, 27 May 1996 and 7 June 1997
Vyborg	60° 45′ N, 30° 12′ E	21 May 1995, 28 May 1996 and 7 June 1997
St. Petersburg	59° 45′ N, 30° 19′ E	4 June 1997
Aunus	61° 00′ N, 33° 00′ E	5 June 1997
Salmi	61° 22′ N, 31° 47′ E	6 June 1997
Pitkäranta	61° 34, N, 31° 30′ E	6 June 1997

King 1982, Baptista & Morton 1988, McGregor & Thompson 1988). In this work I studied (1) how common the uttering of the rain-call is compared to singing of the full song, (2) which rain-call dialects occur now in Finnish and Russian Karelia, and (3) whether changes have occurred in the distribution of rain-call dialects since the first observations of them in southeastern Karelia 120 years ago.

2. Material and methods

To map the occurrence of different rain-call dialects of the Chaffinch in Finnish and Russian Karelia, I visited the localities and their surroundings where the Karelian dialect had been heard at the end of the 19th century and in the beginning of the 20th century, and also some localities 50–150 km north and south of those old localities where the "Karelian dialect" had been reported (Table 1). The number of male Chaffinches uttering different rain-calls were counted and recorded in southeastern Finland, mostly near Parikkala and Joensuu (see Table 1 and Fig. 1). On the Karelian Isthmus most of the data were collected around Lake Äyräpäänjärvi, but many other places were also visited, mostly by car, stopping in different forests for recordings. I also made two census trips, one in 1995 and another in 1996, from Värtsilä via Käkisalmi and Lake Äyräpäänjärvi to Vyborg. During these trips I stopped in many places for recordings but collected most of the data at the places mentioned in Table 1. Between 2 and 7 June 1997 I made a census and recording trip around Lake Ladoga by car stopping in forest areas so that some areas south and east of the Karelian Isthmus and on the east coast of Lake Ladoga were also checked (see Fig. 1 and Table 1). The main habitat (deciduous or coniferous forest) of the males uttering the rain-call was registered for 764 allopatric males and for 40 sympatric males. All together the study area covered about 60 000 km^2. The dialect border between the two main dialects, "hüit" and "Karelian krik", was determined according to data collected where both dialects occurred with equal frequency (50%). The sympatric zone was based on data where both dialects occurred but fewer than 95% of all males uttered rain-calls.

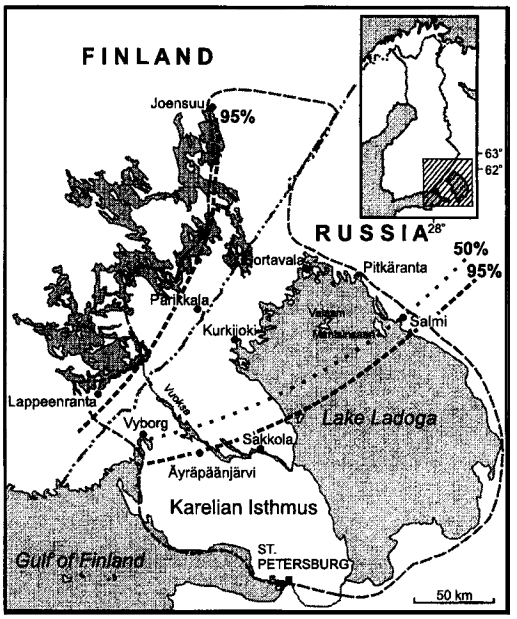

Fig. 1. Map of the study area. – – – – = border of the study area; · · · · = border of the two rain call dialects (the border where both dialects are equally common); and ------ = the border where the proportion of the dominating dialect is 95%.

The rain-calls of male Chaffinches were recorded with a Sony stereo-cassette-order Walkman professional WM-D6C and Sony DAT Walkman TCD-D3 with Sennheiser MKH 60 P48 microphone. The length of the rain-calls were measured to the nearest 0.01 second, and the lowest and highest frequencies of these rain-calls were measured to the nearest 100 Hz. The calls of 19 "hüit males" and 45 "Karelian kriek males" were measured and the mean values of 4 to 39 rain-calls/male were used in calculations. All the measurements and sonograms (bandwidth = 352.9 Hz) were done using a Power Macintosh 4400/200 computer with a Canary 1.2 program.

Daily and seasonal singing and rain-call activity were studied during 1997. The date and time of a total of 1354 independent singing males and 406 rain-call uttering males from southeastern Finland, Russian Karelia and the Karelian Isthmus were recorded between 19 April and 26 June. In order to determine whether "Karelian kriek males" prefer deciduous forest or avoid pine forests, I determined the number of "Karelian kriek

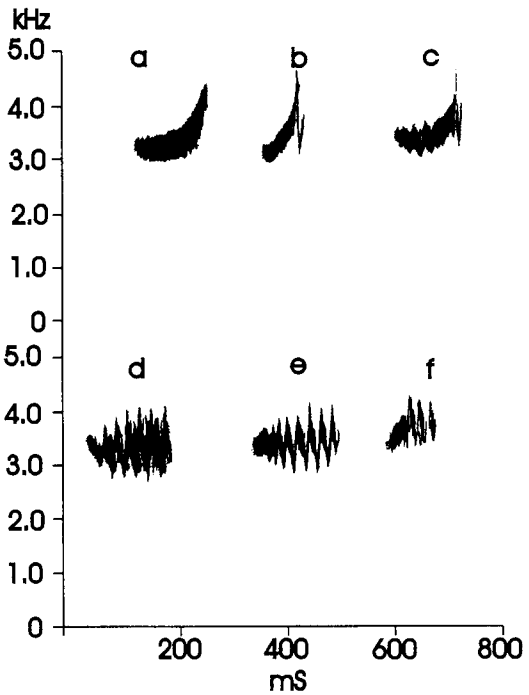

Fig. 2. Sonograms of different types of rain-calls observed in the study area. The sonograms a (hüi) and b (hüit) belong to a whistle-like "hüit" group; c is a hybrid resembling the "hüit" dialect; d and e belong to a trill-like "rülsch" group and are referred to here as "Karelian dialect"; d commenced with a descending part and e with an ascending part; sonogram f is a hybrid resembling "Karelian dialect".

males" in a 1.3 km^2 Scotch pine (*Pinus silvestris*) forest and in a 0.2 km^2 deciduous (*Alnus glutinosa*, *A. incana*, *Betula pendula*, *B. pubescens*) forest. The number of vocalizing male Chaffinches was counted by walking an intensively zig-zag path through the forests on 27 April in 1997 between 05.00 and 08.30 h.

The site-fidelity of adult males and females and the natal dispersion of nestlings were studied by using the data of the Finnish Ringing Centre from ringings, recoveries of dead birds and recaptures of live Finnish Chaffinches. The following criteria were required for those recoveries included in this study: 1) Chaffinches ringed as nestlings: recoveries of dead birds and recaptures of alive birds made during the following summers between 16 April and 31 July. 2) Adult males and females: ringed at breeding time, between 16 April and 31 July and recaptured either alive or dead at breeding time one or more years after the year of ringing. The distance of recoveries of dead birds and recaptures of live birds from their ringing (breeding) place were measured to the nearest kilometre and based on the data of the Finnish Ringing Centre.

3. Results

3.1. Rain-call dialects

Male Chaffinches in the study area belonged to the two main dialect groups, "hüit" and "rülsch". Among the males belonging to the "hüit" dialect group there were some that had a short and simple "hüi" dialect form (Fig. 2a). Of the 65 "hüit" males recorded, only four uttered the "hüi" variant that consisted only of an ascending "hüi" whistle. These males do not form any separate "hüi" group but were scattered individually among many "hüit" males.

The "hüit" rain-call (Fig. 2b) sound begins with ascending whistle, "hüi" from $\bar{x}$ = 2.91, SD = 0.11 kHz and went up to $\bar{x}$ = 4.80, SD = 0.28 kHz, n = 19, followed by "it", a rapidly descending and again a weak and rapidly ascending part. The length of this call was $\bar{x}$ = 110, SD = 9.69 mS, n = 19 and it was repeated at intervals of $\bar{x}$ = 1.39, SD = 0.64 s (n = 19). The other main rain-call dialect was southeastern "Karelian dialect" (Fig. 2d and 2e), which belongs to the "rülsch" dialect group. It was slightly lower than the "hüit" sound. The lowest point was $\bar{x}$ = 2.60, SD = 0.14 kHz; and the highest point was $\bar{x}$ = 4.11, SD = 0.09 kHz, n = 45. It was also longer than the "hüit" sound, being $\bar{x}$ = 175, SD = 13.92 mS, n = 45. This sound was composed of a trill where pitch went up and down five to eight times in rapid succession. The mean number of high pitch peaks in the trill was 6.60, SD = 0.59, n = 45. Most males (118 of 130 recorded males) commenced the trill with a short descending part (Fig. 2d). Five of the 130 males commenced it with an ascending part (Fig. 2e), and 7 of these males had both kinds of beginnings among their "Karelian dialect" repertoire. The males with an ascending beginning did not form a separate dialect group — the most northern one was in Parikkala, in southeastern Finland; the most southern one was south of St.

Petersburg. These findings were spread over five years. The "Karelian dialect" rain-call was repeated at intervals of $\bar{x}$ = 1.70, SD = 0.73 s, n = 42. The "Karelian dialect" rain-calls of ten males recorded in sympatry differed from those recorded in allopatry. In sympatry the trill was slightly higher, the lowest point $\bar{x}$ = 2.67, SD = 0.06 kHz, the highest point $\bar{x}$ = 4.18, SD = 0.09 kHz; and the trill had significantly fewer high pitch peaks than in allopatry ($\bar{x}$ = 5.4 times, SD = 1.47, Z = –3.33, P = 0.009, Mann-Whitney U-test). In sympatry I found six males that uttered "hybrid" calls. In two cases the rain-call was more similar to the "hüit" rain-calls (Fig. 2c) and in 4 cases more similar to the "Karelian dialect" (Fig. 2f). In sympatry or close to sympatry I also found six bilingual males, two "hüit" calling males that uttered dominantly "hüit" rain-calls but with irregular frequency uttered "Karelian dialect" rain-calls between "hüit" rain-calls. Similarly there were four bilingual males who uttered predominantly the "Karelian dialect" and irregularly the "hüit" rain-calls between the "Karelian dialect" rain-calls.

According to these observations, the border line where these two rain-call dialects were equally common seemed to go from south of Vyborg via Hiitola to Salmi northeast of Lake Ladoga (Fig. 1). However, the sympatric zone of these dialects was rather broad, between 50 and 180 km. In eastern Finland 30 (5.1%) of the 594 males in Parikkala and Joensuu uttered "Karelian dialect" rain-calls; and on the Karelian Isthmus, near Lake Äyräpäänjärvi, in 1991–97 nine (4.5%) of the 202 males uttered the "hüit" rain-call. The males uttering the "Karelian dialect" seemed to disperse further from the 50% dialect border than did those males uttering the "hüit" dialect. About 5% of the males were observed to utter the "Karelian dialect" at a distance of 40 to 170 km northwest of the 50% dialect border, and about 5% of the males uttered the "hüit" dialect at a distance of 10 to 20 km southeast of the 50% dialect border.

Some, but not all, of the males that were observed probably many times during the same breeding season continued to utter the same dialect throughout the whole period, even though all their nearby neighbours uttered different dialects. Once one territory in a "hüit" dialect area was occupied in two consecutive years by a "kriek" male and a territory in the area of "Karelian dialect" was occupied in three consecutive years by a "hüit" male. At least in one case, one of these males managed to breed successfully.

3.2. Time and proportions of song and rain-call vocalisation

The vocalization of male Chaffinches was most active in the morning before noon. Of all utterings, the proportion of full song was highest in the morning; and the proportion of rain-calls increased towards evening (χ^2 = 14.2, P = 0.0016, Kolmogorov-Smirnov test). In Finland, in the area of the "hüit" rain-call dialect, the males sang full song (1008 observations) five times as often as they uttered rain-calls (225 observations). In Russian Karelia, in the area of the "Karelian rain-call dialect", the males (320 observations) sang full song only three times as often as they (166 observations) uttered rain-calls. This difference between the proportions of uttering "hüit" and "Karelian dialect" was statistically significant (χ^2 = 4.86, P < 0.05, χ^2-test). The data do not include bilingual and "hybrid" males or some males singing in the sympatric area, which I was not able to identify as belonging to either "hüit" or "Karelian dialect". All birds observed to utter rain-calls were males and with few exceptions they were uttering rain-calls only during the breeding season. However, the rain-call was first heard two to five days after the first birds arrived. The last rain-calls were heard at the end of September. The proportion of rain-calls of all utterings increased from 12.5% to 36.0% from spring (19.4.) to summer (8.6.) when the data of 1354 independent singers and 406 independent calling males in 1997 were used and which were measured in time periods of five days (r^2 = 0.806, P = 0.0001). At the end of the breeding period, in the beginning of July, the proportion was more than 60%, but there were so few observations that the numbers are not reliable.

The rain-call dialects did not seem to be closely related to specific habitat types. Both dialects were frequently observed in both deciduous and coniferous forests. On a large scale (whole data from southeastern Finland and the Karelian Isthmus) the "huit" dialect was more common in coniferous forests and the "Karelian dialect" in deciduous forests (χ^2 = 8.6, P = 0.003, Fisher's exact

test). In the study areas in southeastern Finland where coniferous forests were more common than deciduous forests the two dialects were similarly more numerous in coniferous forests ($\chi^2 = 1.3$, P = 0.263, Fisher's exact test) and similarly more numerous in deciduous forests ($\chi^2 = 0.46$, P = 0.500, Fischer's exact test) in the study areas on the Karelian Isthmus where deciduous forests were more common than coniferous forests. Close to Lake Äyräpäänjärvi on the morning of 27 April 1997 there were 42 "Karelian dialect" vocalizing male Chaffinches in a coniferous forest of 1.3 km^2 (32.3 males/km^2) and 29 "Karelian dialect" vocalizing males in a deciduous forest of 0.2 km^2 (145 males/km^2).

3.3 Site-fidelity and natal dispersion

The natal dispersion of Chaffinches seemed to be rather short (Table 2). Of the 24 recoveries of dead birds 62.5% were found within 1 km and about 80% within 5 km. Of the 13 birds recaptured alive, 76.9% were found within 1 km and all 13 birds were found within 5 km from their natal nest site. Site-fidelity of the adult birds, which had already bred at least once, was still higher than that of nestlings (Table 3). The site fidelity of adult breeders seemed to be similar for males and females (Table 3) (the numbers in Table 3 are lower than those in Table 2 due to the fact that the data used here also included some birds whose sex was unknown), and there were no statistical differences between males and females in the distances they were from their earlier breeding site when recovered (Z = 0.07, Tied P = 0.96, Mann-Whitney U test).

4. Discussion

4.1. Rain-call variations

The "hüit" and "Karelian" rain-call dialects differed from those measured by Baptista (1990) in southern Germany by being slightly shorter in time

Table 2. The number of Chaffinches dispersed to different distances from their natal nest.

	Dispersal distance (km)					
	0.0–1.0	1.1–5.0	5.1–10.0	10.1–50.0	<50	Total
Recoveries of dead yearlings	15	4	1	4	–	24
Recaptures of live yearlings	10	3	–	–	–	13
Recoveries of dead adult birds which had bred at least once	47	4	1	7	13	72
Recaptures of live adult birds which had bred at least once	756	10	–	7	2	775

Table 3. Distribution of the recoveries of dead and recaptures of live males and females from their earlier breeding site.

	Distance categories (km)									
	0–1		1.1–5		5.1–10		10.1–50		over 50	
	n	%	n	%	n	%	n	%	n	%
Recoveries of dead:										
males	27	65.9	2	4.8	1	2.4	3	7.3	8	19.5
females	17	63.0	1	3.7	1	3.7	4	14.8	4	14.8
Recaptures of live:										
males	475	97.3	7	1.4	–	–	4	0.8	2	0.4
females	262	98.1	3	1.1	–	–	1	0.4	1	0.4

and lower in frequency. They also differed from those described by von Haartman and von Numers (1992) in the Finnish southwestern archipelago. The "hüit" rain-call in southeastern Finland was about two times longer, ascended more slowly and was frequency modulated but more curved than the "hüit" in southwestern Finland, which had a more linear frequency modulation. The "hüit" rain-call variation seems to resemble those "hüit" variations from Southern Germany and Austria described by Thielcke (1969) and Baptista (1990) more than that described by von Haartman and von Numers (1992). The "Karelian" rain-call also seems to resemble the "rülsch" variations found in England (Cramp & Perrins 1994), northern Italy (Thielcke 1969 p. 315), central Europe (Baptista 1990) and Denmark (Poulsen 1958) more than that found in the archipelago of southwestern Finland. The "Karelian" rain-call variation seems to be longer and have a more narrow frequency band than the "archipelago rrüp" rain-call, which seems to begin with the "hüi" element and to be like some hybrid rain-call described by Baptista (1990); but the "Karelian" rain-call is a pure "rülsch" rain-call without any "hüi" elements. However, the hybrid "Karelian" rain-calls (Fig. 2f) of some males had an ascending "hüit" part at the beginning of the "rülsch" in southeastern Finland and in Russian Karelia. Hybrid rain-calls have also been reported to occur in small numbers in other Chaffinch populations (Deter & Bergmann 1984, Bergmann et al. 1988, Korbut 1995, Baptista 1990, von Haartman & von Numers 1992). The proportion (1.3%) of bilingual males uttering both "hüit" and "Karelian" rain-calls is in accordance with the results of Baptista (1990) in southern Germany but is smaller than that found by Deter and Bergmann (1984) in northern Germany.

"Karelian Chaffinches" were found to utter a rain-call more often than those males that uttered the "hüit" rain-call. This may be a common pattern. At the end of April 1982 in southern France I observed that most male Chaffinches uttered "rülsch" rain-calls and only a few males sang the real song. However, I was not able to find any references in the literature dealing with the relative proportions of the rain-call and the real song. Because the rain-call is vocalized less frequently during the time of pairing, it is probably not used to attract a mate. In addition, use of the rain-call in territorial defence seems not to be reliable because only the real song and the "chink" call are mentioned as being heard when territorial intruders appear (e.g. Poulsen 1958, Cramp & Perrins 1994). In addition, I have never observed male Chaffinches in sympatry to attack against males uttering a strange rain-call dialect or respond to playbacks either of their own or a strange dialect. It seems to me that rain-call is often used as a contact call from a male subject to his mate when feeding on ground or during disturbance near nest.

Mortensen (1967) had a theory that the rain-call types in Denmark follow the habitat types very closely: the "ryhd" (rülsch) type of call is found in old deciduous forests, while the "hüit" type is found in newer coniferous forests. On a large scale, the theory of Mortensen (1967) seemed to be true. The "huit" dialect seems to be common in the area of boreal coniferous forests and the "rülsch" dialect in temperate deciduous forests. On a small scale, however, it apparently is not true. In southern and central Finland Chaffinches are very numerous in both coniferous and deciduous forests, and they all utter the "hüit" dialect regardless of habitat. On the Karelian Isthmus the species is also very numerous both in coniferous and deciduous forests, and the males utter the "Karelian dialect" regardless of habitat.

4.2. Persistence of the rain-call dialects

The song dialects are commonly dynamic in time and space. Song dialect is explained as being acquired by the young males copying their neighbours when they settle in a certain territory (Thielcke 1969, Catchpole & Slater 1995). The long-term maintenance of a local dialect may be explained by the young males copying the song of the older males of the area where they settle to breed in their first spring (Espmark et al. 1989). The boundary between local song dialects is reported to be constant in many populations of some species and to last even decades (see McGregor & Thompson 1988). The rain-call of the Chaffinch is a classical example of the mosaic variation of dialects in Europe (Thielcke 1969, Bergmann et al. 1988). In an area of about 70 km^2 in northern Germany there were four rain-call dialects (Bergmann et al. 1988) and in an area of about

160 km^2 in southern Germany there were three rain-call dialects (Baptista 1990). In Finland, however, mosaic-type variation seems not to occur. The rain-call dialect areas in the archipelago of southwestern Finland and on the Karelian Isthmus are much larger than those observed in central Europe. According to this study, the Finnish "hüit" rain-call areas and the "Karelian" rain-call areas, which meet on the line Vyborg–Salmi (Fig.1), are very large, perhaps hundreds of thousands of square kilometres. According to Korbut (1995), the border between the two rain-call dialects in Russian Karelia seems to continue from Salmi northeast to the northern part of Lake Oneca and to the southwestern cost of the White Sea. Evidently the "hüit" dialect dominates and is uniform throughout the whole of Fennoscandia and northwestern Russia. Jägerskiöld and Kolthoff (1911) mentioned only the "hüit" rain-call dialect from Sweden, and only the "hüit" rain-call has been reported in Norway (Haftorn 1971). According to Mortensen (1967), the "ryhd" dialect is the original rain-call dialect in Denmark in the old forests. When conifer forests were planted about a hundred years ago, the birds uttering the "huit" dialect invaded the new habitats from the north or east.

The border and range of distribution of the "hüit" and "Karelian" rain-call dialects seems to have remained rather constant despite some small changes in the western part of the border and abundance in some localities. I visited all the old places where the "Karelian dialect" had been reported at the end of the 19th century and the beginning of the 20th century. Although I was not able to confirm any real changes in the range of distribution of these two dialects, I was able to detect some changes in their relative abundance in some of the localities studied. In 1937 Hytönen (1937) observed 8–10 males uttering the "Karelian" rain-call among the "huit" males in Pitkäranta, Lunkulansaari and Mantsinsaari on the northeastern coast of Lake Ladoga. On my visits to the same area in 1996 and 1997 the two rain-call dialects were equally common. According to Räsänen (1924), the "Karelian krik" rain-call was heard commonly in parks in Kurkijoki during the summers of 1922 and 1923. When I visited Kurkijoki in 1995–1997, I heard many males uttering the "Karelian" rain-call; but the "hüit" rain-call was slightly more common. According to Putkonen (unpubl.), both "hüit" Chaffinch males and "Karelian" Chaffinch males were common around Lake Äyräpäänjärvi during 1934–1937, but he has not estimated the numbers of males uttering the different dialects. Nowadays (1991–1997), the "Karelian" rain-call dominates there, and only about 4.5% of the males are uttering the "hüit" version. Similarly, nearly 5% of the male Chaffinches were observed to vocalize the "Karelian dialect" nowadays, in southeastern Finland. These observations may indicate that the "Karelian" dialect is slowly invading from the south towards the north. This is in accordance with the findings that the sympatric area is wider north of the 50% dialect border than it is south of that border (see Fig. 1). If this variation in the "Karelian" rain-call observed by Schulman (1883), Räsänen (1924), Hortling (1927), Merikallio (1929), Hytönen (1937) and Putkonen (unpubl.) was the same as that which I recorded in 1991 to 1997 in the same areas of Russian Karelia and on the Karelian Isthmus, then the "Karelian" rain-call has persisted in the same area for about 120 years or more. However, I have no data from the period between 1937 and 1991.

The exceptionally high constancy of rain-call dialect areas of the Chaffinch can presumably be explained by the high site-fidelity of adult Chaffinches and the low dispersal rate of the nestlings. High values for site-fidelity have been observed in England (Marler 1956), in Finland (Bergman 1953, Lokki 1981, Mikkonen 1983) and in Sweden (Anvén & Enemar 1957). In Kaliningrad in western Russia over 90% of the 1-year-olds first bred within 1 km of their natal site (Sokolov 1986). Although the number of recaptures of dead birds and especially the number of recoveries of live birds are highly biased, the present data indicate a rather high site-fidelity of adult chaffinches and low natal dispersion of first breeders. If the rain-call dialect is acquired by learning (see Marler 1956, Thielcke 1969, Baptista 1990) when young males settling in a territory in their first breeding season copy their neighbours, this can, in addition to ensuring high site-fidelity, lead to a very constant border between dialects. However, this leaves an open question. Why have these rain-call dialects evolved? Are rain-call dialects advantageous for male Chaffinches in a simi-

lar way as song dialects are for some species where males need to devote less time to territorial defence and can rear more youngs (see Payne 1982 and Espmark et al. 1989) or are they only by-products without any purpose (see Slater et al. 1984)? Alternatively they may be meaningless but genetically inherited, and thus, due to high site-fidelity of Chaffinches, the persistency of the rain-call dialects is also high.

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Selostus: Peipon sadelaulun pysyvyys Suomen ja Venäjän Karjalassa: seuraus peipon kotipaikkauskollisuudesta

Tavallisen peiponlaulun lisäksi tavataan peipolla myös ns. sadelaulua. Sadelaulun tarkkaa merkitystä ei tiedetä, mutta se liitetään usein johonkin häiriötekijään tai sitä pidetään jonkinlaisena laulun vastikkeena. Sadelaulua kuuluu vain pesimäaikaan ja ainoastaan koiraat laulavat sitä. Peipon sadelaulua kuulee kolmesta viiteen kertaan harvemmin kuin sen tavallista laulua ja varsinkin aamuisin laulukauden alussa sadelaulua kuuluu harvoin. Koiraan sadelaulussa on erotettavissa alueellisia murteita. Murteet jaetaan kahteen pääryhmään: vihellyksenomaiseen "hüit" murteeseen ja surahtavaan "rülsch" murteeseen. Suomessa peipon valtamurre on "hüit" vain itäisestä Suomesta ja Lounais-Suomen saaristosta on tavattu "rülsch" murretta. Tässä työssä on kartoitettu peipon sadelaulumurteiden esiintyminen Itä-Suomessa (Joensuun, Parikkalan ja Lappenrannan ympäristöt) ja Karjalan Kannaksella sekä Laatokan etelä-, itä- ja pohjoisrannoilta. Itä-Suomessa vallitseva sadelaulumurre on "hüit" ja Karjalan Kannaksella ja Laatokan etelä ja itärannalla "rülsch" murreryhmään kuuluva "kriek" eli "Karelian" murre. Näiden murrealueiden välissä on leveä yhteisesiintymisalue, jolla tavataan kumpaakin murretta ja myös "kaksikielisiä" koiraita, jotka laulavat kahta eri murretta, tai koiraita joiden murre on sekoitus kummastakin murteesta. Toisin kuin Keski-Euroopassa tutkimusalueella ei tavata murteissa mosaiikkimaista levinneisyyttä vaan ne muodostavat laajat ja yhtenäiset metsätyypistä riippumattomat murrealueet, jotka ovat ajallisesti hyvin pysyviä. Murteiden pitkäaikainen pysyvyys on todennäköisesti seurausta peipon voimakkaasta kotipaikkauskollisuudesta ja murteiden oppimisesta vanhoilta pesiviltä koirailta.

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