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# Population trends of common birds in Estonia in 1983–2010

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**Abstract.** The paper presents the set-up and development of a common bird monitoring scheme in Estonia in 1983–2010. The point-count survey of widespread terrestrial bird species was undertaken to measure long-term population changes and to produce indicators of the condition of habitat types and the wider environment. The scheme has been mostly run by skilled volunteers of the Estonian Ornithological Society. The method applied is point counting on free-choice routes and without limiting recording distance. In the Estonian scheme, each count route consists of 20 points, with 5-minute stops at least 200 m apart. In total, 143 point count routes have been in use by 89 active birdwatchers and professional ornithologists in the course of 28 years. Yearly abundance indices for 87 bird species were calculated using TRIM software. The most evident changes in bird numbers were the declines detected in 1992–1996 among farmland species, and in 2007–2010 among farmland and woodland species. The long-term population trends (1975–2010) in four countries around the Baltic Sea depend on the migratory strategy of bird species. Among trans-Saharan migrants the proportion of declining species was much higher in comparison with short-distance migrants and sedentary species. A marked difference between these countries was found among sedentary bird species – with up to 2/3 of species with increasing trends in Finland and less than 1/3 in Denmark, Sweden, and Estonia. There is a growing interest in using the results of the scheme both at the national and the international scale (PECBMS).

**Key words:** citizen science, Common Bird Census, Estonia, farmland bird index, long-term monitoring, point counts, population dynamics.

## INTRODUCTION

There is a long tradition of bird surveys at the national scale in Estonia. The oldest long-term projects are bird phenology monitoring (continuous scheme since 1922), the White Stork survey (since 1939), and International Waterfowl Census (since 1967), mostly performed by voluntary birdwatchers of the Estonian

Ornithological Society. Important milestones for the development of citizen science in Estonia were the successful compilation of the first breeding bird atlas project (fieldwork 1977–1982; Renno, 1993) and the subsequent introduction of a national common bird monitoring scheme based on point counts in 1983 (Kuresoo, 1991).

The first comprehensive bird monitoring schemes in the United Kingdom (Williamson & Homes, 1964) and in North America (Robbins et al., 1986) in the 1960s were initiated mainly to monitor human-caused effects on birds, such as the impacts of chemical pesticides or habitat degradation and, in particular, the intensification of agriculture. Measuring variation in bird numbers appeared to be an important tool to document natural changes of populations as well: crashes due to weather incidents, periodic fluctuations, short- and long-term trends. The drop of the numbers of the Common Whitethroat *Sylvia communis* by about 70% between 1968 and 1969, revealed by the Common Bird Census, was not explainable by local environmental factors in the United Kingdom only. Soon the impact of Sahelian drought on the wintering Common Whitethroat and several other migratory European bird populations was documented (Winstanley et al., 1974). The existing generic monitoring schemes, besides measuring human-induced environmental changes, raise alerts about sudden crashes or long-term declines of bird populations and satisfy information needs of nature conservationists and climatologists (global warming). Recently, the climatic impact indicator was developed, which integrates bioclimate envelope modelling (Green et al., 2008) and the population trends observed in European birds (Gregory et al., 2009).

In Europe common bird monitoring schemes were pioneered by the United Kingdom (since 1962; Williamson & Homes, 1964) and the Nordic countries – Finland (since 1941; Merikallio, 1958; Järvinen & Väisänen, 1978), Sweden (1969; Svensson, 1981), and Denmark (1975; Braae & Laursen, 1979). In 1980–1984, new projects were started in Switzerland, Czechoslovakia, Estonia, Latvia, and the Netherlands (Kuresoo, 1991; Klvaňova & Vořišek, 2007). The first monitoring schemes were based on line transect counts (Finland), or the rather labour-intensive territorial mapping method (United Kingdom, Sweden). Soon a new method, point count, gained popularity, in particular after the launching of the Breeding Bird Survey based on fifty 3-min car stops in the USA and Canada in 1966 (Robbins et al., 1986). In Europe the point count method was taken into use in France (Blondel et al., 1970), but it was first used for common bird monitoring in the Baltic Sea region: Sweden (1975) and Denmark (1976), and soon in Estonia, Latvia (both 1983), and Finland (1984). The Estonian scheme was born after a wide discussion on generic monitoring methods and indicator functions of common birds in the Nordic countries in the 1970s and the attempts of Fennoscandian ornithologists to raise similar enthusiasm in the Baltic Sea countries (Svensson, 1978; Järvinen & Väisänen, 1979).

Among the 28 common bird census schemes running presently in Europe, 13 are based on point counts, followed by line transects (9), territory mapping (3), and a combination of these methods (3) (Klvaňova & Vořišek, 2007). The popularity of the point counts could be explained by the simple and observer-friendly design of count routines and its suitability in woody and bushy habitats. The Estonian point count scheme has been mostly run by voluntary members of the Estonian Ornithological Society and of local bird clubs. Some administrative support has been received since 1994 in association with the launching of the National Environmental Monitoring Programme, which includes 11 long-term schemes on bird populations and habitats (Leito & Kuresoo, 2000). Although the point count scheme was designed to provide research tools in their own right, its value has risen gradually as it measures long-term changes in many species, helping to produce indicators of the condition of habitats and the environment at a wider scale. In 2002 the Pan-European Common Bird Monitoring Scheme (PECBMS) was initiated with the goal to use common birds as indicators of the general state of nature, using scientific data on the changes in breeding populations across Europe (Gregory et al., 2005, 2007). In 2004 the European Union adopted the farmland bird index (FBI), produced by PECBMS as a 'long-list structural indicator' for Europe (Gregory et al., 2008). In 2010 the Wild Bird Indicators (WBI) for North America and Europe were produced (http://www.twentyten.net/wbi). The WBI combine monitoring data of 202 bird species since 1965 (the United States) or 1980 (18 European countries including Estonia). Such high level interest puts political pressure on individual European countries to support their common-bird monitoring programmes.

In the current paper we (1) describe the set-up and development of the common-bird monitoring scheme in Estonia from its beginning in 1983 until the present time, (2) present yearly population indices for 87 breeding bird species to update previous reports (Kuresoo, 1991; Kuresoo & Mänd, 1991; Kuresoo & Ader, 2000), (3) extract the most evident patterns in bird dynamics through presenting the national multispecies indices for farmland birds and for forest birds, and (4) compare population trends grouped by migratory strategy among four countries around the Baltic Sea.

## MATERIAL AND METHODS

### Breeding bird monitoring scheme 1983–2010

The method applied was point counting on free-choice routes using unlimited recording distance. The project initiators aimed at a cost-effective and simple method to attract advanced voluntary birdwatchers. After a pilot study in 1982, the scheme was started in 1983, one year after the successful completion of the fieldwork for the national breeding bird atlas (1977–1982). This substantially increased the number of active birdwatchers in Estonia (Renno, 1993). The design

is similar to the popular Danish point count project, which saw a rise of monitoring routes from 26 to 100 in only 4 years (Braae & Laursen, 1979).

In the Estonian scheme, each count route consists of 20 points with 5-minute stops at least 200 m apart in closed landscape and 300 m in open landscape to minimize double-counting of individuals. It is recommended that each point be fixed in a relatively homogeneous habitat, avoiding sharp habitat-edge situations. The census has to be carried out by the same person and in exactly the same points in subsequent years. There are no restrictions on how the participants move between points, but in practice observers prefer walking instead of using vehicles.

Originally, two spring counts were recommended: the first (early count) between 25 April and 15 May, and the second (main count) between 25 May and 20 June. Since 1995 only the main count has been recommended in order to stop further decline in the number of routes (Fig. 1). The data used in the present paper are based on the results from the main counts. When no main count was carried out, the data from the first count, but not earlier than 20 May, were used. The date and hour of repeated counts in successive years were standardized: the maximum allowed variation is ±7 days and ±1 hour. The counting of birds usually starts at sunrise and is normally completed within 5 hours after the sunrise. Calm weather without precipitation is recommended for the counts as rainy or cold weather reduce bird activity and moderate to strong wind will 'jam' bird voices.

Observers are asked to record all birds seen or heard that can be regarded as breeding individuals (excluding birds just flying over). It is recommended that simple sketching of bird positions (with movements and various territorial activity) be used on paper to avoid double recording of territorial birds and to separate confirmed and probable breeding pairs (singing and territorially behaving individuals) from possible breeding pairs (silent individuals with missing territorial activity, scored as 0.5 'breeding pairs'). Individuals of aerial birds like swallows, martins, and swifts, and colonial birds like the Grey Heron *Ardea cinerea*, the Rook *Corvus frugilegus*, and gulls, were not counted, but their presence was recorded.

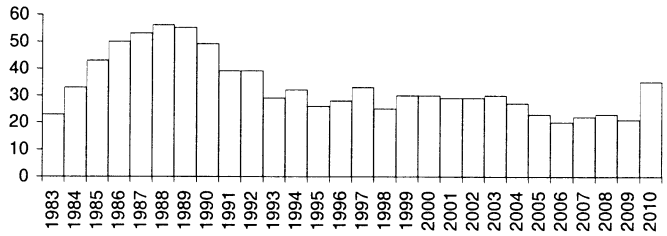


**Fig. 1.** Annual number of point count routes in use in Estonia in 1983–2010.

The number of bird census routes increased considerably between 1983 and 1988, declined rapidly in the next five years (probably due to socio-economic reasons), and stayed low for a long time (Fig. 1). After the fieldwork for the second national breeding bird atlas in 2003–2008, a new attempt was made to attract 'trained birdwatchers' to participate in the point count scheme. Indeed, there was a promising increase of point routes in 2010. In total, 143 count routes were in use in 1983–2010, of which 37 routes are still active (counts were made in 2009–2010; Fig. 2). The geographical distribution of all routes is quite even, but active routes show a clumped pattern. Altogether 89 active birdwatchers and professional ornithologists have participated in the scheme.

The 143 point-count routes comprise 14 modified routes, including 6 with observer change and 8 with a major habitat change in at least three count points. Since 1985 the observers have been asked to record the habitat type for each count point from a list of 22 predefined habitats. In the case of large-scale modification of habitats (expansive forest clear-cuts, overgrowth of agricultural areas and clear-cuts), the permanent route was considered as a new or the observers themselves abandoned the route and started a new one. The major land cover classes according to the CORINE land cover classification – forests, agricultural areas – are sampled adequately, but urban areas are excessively and natural semi-open landscapes insufficiently represented (Table 1).

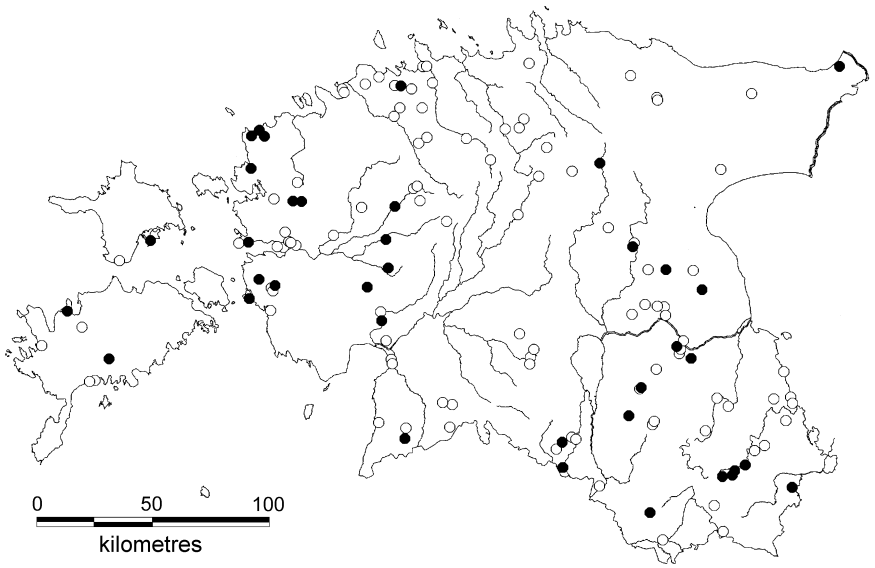


**Fig. 2.** Distribution of the point count routes in use in Estonia in 1983–2008 (open circles) and in 2009–2010 (filled circles).

**Table 1.** Representation of CORINE land cover classes (Meiner, 1999; map from the year 2000) in Estonia and in the count points (400 points, radius from point 150 m) in 2009

| CORINE land cover class | Estonia, % | Count points, % | Difference |
|---|---|---|---|
| Discontinuous urban fabric | 1.1 | 5.2 | 4.1 |
| Industrial or commercial units | 0.4 | 1.3 | 0.9 |
| Road and rail networks | 0.1 | 0.0 | –0.1 |
| Port areas, airports | 0.1 | 0.0 | –0.1 |
| Mineral extraction sites | 0.2 | 0.0 | –0.2 |
| Dump sites | 0.1 | 0.0 | –0.1 |
| Green urban areas | 0.1 | 2.7 | 2.7 |
| Urban areas/Artificial surfaces, total | 2.0 | 9.2 | 7.2 |
| Non-irrigated arable land | 14.6 | 18.1 | 3.4 |
| Pastures | 5.7 | 8.7 | 3.0 |
| Complex cultivation patterns | 4.0 | 4.8 | 0.8 |
| Land principally occupied by agriculture, with significant areas of natural vegetation | 8.3 | 8.5 | 0.2 |
| Agricultural areas, total | 32.5 | 40.0 | 7.5 |
| Broad-leaved forest | 9.5 | 3.2 | –6.4 |
| Coniferous forest | 18.2 | 22.5 | 4.3 |
| Mixed forest | 18.4 | 14.1 | –4.3 |
| Forests, total | 46.1 | 39.7 | –6.4 |
| Natural grasslands | 0.9 | 0.1 | –0.7 |
| Moors and heathland | 0.4 | 0.0 | –0.4 |
| Transitional woodland–scrub on mineral land | 5.8 | 4.0 | –1.8 |
| Transitional woodland–scrub on mire | 3.1 | 0.9 | –2.2 |
| Beaches and dunes | 0.2 | 0.0 | –0.2 |
| Sparsely vegetated areas | 0.1 | 0.0 | –0.1 |
| Natural semi-open landscape, total | 10.3 | 5.0 | –5.3 |
| Reed-beds | 0.8 | 0.8 | 0.0 |
| Open fens and transitional bogs | 0.9 | 0.0 | –0.9 |
| Open lawn and pool communities | 2.2 | 5.0 | 2.8 |
| Peat extraction areas | 0.5 | 0.0 | –0.5 |
| Wetlands, total | 4.4 | 5.8 | 1.4 |
| Water courses | 0.1 | 0.0 | –0.1 |
| Water bodies | 4.5 | 0.3 | –4.2 |
| Inland waters, total | 4.6 | 0.3 | –4.3 |

## Population trends and indices

Yearly abundance indices for the 87 bird species most frequently sighted in 1983–2010 were calculated using TRIM software (Trends and Indices for Monitoring Data). TRIM analyses time series of counts with missing observations

using Poisson regression and produces estimates of yearly indices and trends (Pannekoek & van Strien, 2001). Linear trend with serial correlation and all years as change points were used. The year 1988 was chosen as the base year (index = 100%) because of the highest number of routes in use.

To assess changes in biodiversity, multispecies indices were calculated for 37 species of farmland birds and 37 species of forest birds following the procedure of Gregory et al. (2005). The method gives each species an equal weight. Geometric means rather than arithmetic means were used (i.e. an index increase from 100 to 200 and decrease from 100 to 50 were considered equivalent, but opposite). Classification of species as farmland and woodland species was based on Berg (2002), Gregory et al. (2005), and Wretenberg et al. (2006). As an exception, *Luscinia luscinia* was considered a woodland species in Estonia (Leibak et al., 1994). Among the species absent in the Swedish and British lists, *Ciconia ciconia*, *Crex crex*, *Tringa totanus*, *Delichon urbicum*, *Anthus pratensis*, *Locustella fluviatilis*, *Sylvia nisoria*, *Muscicapa striata*, and *Carpodacus erythrinus* were classified as farmland species; *Dryocopus martius*, *Dendrocopos minor*, *Phylloscopus sibilatrix*, *Ficedula parva*, *Parus montanus*, *P. cristatus*, *Certhia familiaris*, *Oriolus oriolus*, *Nucifraga caryocatactes*, *Pyrrhula pyrrhula*, and *Coccothraustes coccothraustes* were classified as woodland species.

The accordance of individual species indices to the multispecies indices was estimated using Spearman correlation. The species that contributed most for considerable declines of multispecies indices in 1992–1996 and 2007–2010 were identified on the basis of the strongest change in the same direction in the species index.

Long-term population trends of breeding birds of Estonia, Finland, Sweden and Denmark for the period 1975–2010 were analysed according to Väisänen (2005), Lindström et al. (2009), and Heldbjerg & Eskildsen (2010). In the assessment of population change and direction, the species trend was considered increasing with yearly population change YPC ≥ 1.00%, stable with YPC between 0.99 and –0.99%, and declining with YPC ≤ –1.00%. For that analysis, 67 common bird species were grouped according to the migratory strategy as sedentary (26 species) and European (19) or trans-Saharan migrants (22).

## RESULTS

Yearly population indices of 87 breeding bird species, trend values (slopes), and trend classes for the period 1983–2010 are presented in Appendix 1. The trends of 30 species most frequently sighted are presented in Table 2.

Among the multispecies indices, the woodland bird index shows a steady increase until 2000, followed by a moderate negative trend in 2001–2006, and a sharp decline in 2007–2010. The farmland bird index largely follows the woodland bird index, but shows two distinctive declines – in 1994–1996 and

**Table 2.** Trend estimates, standard errors, and trend classes of the 30 most frequently sighted bird species between 1983 and 2010

| Species | Main habitat[a] | Number of routes | Change | | Trend class[b] |
|---|---|---|---|---|---|
| | | | % per year | SE | |
| *Columba palumbus* | FA | 125 | 0.8 | 0.6 | Stable |
| *Cuculus canorus* | WO | 131 | 0.3 | 0.5 | Stable |
| *Dendrocopos major* | WO | 112 | 0.3 | 0.6 | Stable |
| *Alauda arvensis* | FA | 101 | –1.2 | 0.4 | Moderate decline** |
| *Anthus trivialis* | WO | 132 | –2.3 | 0.4 | Moderate decline** |
| *Troglodytes troglodytes* | WO | 96 | 1.9 | 0.6 | Moderate increase** |
| *Prunella modularis* | WO | 98 | 0.5 | 0.9 | Stable |
| *Erithacus rubecula* | WO | 120 | 1.2 | 0.5 | Moderate increase** |
| *Luscinia luscinia* | WO | 118 | 0.9 | 0.6 | Stable |
| *Turdus merula* | WO | 131 | 2.0 | 0.5 | Moderate increase** |
| *Turdus pilaris* | FA | 109 | –0.1 | 0.6 | Stable |
| *Turdus philomelos* | WO | 128 | 0.7 | 0.4 | Stable |
| *Turdus iliacus* | WO | 118 | –1.5 | 0.7 | Moderate decline* |
| *Hippolais icterina* | WO | 94 | –0.5 | 0.8 | Stable |
| *Sylcia atricapilla* | WO | 118 | 0.8 | 0.6 | Stable |
| *Sylvia borin* | WO | 127 | 0.6 | 0.5 | Stable |
| *Sylvia communis* | FA | 124 | 0.2 | 0.7 | Stable |
| *Phylloscopus sibilatrix* | WO | 127 | –2.3 | 0.4 | Moderate decline** |
| *Phylloscopus collybita* | WO | 133 | –0.7 | 0.4 | Moderate decline* |
| *Phylloscopus trochilus* | WO | 139 | –0.9 | 0.4 | Moderate decline* |
| *Regulus regulus* | WO | 88 | –1.2 | 0.7 | Stable |
| *Ficedula hypoleuca* | WO | 116 | –1.2 | 0.6 | Moderate decline* |
| *Parus major* | WO | 130 | –0.1 | 0.5 | Stable |
| *Oriolus oriolus* | WO | 112 | –1.3 | 0.8 | Stable |
| *Corvus corone* | FA | 119 | –0.5 | 0.5 | Stable |
| *Corvus corax* | WO | 100 | –0.1 | 1.1 | Stable |
| *Fringilla coelebs* | WO | 138 | –0.3 | 0.2 | Stable |
| *Carduelis spinus* | WO | 103 | –2.0 | 1.0 | Moderate decline* |
| *Carpodacus erythrinus* | FA | 132 | 0.2 | 0.6 | Stable |
| *Emberiza citrinella* | FA | 114 | –2.1 | 0.7 | Moderate decline** |

[a] FA, farmland; WO, woodland.
[b] $p < 0.05$; ** $p < 0.01$.

in 2007–2010 (Fig. 3). The species that contributed most to these declines are presented in Table 3. The farmland multispecies index was most concordant with the indices of *Pica pica*, *Columba palumbus*, *Hirundo rustica*, *Turdus pilaris*, *Corvus corone*, and *Tringa totanus* ($r_s$ = 0.39–0.53, $n$ = 28 years, $p < 0.05$); in the woodland index the most similarly co-varying species were *Turdus merula*, *Sitta europaea*, *Dryocopus martius*, *Dendrocopos major*, *Garrulus glandarius*, *Pyrrhula pyrrhula*, *Certhia familiaris*, *Troglodytes troglodytes*, *Corvus corax*, *Erithacus rubecula*, and *Regulus regulus* ($r_s$ = 0.38–0.74, $n$ = 28 years, $p < 0.05$).

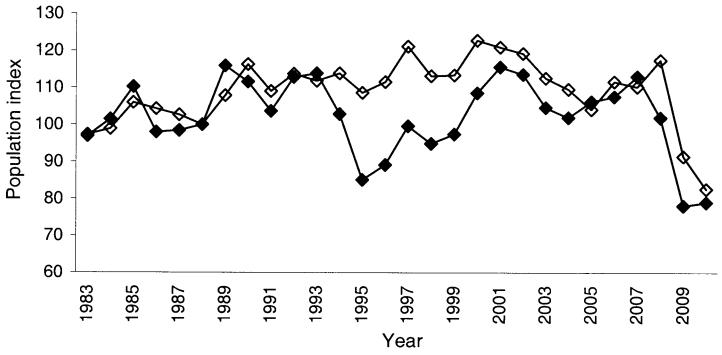


**Fig. 3.** Multispecies indices for farmland (filled symbols) and woodland (open symbols) birds in Estonia in 1983–2010.

**Table 3.** The ten species that contributed most to the drastic declines of the multispecies indices in 1994–1996 and 2007–2010 ranked by the strength of the impact

| 1994–1996 Farmland | 2007–2010 Farmland | 2007–2010 Woodland |
|---|---|---|
| *Sylvia nisoria* | *Tringa totanus* | *Parus palustris* |
| *Numenius arquata* | *Motacilla flava* | *Loxia curvirostra* |
| *Anthus pratensis* | *Oenanthe oenanthe* | *Sitta europaea* |
| *Jynx torquilla* | *Crex crex* | *Dryocopus martius* |
| *Passer montanus* | *Passer montanus* | *Parus cristatus* |
| *Oenanthe oenanthe* | *Motacilla alba* | *Dendrocopos major* |
| *Corvus monedula* | *Columba palumbus* | *Oriolus oriolus* |
| *Vanellus vanellus* | *Delichon urbicum* | *Dendrocopos minor* |
| *Carduelis chloris* | *Locustella naevia* | *Nucifraga caryocatactes* |
| *Crex crex* | *Acrocephalus schoenobaenus* | *Parus montanus* |

In Appendix 2, the long-term population trends in comparison with those in Finland, Sweden, and Denmark are presented for the period 1975–2010. A difference among the four countries was found for the long-term trends in sedentary bird species ($\chi^2 = 12.6$, $df = 6$, $p = 0.05$). The trends are similar in Estonia, Sweden, and Denmark, and all four countries had a rather moderate proportion of declining species, but in Finland 65% of the sedentary species showed distinct increasing trends (Fig. 4a). A characteristic of short-distance migrants overwintering in Europe (Fig. 4b) is a high proportion of declining species in Estonia and Fennoscandia compared with sedentary species and a large proportion of increasing species in Denmark (42%). Trans-Saharan migrants suffered the most pronounced declines, with only a few species that increased in numbers in all four countries (Fig. 4c).

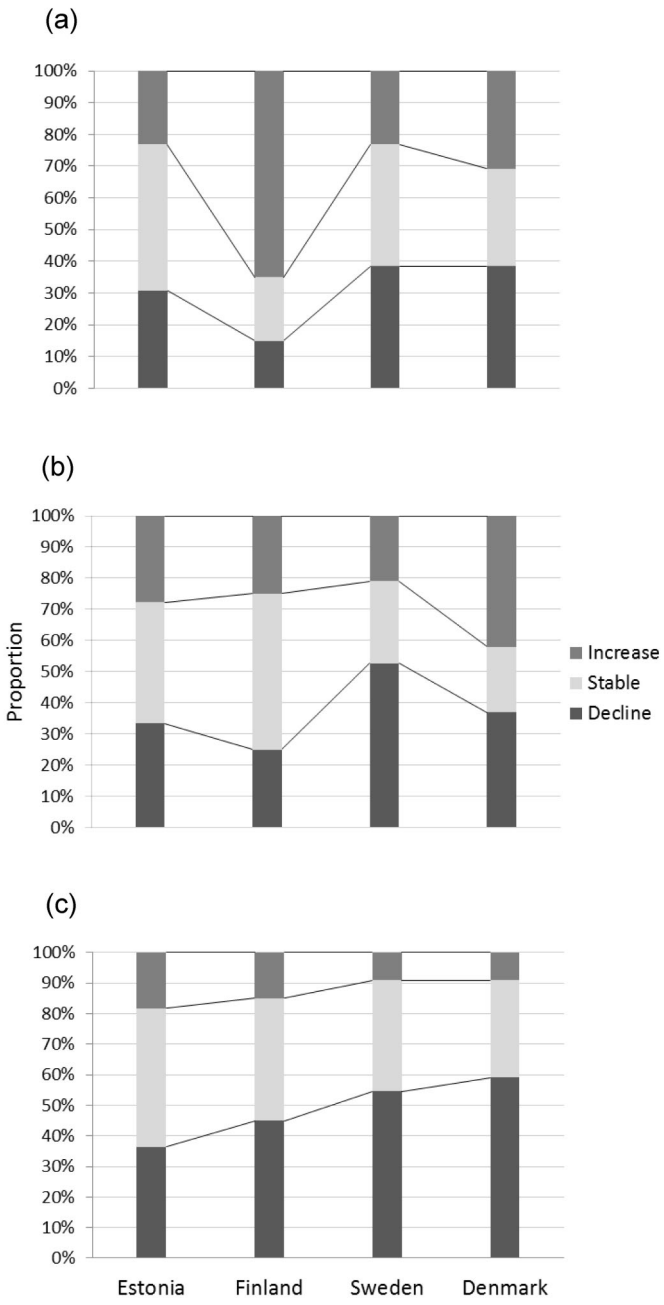


**Fig. 4.** Population trend patterns of sedentary bird species (a; $n = 26$)), short-distance migrants (b; $n = 19$), and trans-Saharan migrants (c; $n = 22$) in four countries in 1975–2010. *Sources*: Finland: data from 1983–2005 by Väisänen (2005); Denmark: 1975–2009 by Heldbjerg & Eskildsen (2010); Sweden: 1975–2008 by Lindström et al. (2009).

## DISCUSSION

The farmland and woodland bird indices presented are the first multispecies indices documenting considerable long-term changes of bird numbers in broad habitat types in Estonia. At the continental scale, the wild bird indices have been produced since 2005 (Gregory et al., 2005, 2007). According to the last update, the common farmland index dropped by 44% in 1980–2005 (Klvaňova & Vořišek, 2007). This decline is largely the cost of specialization and intensification of agricultural methods in West Europe (Newton, 2004). In the early 1990s, a temporary increase of farmland bird populations occurred in Central and East Europe, coinciding with a period when the intensity of agriculture in those countries decreased after the collapse of political systems (Gregory et al., 2005). For example, in Latvia a short-time increase of the numbers of the Corncrake *Crex crex* as well as of other farmland birds in the 1990s was caused by extensive farmland abandonment; the trend reversed from 2000 because of rapid over-growth of abandoned arable lands (Aunins & Priednieks, 2008).

The dynamics in the Estonian indices differs from those in the continental indices. However, the increase of the national farmland bird index from 1995 to 2001, followed by a moderate decline, is rather similar to changes of farmland bird populations in Latvia (Aunins & Priednieks, 2009). As to Estonian woodland birds, we found a steady increase until 2000, followed by a moderate negative trend in 2001–2006, and a sharp decline in 2007–2010. Changes in the numbers of breeding woodpeckers, contributing to the decline of the woodland bird index in 2007–2010, were also detected by the national woodpecker monitoring scheme (Rein Nellis, pers. comm.). At continental scale no obvious trend among specialist forest birds has been found (decline of 2% from 1980–2007; Gregory et al., 2009).

Comparison of long-term trends among the four countries indicated distinct increasing trends in Finnish sedentary birds. The strong population growth in the Tree Sparrow *Passer montanus*, the Blue Tit *Parus caeruleus*, and the Greenfinch *Carduelis chloris* have been explained, at least partly, by an increase in winter feeding (Väisänen & Solonen, 1997; Vepsäläinen et al., 2005). Declines were more frequent in short-distance migrants over-wintering in Europe. As this species group includes many farmland birds, proportionally more declines were observed in Denmark and Sweden – in countries with intensive farming. The population trends and dynamics of short-distance migrants often vary because of distinct climatic conditions, in particular because of local climatic events such as sudden cold spells in the northern part of the region (Kuresoo, 1990). According to Estonian data, short-distance migrants are sensitive to spring cold spells. For example, the snowstorm and the accompanying low temperatures at the end of April 1988 halved the number of the Song Thrush *Turdus philomelos* and the Robin *Erithacus rubecula* and caused a strong decline of the Dunnock *Prunella modularis* and the Redwing *Turdus iliacus* populations >35% in Estonia (Kuresoo, 1989, 1990).

Trans-Saharan migrants show the most pronounced declines, in particular in the western countries – in Sweden and Denmark. There is increasing evidence that a higher proportion of long-distance migratory (trans-Saharan) species breeding in the western part of the European range compared with the eastern part of the continent are negatively affected by periodic droughts in the Sahel regions of Africa (Heldbjerg & Fox, 2008; Zwarts et al., 2009). The smaller and fewer declines in the east may be associated also with conditions in breeding grounds – human impact on the landscape in Europe exhibits a gradient from intensive in the west to more extensive in the east (Zwarts et al., 2009).

There is growing interest in using the results of the Estonian point count scheme at the national scale. In the periodical evaluation of the numbers and trends of Estonian birds (1991–2008), the common bird species trend analysis was based on the point count scheme data (Lõhmus et al., 1998; Elts et al., 2003, 2009). For a number of declining bird species such as woodpeckers, tetraonids, and farmland birds, the population indices derived from the point count schemes have been used for the assessment of population status.

Undoubtedly, there is a need for expanding and improving the Estonian point count scheme. The main steps in this work are to at least double the number of point count routes and to improve the geographical distribution of count routes and the coverage of different habitats.

## ACKNOWLEDGEMENTS

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APPENDIX 1

## POPULATION INDICES OF BREEDING BIRDS IN ESTONIA BASED ON POINT COUNTS IN 1983–2010

| No. | Species name | EURING | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | White Stork | 1 340 | 102 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 91 | 70 |
| 2 | Mallard | 1 860 | 83 | 131 | 147 | 47 | 83 | 100 | 60 | 46 | 19 | 60 | 143 | 32 | 40 | 47 | 45 | 4 | 33 |
| 3 | Common Buzzard | 2 870 | 70 | 67 | 81 | 82 | 86 | 100 | 35 | 86 | 58 | 43 | 91 | 30 | 71 | 49 | 70 | 44 | 47 |
| 4 | Hazel Grouse | 3 260 | 122 | 274 | 182 | 137 | 137 | 100 | 176 | 170 | 143 | 78 | 157 | 34 | 24 | 30 | 23 | 20 | 44 |
| 5 | Black Grouse | 3 320 | 31 | 23 | 35 | 17 | 47 | 100 | 34 | 33 | 20 | 44 | 37 | 38 | 46 | 30 | 24 | 15 | 17 |
| 6 | Corncrake | 4 210 | 30 | 55 | 90 | 56 | 36 | 100 | 37 | 23 | 17 | 44 | 23 | 28 | 25 | 23 | 17 | 27 | 55 |
| 7 | Common Crane | 4 330 | 104 | 100 | 188 | 119 | 120 | 100 | 116 | 97 | 184 | 41 | 193 | 203 | 145 | 416 | 316 | 20 | 211 |
| 8 | Lapwing | 4 930 | 134 | 210 | 203 | 62 | 58 | 100 | 163 | 127 | 78 | 64 | 61 | 99 | 34 | 53 | 159 | 140 | 134 |
| 9 | Common Snipe | 5 190 | 80 | 93 | 152 | 81 | 157 | 100 | 60 | 17 | 80 | 64 | 63 | 67 | 27 | 82 | 122 | 65 | 49 |
| 10 | Curlew | 5 410 | 128 | 130 | 116 | 80 | 59 | 100 | 88 | 94 | 100 | 87 | 75 | 92 | 49 | 17 | 51 | 13 | 28 |
| 11 | Redshank | 5 460 | 50 | 132 | 217 | 61 | 106 | 100 | 99 | 54 | 49 | 72 | 125 | 98 | 79 | 76 | 74 | 94 | 123 |
| 12 | Green Sandpiper | 5 530 | 62 | 63 | 55 | 67 | 98 | 100 | 98 | 91 | 78 | 78 | 73 | 25 | 57 | 51 | 77 | 59 | 86 |
| 13 | Wood Pigeon | 6 700 | 45 | 101 | 85 | 83 | 84 | 100 | 89 | 122 | 90 | 113 | 111 | 111 | 106 | 94 | 103 | 90 | 116 |
| 14 | Turtle Dove | 6 870 | 62 | 87 | 81 | 94 | 87 | 100 | 108 | 109 | 74 | 75 | 93 | 59 | 79 | 112 | 77 | 35 | 61 |
| 15 | Cuckoo | 7 240 | 93 | 97 | 124 | 119 | 98 | 100 | 92 | 120 | 83 | 103 | 111 | 106 | 97 | 114 | 83 | 85 | 71 |
| 16 | Swift | 7 950 | 85 | 29 | 163 | 157 | 123 | 100 | 149 | 95 | 134 | 149 | 89 | 84 | 172 | 85 | 126 | 128 | 133 |
| 17 | Wryneck | 8 480 | 103 | 79 | 63 | 89 | 121 | 100 | 89 | 95 | 136 | 79 | 131 | 83 | 92 | 16 | 64 | 62 | 59 |
| 18 | Black Woodpecker | 8 630 | 23 | 80 | 95 | 112 | 68 | 100 | 84 | 80 | 111 | 84 | 124 | 153 | 119 | 205 | 225 | 75 | 154 |
| 19 | Great Spotted Woodpecker | 8 760 | 90 | 109 | 81 | 122 | 86 | 100 | 122 | 172 | 85 | 89 | 152 | 199 | 92 | 117 | 132 | 163 | 145 |
| 20 | Lesser Spotted Woodpecker | 8 870 | 295 | 159 | 219 | 129 | 222 | 100 | 352 | 261 | 161 | 176 | 513 | 275 | 79 | 206 | 266 | 136 | 119 |
| 21 | Skylark | 9 760 | 208 | 155 | 120 | 120 | 122 | 100 | 132 | 165 | 164 | 153 | 171 | 158 | 119 | 137 | 147 | 144 | 144 |
| 22 | Barn Swallow | 9 920 | 29 | 72 | 101 | 88 | 119 | 100 | 115 | 94 | 114 | 107 | 119 | 71 | 94 | 82 | 93 | 99 | 103 |
| 23 | House Martin | 10 010 | 42 | 78 | 201 | 187 | 84 | 100 | 180 | 212 | 233 | 119 | 149 | 148 | 195 | 168 | 103 | 184 | 193 |
| 24 | Tree Pipit | 10 090 | 108 | 119 | 127 | 127 | 139 | 100 | 115 | 104 | 91 | 108 | 91 | 79 | 96 | 98 | 100 | 82 | 90 |
| 25 | Meadow Pipit | 10 110 | 216 | 227 | 168 | 198 | 156 | 100 | 134 | 200 | 193 | 182 | 183 | 132 | 153 | 20 | 227 | 149 | 99 |
| 26 | Yellow Wagtail | 10 172 | 44 | 48 | 48 | 69 | 45 | 100 | 93 | 84 | 77 | 102 | 112 | 127 | 118 | 50 | 85 | 195 | 129 |
| 27 | Pied Wagtail | 10 202 | 225 | 106 | 171 | 87 | 133 | 100 | 118 | 149 | 173 | 178 | 197 | 179 | 113 | 233 | 184 | 284 | 267 |
| 28 | Wren | 10 660 | 115 | 96 | 62 | 92 | 82 | 100 | 94 | 106 | 87 | 125 | 101 | 119 | 138 | 136 | 156 | 155 | 161 |
| 29 | Dunnock | 10 840 | 89 | 122 | 114 | 136 | 155 | 100 | 100 | 93 | 89 | 132 | 94 | 136 | 135 | 112 | 142 | 108 | 114 |
| 30 | Robin | 10 990 | 300 | 211 | 230 | 240 | 234 | 100 | 168 | 230 | 179 | 278 | 291 | 270 | 282 | 273 | 374 | 348 | 287 |
| 31 | Thrush Nightingale | 11 030 | 54 | 62 | 49 | 94 | 107 | 100 | 96 | 103 | 86 | 112 | 96 | 89 | 116 | 88 | 88 | 98 | 79 |

APPENDIX 1. *Continued*

| No. | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | No. of plots | Additive slope | SE of additive slope | Multi-plicative slope | SE of multi-plicative slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 65 | 308 | 1 134 | 1 497 | 1 438 | 1 710 | 1 365 | 1 221 | 1 463 | 1 591 | 1 504 | 18 | 0.1267 | 0.0226 | 1.135 | 0.0257 |
| 2 | 85 | 69 | 46 | 41 | 86 | 52 | 82 | 54 | 64 | 34 | 44 | 79 | –0.0199 | 0.0117 | 0.980 | 0.0115 |
| 3 | 67 | 49 | 65 | 37 | 57 | 74 | 39 | 74 | 114 | 72 | 55 | 72 | –0.0057 | 0.0179 | 0.994 | 0.0178 |
| 4 | 89 | 67 | 67 | 117 | 60 | 96 | 36 | 19 | 10 | 117 | 32 | 44 | –0.0616 | 0.0255 | 0.940 | 0.024 |
| 5 | 11 | 13 | 43 | 25 | 10 | 5 | 3 | 31 | 22 | 18 | 7 | 34 | –0.053 | 0.0291 | 0.948 | 0.0276 |
| 6 | 60 | 54 | 45 | 35 | 38 | 60 | 36 | 38 | 23 | 8 | 19 | 67 | –0.0219 | 0.0182 | 0.978 | 0.0178 |
| 7 | 343 | 290 | 302 | 252 | 156 | 145 | 180 | 309 | 310 | 427 | 352 | 56 | 0.0418 | 0.0138 | 1.043 | 0.0144 |
| 8 | 123 | 121 | 210 | 194 | 347 | 263 | 335 | 411 | 311 | 406 | 289 | 73 | 0.0498 | 0.0131 | 1.051 | 0.0137 |
| 9 | 106 | 99 | 55 | 80 | 148 | 68 | 119 | 66 | 67 | 28 | 18 | 76 | –0.0181 | 0.0184 | 0.982 | 0.0181 |
| 10 | 20 | 33 | 30 | 51 | 33 | 26 | 25 | 91 | 8 | 32 | 35 | 47 | –0.0633 | 0.022 | 0.939 | 0.0207 |
| 11 | 158 | 169 | 58 | 21 | 60 | 181 | 548 | 839 | 210 | 51 | 13 | 16 | 0.0078 | 0.0381 | 1.008 | 0.0384 |
| 12 | 56 | 78 | 69 | 83 | 91 | 46 | 84 | 49 | 57 | 30 | 67 | 66 | –0.0103 | 0.013 | 0.990 | 0.0129 |
| 13 | 104 | 119 | 138 | 91 | 71 | 101 | 110 | 106 | 145 | 78 | 81 | 125 | 0.0081 | 0.0059 | 1.008 | 0.0059 |
| 14 | 43 | 59 | 59 | 38 | 58 | 55 | 30 | 86 | 38 | 41 | 39 | 72 | –0.0319 | 0.0169 | 0.969 | 0.0164 |
| 15 | 91 | 72 | 117 | 92 | 95 | 120 | 130 | 110 | 116 | 109 | 124 | 131 | 0.0026 | 0.0047 | 1.003 | 0.0047 |
| 16 | 131 | 100 | 108 | 114 | 98 | 75 | 155 | 131 | 131 | 118 | 106 | 71 | 0.0073 | 0.0131 | 1.007 | 0.0132 |
| 17 | 70 | 79 | 90 | 110 | 46 | 29 | 26 | 25 | 38 | 20 | 18 | 48 | –0.0517 | 0.0252 | 0.950 | 0.0239 |
| 18 | 167 | 142 | 188 | 106 | 88 | 149 | 175 | 194 | 162 | 51 | 72 | 63 | 0.0229 | 0.0136 | 1.023 | 0.0139 |
| 19 | 136 | 131 | 112 | 82 | 70 | 89 | 95 | 130 | 226 | 101 | 87 | 112 | 0.0029 | 0.0061 | 1.003 | 0.0061 |
| 20 | 319 | 124 | 201 | 215 | 243 | 108 | 165 | 284 | 196 | 101 | 58 | 37 | –0.0164 | 0.0323 | 0.984 | 0.0318 |
| 21 | 136 | 125 | 133 | 141 | 113 | 106 | 105 | 114 | 110 | 100 | 101 | 101 | –0.0124 | 0.0044 | 0.988 | 0.0043 |
| 22 | 115 | 91 | 111 | 104 | 98 | 111 | 92 | 113 | 113 | 91 | 79 | 89 | 0.01 | 0.0108 | 1.010 | 0.0109 |
| 23 | 225 | 115 | 192 | 169 | 181 | 152 | 209 | 238 | 268 | 186 | 191 | 46 | 0.0266 | 0.0151 | 1.027 | 0.0155 |
| 24 | 83 | 91 | 92 | 83 | 80 | 72 | 70 | 81 | 63 | 63 | 59 | 132 | –0.0237 | 0.0037 | 0.977 | 0.0036 |
| 25 | 126 | 124 | 134 | 74 | 96 | 108 | 108 | 60 | 123 | 88 | 145 | 49 | –0.0272 | 0.0083 | 0.973 | 0.0081 |
| 26 | 99 | 80 | 93 | 54 | 64 | 109 | 94 | 220 | 86 | 32 | 12 | 33 | –0.0004 | 0.0233 | 1.000 | 0.0233 |
| 27 | 322 | 258 | 274 | 281 | 230 | 269 | 248 | 324 | 246 | 210 | 192 | 94 | 0.0307 | 0.0063 | 1.031 | 0.0065 |
| 28 | 141 | 143 | 151 | 128 | 113 | 71 | 158 | 135 | 129 | 166 | 138 | 96 | 0.0183 | 0.0058 | 1.019 | 0.0059 |
| 29 | 130 | 146 | 143 | 129 | 165 | 83 | 139 | 133 | 131 | 133 | 90 | 98 | 0.0052 | 0.0091 | 1.005 | 0.0091 |
| 30 | 279 | 325 | 326 | 263 | 242 | 235 | 301 | 272 | 234 | 299 | 276 | 120 | 0.0123 | 0.0046 | 1.012 | 0.0046 |
| 31 | 100 | 86 | 92 | 105 | 99 | 105 | 104 | 129 | 89 | 99 | 55 | 118 | 0.0085 | 0.0057 | 1.009 | 0.0057 |

*Continued overleaf*

APPENDIX 1. *Continued*

| No. | Species name | EURING | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | Common Redstart | 11 220 | 154 | 28 | 52 | 97 | 120 | 100 | 240 | 36 | 188 | 42 | 190 | 102 | 166 | 149 | 133 | 150 | 106 |
| 33 | Whinchat | 11 370 | 76 | 68 | 114 | 96 | 100 | 100 | 73 | 79 | 69 | 75 | 67 | 47 | 58 | 73 | 77 | 89 | 62 |
| 34 | Wheatear | 11 460 | 116 | 314 | 779 | 278 | 105 | 100 | 246 | 361 | 413 | 652 | 760 | 498 | 130 | 772 | 618 | 631 | 625 |
| 35 | Blackbird | 11 870 | 164 | 156 | 120 | 113 | 126 | 100 | 122 | 128 | 170 | 192 | 211 | 228 | 204 | 182 | 212 | 253 | 202 |
| 36 | Fieldfare | 11 980 | 59 | 47 | 53 | 45 | 66 | 100 | 95 | 96 | 87 | 72 | 82 | 87 | 65 | 69 | 62 | 58 | 73 |
| 37 | Song Thrush | 12 000 | 253 | 232 | 247 | 221 | 270 | 100 | 109 | 134 | 210 | 259 | 249 | 255 | 258 | 184 | 296 | 290 | 257 |
| 38 | Redwing | 12 010 | 174 | 190 | 177 | 115 | 158 | 100 | 104 | 83 | 157 | 127 | 129 | 170 | 134 | 143 | 194 | 156 | 140 |
| 39 | Mistle Thrush | 12 020 | 508 | 340 | 353 | 276 | 474 | 100 | 79 | 26 | 64 | 248 | 232 | 126 | 29 | 80 | 121 | 56 | 44 |
| 40 | Grasshopper Warbler | 12 360 | 150 | 238 | 186 | 133 | 178 | 100 | 216 | 196 | 122 | 123 | 244 | 69 | 95 | 211 | 98 | 57 | 36 |
| 41 | River Warbler | 12 370 | 81 | 53 | 85 | 134 | 69 | 100 | 137 | 93 | 68 | 167 | 59 | 98 | 49 | 117 | 38 | 49 | 93 |
| 42 | Sedge Warbler | 12 430 | 115 | 106 | 97 | 94 | 99 | 100 | 114 | 95 | 57 | 116 | 85 | 161 | 74 | 76 | 134 | 117 | 106 |
| 43 | Marsh Warbler | 12 500 | 91 | 104 | 134 | 135 | 76 | 100 | 127 | 92 | 88 | 84 | 111 | 82 | 130 | 79 | 121 | 93 | 89 |
| 44 | Icterine Warbler | 12 590 | 105 | 102 | 72 | 112 | 101 | 100 | 90 | 80 | 105 | 63 | 65 | 91 | 70 | 73 | 77 | 76 | 76 |
| 45 | Barred Warbler | 12 730 | 68 | 59 | 93 | 153 | 114 | 100 | 95 | 58 | 30 | 98 | 110 | 33 | 22 | 63 | 35 | 26 | 22 |
| 46 | Lesser Whitethroat | 12 740 | 23 | 65 | 32 | 54 | 79 | 100 | 71 | 93 | 99 | 70 | 51 | 95 | 74 | 101 | 52 | 90 | 70 |
| 47 | Common Whitethroat | 12 750 | 50 | 63 | 76 | 78 | 82 | 100 | 103 | 105 | 88 | 110 | 109 | 79 | 104 | 105 | 91 | 99 | 100 |
| 48 | Garden Warbler | 12 760 | 63 | 60 | 75 | 87 | 70 | 100 | 73 | 93 | 76 | 75 | 72 | 59 | 83 | 87 | 80 | 85 | 68 |
| 49 | Blackcap | 12 770 | 84 | 72 | 63 | 103 | 74 | 100 | 113 | 103 | 83 | 87 | 76 | 79 | 77 | 80 | 82 | 88 | 96 |
| 50 | Wood Warbler | 13 080 | 110 | 111 | 107 | 101 | 122 | 100 | 100 | 82 | 98 | 97 | 82 | 86 | 94 | 86 | 85 | 67 | 72 |
| 51 | Chiffchaff | 13 110 | 168 | 176 | 133 | 141 | 128 | 100 | 106 | 110 | 97 | 116 | 112 | 108 | 100 | 101 | 89 | 97 | 107 |
| 52 | Willow Warbler | 13 120 | 89 | 71 | 73 | 76 | 78 | 100 | 87 | 87 | 91 | 95 | 99 | 92 | 102 | 88 | 89 | 80 | 94 |
| 53 | Goldcrest | 13 140 | 181 | 81 | 102 | 70 | 52 | 100 | 132 | 139 | 122 | 145 | 146 | 100 | 83 | 75 | 102 | 92 | 119 |
| 54 | Spotted Flycatcher | 13 350 | 76 | 42 | 64 | 66 | 69 | 100 | 82 | 80 | 71 | 63 | 76 | 43 | 79 | 71 | 96 | 74 | 61 |
| 55 | Red-breasted Flycatcher | 13 430 | 76 | 68 | 82 | 90 | 118 | 100 | 118 | 96 | 48 | 72 | 81 | 95 | 124 | 113 | 69 | 102 | 107 |
| 56 | Pied Flycatcher | 13 490 | 68 | 74 | 95 | 80 | 113 | 100 | 104 | 94 | 107 | 115 | 74 | 77 | 77 | 90 | 90 | 81 | 80 |
| 57 | Long-tailed Tit | 14 370 | 123 | 234 | 368 | 280 | 47 | 100 | 197 | 44 | 164 | 180 | 198 | 58 | 28 | 46 | 19 | 13 | 21 |
| 58 | Marsh Tit | 14 400 | 117 | 120 | 92 | 119 | 80 | 100 | 60 | 67 | 80 | 49 | 30 | 33 | 44 | 35 | 78 | 116 | 86 |
| 59 | Willow Tit | 14 420 | 34 | 46 | 64 | 46 | 74 | 100 | 75 | 97 | 73 | 53 | 41 | 33 | 37 | 36 | 38 | 32 | 57 |
| 60 | Crested Tit | 14 540 | 324 | 236 | 155 | 234 | 174 | 100 | 245 | 261 | 225 | 166 | 101 | 188 | 205 | 139 | 188 | 172 | 208 |
| 61 | Coal Tit | 14 610 | 158 | 79 | 275 | 148 | 151 | 100 | 134 | 147 | 382 | 366 | 1293 | 259 | 256 | 295 | 86 | 37 | 29 |
| 62 | Blue Tit | 14 620 | 141 | 206 | 212 | 134 | 137 | 100 | 101 | 161 | 160 | 169 | 132 | 137 | 167 | 132 | 139 | 100 | 195 |
| 63 | Great Tit | 14 640 | 129 | 102 | 121 | 103 | 108 | 100 | 96 | 117 | 135 | 126 | 104 | 104 | 95 | 97 | 116 | 104 | 118 |

APPENDIX 1. *Continued*

| No. | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | No. of plots | Additive slope | SE of additive slope | Multi-plicative slope | SE of multi-plicative slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 109 | 66 | 190 | 93 | 109 | 108 | 135 | 189 | 247 | 139 | 453 | 42 | 0.0336 | 0.0228 | 1.034 | 0.0236 |
| 33 | 64 | 71 | 87 | 83 | 74 | 78 | 75 | 66 | 66 | 56 | 64 | 83 | –0.0095 | 0.0071 | 0.991 | 0.007 |
| 34 | 500 | 739 | 677 | 309 | 411 | 411 | 408 | 732 | 870 | 250 | 603 | 41 | 0.0346 | 0.0174 | 1.035 | 0.018 |
| 35 | 241 | 232 | 244 | 222 | 220 | 194 | 203 | 188 | 216 | 165 | 183 | 131 | 0.0197 | 0.0044 | 1.020 | 0.0045 |
| 36 | 83 | 84 | 60 | 66 | 60 | 68 | 63 | 75 | 69 | 56 | 58 | 109 | –0.0009 | 0.0057 | 0.999 | 0.0057 |
| 37 | 254 | 227 | 257 | 229 | 249 | 215 | 229 | 209 | 178 | 274 | 242 | 128 | 0.007 | 0.0043 | 1.007 | 0.0043 |
| 38 | 120 | 147 | 122 | 103 | 107 | 117 | 109 | 99 | 89 | 95 | 100 | 118 | –0.0149 | 0.0071 | 0.985 | 0.007 |
| 39 | 45 | 29 | 39 | 89 | 63 | 130 | 91 | 110 | 242 | 160 | 87 | 37 | –0.0404 | 0.0242 | 0.960 | 0.0232 |
| 40 | 48 | 141 | 70 | 103 | 99 | 77 | 83 | 97 | 90 | 18 | 39 | 66 | –0.0508 | 0.0327 | 0.950 | 0.0311 |
| 41 | 82 | 49 | 92 | 52 | 69 | 34 | 33 | 33 | 12 | 33 | 34 | 53 | –0.0453 | 0.0213 | 0.956 | 0.0203 |
| 42 | 139 | 117 | 66 | 71 | 72 | 69 | 67 | 77 | 95 | 59 | 47 | 56 | –0.0171 | 0.0139 | 0.983 | 0.0136 |
| 43 | 86 | 91 | 93 | 68 | 106 | 114 | 122 | 109 | 93 | 80 | 76 | 79 | –0.0056 | 0.011 | 0.994 | 0.011 |
| 44 | 87 | 91 | 72 | 91 | 99 | 121 | 82 | 73 | 96 | 63 | 84 | 94 | –0.0049 | 0.0077 | 0.995 | 0.0076 |
| 45 | 47 | 43 | 20 | 22 | 40 | 15 | 21 | 33 | 13 | 4 | 10 | 30 | –0.0834 | 0.0399 | 0.920 | 0.0367 |
| 46 | 98 | 94 | 118 | 100 | 108 | 110 | 114 | 95 | 87 | 139 | 109 | 110 | 0.0325 | 0.0109 | 1.033 | 0.0113 |
| 47 | 89 | 83 | 85 | 80 | 93 | 92 | 94 | 88 | 95 | 70 | 62 | 124 | 0.0024 | 0.0065 | 1.002 | 0.0066 |
| 48 | 70 | 79 | 81 | 84 | 92 | 86 | 81 | 90 | 81 | 68 | 92 | 127 | 0.0055 | 0.0046 | 1.006 | 0.0046 |
| 49 | 78 | 88 | 87 | 93 | 125 | 103 | 125 | 104 | 109 | 78 | 89 | 118 | 0.008 | 0.0058 | 1.008 | 0.0058 |
| 50 | 81 | 72 | 65 | 46 | 74 | 71 | 65 | 64 | 72 | 71 | 63 | 127 | –0.023 | 0.0043 | 0.977 | 0.0042 |
| 51 | 116 | 112 | 121 | 123 | 132 | 123 | 108 | 128 | 99 | 102 | 109 | 133 | –0.0074 | 0.0037 | 0.993 | 0.0037 |
| 52 | 90 | 68 | 82 | 63 | 67 | 78 | 79 | 77 | 69 | 60 | 63 | 139 | –0.0088 | 0.0037 | 0.991 | 0.0037 |
| 53 | 146 | 130 | 73 | 83 | 71 | 65 | 78 | 67 | 110 | 93 | 63 | 88 | –0.0123 | 0.0074 | 0.988 | 0.0073 |
| 54 | 91 | 97 | 83 | 73 | 59 | 54 | 81 | 54 | 75 | 56 | 54 | 76 | –0.002 | 0.008 | 0.998 | 0.008 |
| 55 | 97 | 133 | 101 | 104 | 97 | 83 | 105 | 90 | 111 | 132 | 137 | 73 | 0.0128 | 0.0135 | 1.013 | 0.0136 |
| 56 | 89 | 85 | 79 | 67 | 73 | 50 | 75 | 83 | 67 | 55 | 80 | 116 | –0.0121 | 0.0057 | 0.988 | 0.0057 |
| 57 | 16 | 41 | 54 | 40 | 283 | 129 | 20 | 15 | 22 | 39 | 101 | 31 | –0.0642 | 0.0361 | 0.938 | 0.0338 |
| 58 | 103 | 96 | 102 | 92 | 75 | 77 | 59 | 93 | 71 | 16 | 28 | 82 | –0.021 | 0.0129 | 0.979 | 0.0126 |
| 59 | 41 | 27 | 42 | 57 | 41 | 24 | 36 | 31 | 31 | 11 | 17 | 91 | –0.0388 | 0.0138 | 0.962 | 0.0133 |
| 60 | 262 | 230 | 400 | 415 | 262 | 203 | 183 | 190 | 235 | 136 | 58 | 70 | –0.0051 | 0.0123 | 0.995 | 0.0123 |
| 61 | 389 | 98 | 606 | 479 | 423 | 88 | 332 | 155 | 150 | 48 | 27 | 24 | –0.0165 | 0.0449 | 0.984 | 0.0441 |
| 62 | 230 | 216 | 173 | 264 | 142 | 151 | 153 | 101 | 292 | 193 | 102 | 80 | 0.0051 | 0.0091 | 1.005 | 0.0092 |
| 63 | 112 | 114 | 99 | 111 | 88 | 97 | 121 | 102 | 118 | 141 | 100 | 130 | –0.0007 | 0.0046 | 0.999 | 0.0046 |

*Continued overleaf*

APPENDIX 1. *Continued*

| No. | Species name | EURING | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | Nuthatch | 14 790 | 81 | 72 | 115 | 90 | 65 | 100 | 98 | 197 | 112 | 108 | 107 | 92 | 51 | 85 | 106 | 111 | 129 |
| 65 | Treecreeper | 14 860 | 151 | 62 | 108 | 95 | 63 | 100 | 73 | 119 | 211 | 171 | 130 | 153 | 267 | 140 | 190 | 263 | 159 |
| 66 | Golden Oriole | 15 080 | 124 | 121 | 119 | 171 | 148 | 100 | 91 | 133 | 78 | 95 | 133 | 66 | 68 | 105 | 107 | 98 | 107 |
| 67 | Red-backed Shrike | 15 150 | 129 | 146 | 120 | 121 | 124 | 100 | 112 | 116 | 72 | 91 | 55 | 40 | 15 | 104 | 16 | 21 | 39 |
| 68 | Eurasian Jay | 15 390 | 32 | 69 | 102 | 106 | 88 | 100 | 115 | 108 | 93 | 89 | 145 | 116 | 156 | 193 | 162 | 168 | 157 |
| 69 | Common Magpie | 15 490 | 103 | 110 | 92 | 115 | 76 | 100 | 120 | 109 | 110 | 128 | 130 | 110 | 76 | 119 | 138 | 115 | 116 |
| 70 | Spotted Nutcracker | 15 570 | 61 | 46 | 81 | 66 | 46 | 100 | 100 | 124 | 56 | 136 | 80 | 107 | 204 | 157 | 125 | 100 | 113 |
| 71 | Jackdaw | 15 600 | 128 | 58 | 80 | 73 | 81 | 100 | 83 | 73 | 105 | 102 | 67 | 76 | 53 | 57 | 74 | 81 | 87 |
| 72 | Hooded Crow | 15 671 | 83 | 52 | 67 | 64 | 83 | 100 | 95 | 97 | 88 | 83 | 76 | 76 | 70 | 69 | 75 | 94 | 68 |
| 73 | Raven | 15 720 | 91 | 162 | 176 | 125 | 132 | 100 | 124 | 140 | 284 | 166 | 192 | 243 | 222 | 271 | 162 | 212 | 171 |
| 74 | Starling | 15 820 | 113 | 65 | 80 | 67 | 177 | 100 | 119 | 127 | 114 | 111 | 47 | 94 | 75 | 121 | 90 | 86 | 99 |
| 75 | House Sparrow | 15 910 | 361 | 105 | 236 | 152 | 109 | 100 | 226 | 137 | 121 | 122 | 127 | 142 | 100 | 86 | 133 | 82 | 99 |
| 76 | Tree Sparrow | 15 980 | 318 | 201 | 26 | 121 | 187 | 100 | 188 | 255 | 124 | 94 | 153 | 105 | 22 | 114 | 71 | 73 | 38 |
| 77 | Chaffinch | 16 370 | 104 | 98 | 97 | 99 | 92 | 100 | 100 | 104 | 98 | 99 | 102 | 101 | 94 | 106 | 114 | 92 | 104 |
| 78 | Greenfinch | 16 490 | 23 | 76 | 33 | 29 | 109 | 100 | 116 | 136 | 113 | 129 | 137 | 71 | 135 | 53 | 129 | 104 | 184 |
| 79 | Goldfinch | 16 530 | 181 | 182 | 150 | 104 | 171 | 100 | 179 | 83 | 267 | 179 | 185 | 143 | 167 | 149 | 188 | 125 | 133 |
| 80 | Siskin | 16 540 | 62 | 73 | 120 | 53 | 95 | 100 | 128 | 88 | 76 | 82 | 109 | 106 | 61 | 96 | 138 | 119 | 80 |
| 81 | Linnet | 16 600 | 315 | 444 | 496 | 219 | 181 | 100 | 198 | 216 | 283 | 257 | 304 | 314 | 344 | 360 | 88 | 260 | 202 |
| 82 | Common Crossbill | 16 660 | 302 | 50 | 110 | 391 | 158 | 100 | 519 | 351 | 106 | 121 | 780 | 2 | 6 | 30 | 143 | 77 | 48 |
| 83 | Common Rosefinch | 16 790 | 78 | 70 | 82 | 94 | 83 | 100 | 103 | 105 | 89 | 100 | 123 | 113 | 118 | 99 | 121 | 104 | 95 |
| 84 | Bullfinch | 17 100 | 104 | 50 | 113 | 77 | 55 | 100 | 117 | 103 | 115 | 115 | 118 | 163 | 98 | 96 | 98 | 131 | 119 |
| 85 | Hawfinch | 17 170 | 60 | 91 | 127 | 80 | 110 | 100 | 187 | 147 | 138 | 215 | 277 | 124 | 125 | 91 | 189 | 67 | 52 |
| 86 | Yellowhammer | 18 570 | 153 | 139 | 148 | 163 | 115 | 100 | 129 | 163 | 191 | 144 | 158 | 149 | 169 | 99 | 132 | 100 | 92 |
| 87 | Reed Bunting | 18 770 | 150 | 141 | 144 | 99 | 138 | 100 | 75 | 107 | 179 | 236 | 232 | 1 127 | 566 | 290 | 1 835 | 1 281 | 1 025 |

APPENDIX 1. *Continued*

| No. | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | No. of plots | Additive slope | SE of additive slope | Multi-plicative slope | SE of multi-plicative slope |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | 192 | 169 | 115 | 101 | 113 | 151 | 100 | 91 | 142 | 37 | 40 | 65 | –0.0024 | 0.0111 | 0.998 | 0.011 |
| 65 | 156 | 227 | 164 | 172 | 290 | 115 | 242 | 120 | 125 | 157 | 75 | 65 | 0.0184 | 0.0139 | 1.019 | 0.0141 |
| 66 | 94 | 91 | 66 | 85 | 74 | 91 | 119 | 138 | 138 | 90 | 53 | 112 | –0.0129 | 0.0083 | 0.987 | 0.0082 |
| 67 | 58 | 85 | 78 | 103 | 89 | 80 | 105 | 52 | 84 | 62 | 54 | 63 | –0.0227 | 0.0156 | 0.978 | 0.0153 |
| 68 | 179 | 148 | 167 | 149 | 145 | 151 | 129 | 160 | 167 | 133 | 156 | 92 | 0.0315 | 0.0076 | 1.032 | 0.0078 |
| 69 | 159 | 143 | 142 | 300 | 119 | 154 | 131 | 163 | 116 | 105 | 116 | 89 | 0.0143 | 0.0084 | 1.014 | 0.0085 |
| 70 | 51 | 211 | 263 | 65 | 169 | 293 | 313 | 245 | 245 | 226 | 88 | 46 | 0.0473 | 0.0251 | 1.048 | 0.0263 |
| 71 | 108 | 95 | 109 | 143 | 54 | 97 | 87 | 44 | 111 | 81 | 81 | 50 | 0.0004 | 0.011 | 1.000 | 0.011 |
| 72 | 92 | 97 | 89 | 82 | 71 | 73 | 75 | 61 | 55 | 66 | 59 | 119 | –0.0052 | 0.005 | 0.995 | 0.005 |
| 73 | 206 | 207 | 117 | 193 | 138 | 141 | 131 | 148 | 133 | 94 | 142 | 100 | –0.0007 | 0.0106 | 0.999 | 0.0106 |
| 74 | 119 | 86 | 88 | 110 | 78 | 129 | 130 | 94 | 145 | 123 | 115 | 81 | 0.0079 | 0.009 | 1.008 | 0.0091 |
| 75 | 127 | 93 | 122 | 96 | 89 | 93 | 102 | 72 | 62 | 82 | 74 | 24 | –0.033 | 0.0134 | 0.968 | 0.0129 |
| 76 | 72 | 46 | 70 | 45 | 81 | 41 | 82 | 134 | 144 | 123 | 61 | 44 | –0.0278 | 0.0301 | 0.973 | 0.0293 |
| 77 | 100 | 94 | 95 | 105 | 97 | 88 | 95 | 91 | 87 | 89 | 91 | 138 | –0.0035 | 0.0024 | 0.997 | 0.0024 |
| 78 | 203 | 359 | 148 | 170 | 172 | 229 | 289 | 203 | 257 | 224 | 355 | 68 | 0.0685 | 0.0187 | 1.071 | 0.0201 |
| 79 | 120 | 168 | 100 | 134 | 71 | 163 | 188 | 55 | 196 | 187 | 127 | 54 | –0.008 | 0.0137 | 0.992 | 0.0136 |
| 80 | 78 | 59 | 84 | 63 | 52 | 68 | 34 | 50 | 70 | 45 | 56 | 103 | –0.0207 | 0.0099 | 0.980 | 0.0097 |
| 81 | 361 | 415 | 415 | 280 | 182 | 315 | 166 | 243 | 51 | 60 | 144 | 40 | –0.0262 | 0.0183 | 0.974 | 0.0178 |
| 82 | 13 | 105 | 71 | 39 | 23 | 14 | 10 | 112 | 491 | 102 | 43 | 48 | –0.054 | 0.0319 | 0.947 | 0.0302 |
| 83 | 101 | 105 | 120 | 75 | 96 | 91 | 109 | 88 | 98 | 88 | 76 | 132 | 0.0019 | 0.006 | 1.002 | 0.006 |
| 84 | 135 | 136 | 97 | 117 | 100 | 65 | 77 | 117 | 90 | 52 | 98 | 88 | 0.0004 | 0.0088 | 1.000 | 0.0088 |
| 85 | 124 | 142 | 91 | 113 | 58 | 111 | 77 | 43 | 160 | 134 | 38 | 39 | –0.0152 | 0.0227 | 0.985 | 0.0224 |
| 86 | 111 | 104 | 90 | 85 | 90 | 91 | 105 | 81 | 106 | 101 | 102 | 114 | –0.0208 | 0.0067 | 0.979 | 0.0066 |
| 87 | 666 | 825 | 826 | 1 177 | 1 086 | 593 | 216 | 350 | 865 | 579 | 529 | 38 | 0.0784 | 0.0373 | 1.082 | 0.0404 |

APPENDIX 2

## COMPARISON OF POPULATION TRENDS (YEARLY CHANGES IN %) OF COMMON BIRDS IN ESTONIA, FINLAND, SWEDEN, AND DENMARK BASED ON POINT COUNTS IN 1975–2010

| No. | Species name | Species name (Latin) | Migratory strategy | Estonia | | Finland | | Sweden | | Denmark | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | %/year | Stat. sign. | %/year | Stat. sign. | %/year | Stat. sign. | %/year | Stat. sign. |
| 1 | Mallard | *Anas platyrhynchos* | European | –1.89 | Stable | – | | 1.30 | *** | 2.31 | ** |
| 2 | Common Buzzard | *Buteo buteo* | European | –0.60 | Stable | – | | 0.80 | ns | 2.49 | ** |
| 3 | Lapwing | *Vanellus vanellus* | European | 5.07 | ** | 0.10 | ns | –1.00 | *** | –2.40 | ** |
| 4 | Common Snipe | *Gallinago gallinago* | European | –1.76 | ns | –2.20 | *** | –2.40 | *** | –3.50 | ** |
| 5 | Stock Dove | *Columba oenas* | European | –2.21 | ns | –2.80 | ** | –3.60 | *** | 4.60 | ** |
| 6 | Wood Pigeon | *Columba palumbus* | European | 0.80 | Stable | 2.00 | *** | –0.30 | * | 1.73 | ** |
| 7 | Cuckoo | *Cuculus canorus* | Trans-Saharan | 0.35 | Stable | –0.10 | ns | –2.60 | *** | –0.80 | ** |
| 8 | Swift | *Apus apus* | Trans-Saharan | –5.28 | ** | –1.90 | *** | –2.60 | *** | –0.33 | ns |
| 9 | Green Woodpecker | *Picus viridis* | Sedentary | –18.11 | ns | – | | –2.20 | *** | –2.80 | ** |
| 10 | Black Woodpecker | *Dryocopus martius* | Sedentary | 2.29 | ns | 4.00 | *** | 0.40 | ns | –1.40 | ns |
| 11 | Great Spotted Woodpecker | *Dendrocopos major* | Sedentary | 0.28 | Stable | 1.10 | * | –0.40 | ns | 0.70 | ** |
| 12 | Skylark | *Alauda arvensis* | European | –0.92 | * | –1.10 | *** | –3.40 | *** | –1.80 | ** |
| 13 | Barn Swallow | *Hirundo rustica* | Trans-Saharan | –1.75 | Stable | –2.10 | *** | 0.40 | ns | –0.70 | ** |
| 14 | Tree Pipit | *Anthus trivialis* | Trans-Saharan | –2.37 | ** | –2.10 | *** | –2.70 | *** | –1.13 | ** |
| 15 | Meadow Pipit | *Anthus pratensis* | European | –2.74 | ** | 0.60 | ns | –1.90 | * | –2.40 | ** |
| 16 | Yellow Wagtail | *Motacilla flava* | Trans-Saharan | 0.25 | Stable | –4.40 | *** | –4.40 | *** | –5.36 | ** |
| 17 | Pied Wagtail | *Motacilla alba* | European | 3.46 | ** | –0.80 | * | –1.10 | *** | 2.80 | ** |
| 18 | Wren | *Troglodytes troglodytes* | European | 1.81 | ** | 5.30 | *** | 4.80 | *** | 2.50 | ** |
| 19 | Dunnock | *Prunella modularis* | European | 0.53 | Stable | 0.20 | ns | –3.10 | *** | –2.50 | ** |
| 20 | Robin | *Erithacus rubecula* | European | 1.23 | ** | 1.80 | *** | –0.40 | ** | 0.20 | ns |
| 21 | Thrush Nightingale | *Luscinia luscinia* | Trans-Saharan | 1.05 | Stable | 1.40 | ns | –2.60 | *** | –1.42 | ** |
| 22 | Common Redstart | *Phoenicurus phoenicurus* | Trans-Saharan | 3.68 | ns | 0.60 | ns | –1.70 | *** | 1.90 | ** |
| 23 | Whinchat | *Saxicola rubetra* | Trans-Saharan | –0.76 | Stable | –2.30 | *** | –1.50 | *** | –5.60 | ** |
| 24 | Wheatear | *Oenanthe oenanthe* | Trans-Saharan | 3.77 | * | –3.00 | *** | –2.60 | *** | –7.00 | ** |
| 25 | Blackbird | *Turdus merula* | Sedentary | 1.99 | ** | 4.10 | *** | 1.20 | *** | 1.20 | ** |
| 26 | Fieldfare | *Turdus pilaris* | Sedentary | 0.27 | Stable | 3.00 | *** | –0.90 | *** | –1.60 | * |
| 27 | Song Thrush | *Turdus philomelos* | European | 0.71 | Stable | –0.30 | ns | 0.40 | * | –0.44 | * |
| 28 | Mistle Thrush | *Turdus viscivorus* | European | –4.07 | ns | 4.40 | *** | 2.60 | *** | 1.90 | * |
| 29 | Grasshopper Warbler | *Locustella naevia* | Trans-Saharan | –5.02 | ns | – | | –3.50 | *** | –3.50 | ** |
| 30 | Sedge Warbler | *Acrocephalus schoenobaenus* | Trans-Saharan | –1.42 | Stable | 0.00 | ns | –2.80 | *** | –0.90 | ns |
| 31 | Marsh Warbler | *Acrocephalus palustris* | Trans-Saharan | –0.51 | Stable | – | | 1.80 | ** | 0.91 | * |
| 32 | Icterine Warbler | *Hippolais icterina* | Trans-Saharan | –0.36 | Stable | –2.30 | * | 0.00 | ns | –3.80 | ** |

APPENDIX 2. *Continued*

| No. | Species name | Species name (Latin) | Migratory strategy | Estonia | | Finland | | Sweden | | Denmark | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | %/year | Stat. sign. | %/year | Stat. sign. | %/year | Stat. sign. | %/year | Stat. sign. |
| 33 | Lesser Whitethroat | *Sylvia curruca* | Trans-Saharan | 3.34 | ** | 1.50 | *** | –0.10 | ns | –2.63 | ** |
| 34 | Common Whitethroat | *Sylvia communis* | Trans-Saharan | 0.40 | Stable | 0.40 | ns | 0.30 | ns | 0.34 | ns |
| 35 | Garden Warbler | *Sylvia borin* | Trans-Saharan | 0.58 | Stable | 0.10 | ns | 0.00 | ns | –1.20 | ** |
| 36 | Blackcap | *Sylvia atricapilla* | European | 0.81 | Stable | –0.10 | ns | 2.70 | *** | 2.76 | ** |
| 37 | Wood Warbler | *Phylloscopus sibilatrix* | Trans-Saharan | –2.30 | ** | –3.90 | *** | 0.20 | ns | –3.40 | ** |
| 38 | Chiffchaff | *Phylloscopus collybita* | Trans-Saharan | –0.72 | Stable | –3.20 | *** | 9.80 | *** | 5.30 | ** |
| 39 | Willow Warbler | *Phylloscopus trochilus* | Trans-Saharan | –0.83 | * | –0.90 | *** | –0.70 | *** | –2.94 | ** |
| 40 | Goldcrest | *Regulus regulus* | Sedentary | –1.25 | Stable | –0.40 | ns | –1.20 | *** | –1.09 | ** |
| 41 | Spotted Flycatcher | *Muscicapa striata* | Trans-Saharan | –0.02 | Stable | –0.60 | ns | –1.50 | *** | 0.50 | ns |
| 42 | Pied Flycatcher | *Ficedula hypoleuca* | Trans-Saharan | –1.18 | * | 1.40 | *** | –0.90 | *** | –3.50 | ** |
| 43 | Long-tailed Tit | *Aegithalos caudatus* | Sedentary | –6.51 | ns | – | | 1.20 | ns | 0.40 | ns |
| 44 | Marsh Tit | *Parus palustris* | Sedentary | –2.08 | Stable | – | | –4.50 | *** | –1.40 | ** |
| 45 | Crested Tit | *Parus cristatus* | Sedentary | –0.51 | Stable | 1.60 | *** | –1.00 | * | –2.93 | ** |
| 46 | Coal Tit | *Parus ater* | Sedentary | –1.65 | ns | –0.20 | ns | –1.40 | *** | –1.40 | ** |
| 47 | Blue Tit | *Parus caeruleus* | Sedentary | 0.56 | Stable | 8.30 | *** | 1.10 | *** | 0.80 | * |
| 48 | Great Tit | *Parus major* | Sedentary | 0.12 | Stable | 2.10 | *** | –0.70 | *** | –0.80 | ** |
| 49 | Nuthatch | *Sitta europaea* | Sedentary | –0.23 | Stable | – | | 0.80 | * | 2.07 | ** |
| 50 | Treecreeper | *Certhia familiaris* | Sedentary | 1.86 | Stable | 2.20 | *** | –1.40 | *** | 1.63 | * |
| 51 | Red-backed Shrike | *Lanius collurio* | Trans-Saharan | –2.15 | ns | –0.50 | ns | –2.00 | *** | –3.20 | ** |
| 52 | Eurasian Jay | *Garrulus glandarius* | Sedentary | 3.14 | ** | 1.30 | * | –0.90 | ** | 0.30 | ns |
| 53 | Common Magpie | *Pica pica* | Sedentary | 1.95 | * | 0.40 | ns | 0.10 | ns | 0.67 | * |
| 54 | Jackdaw | *Corvus monedula* | Sedentary | 0.87 | Stable | 6.10 | *** | 0.20 | ns | 0.10 | ns |
| 55 | Hooded Crow | *Corvus corone corone* | Sedentary | –0.25 | Stable | –1.30 | *** | –1.90 | *** | 1.03 | ** |
| 56 | Raven | *Corvus corax* | Sedentary | –0.06 | Stable | 1.70 | ns | 3.10 | *** | 9.61 | ** |
| 57 | Starling | *Sturnus vulgaris* | European | 1.89 | Stable | –4.10 | *** | –2.20 | *** | –1.90 | ** |
| 58 | House Sparrow | *Passer domesticus* | Sedentary | –1.09 | Stable | –3.50 | *** | –4.80 | *** | –1.70 | ** |
| 59 | Tree Sparrow | *Passer montanus* | Sedentary | –0.68 | ns | – | | –0.30 | ns | 2.40 | ** |
| 60 | Chaffinch | *Fringilla teydea* | European | –0.32 | Stable | –0.30 | ** | –0.30 | *** | 0.70 | ** |
| 61 | Greenfinch | *Carduelis chloris* | Sedentary | 7.17 | ** | 8.60 | *** | 1.10 | *** | 2.00 | ** |
| 62 | Goldfinch | *Carduelis carduelis* | Sedentary | –0.27 | Stable | – | | 10.50 | *** | 8.00 | ** |
| 63 | Linnet | *Carduelis cannabina* | European | –1.89 | ns | – | | –3.70 | *** | –2.30 | ** |
| 64 | Common Crossbill | *Loxia curvirostra* | Sedentary | –6.38 | ns | –3.50 | *** | 0.70 | ns | –3.80 | ** |
| 65 | Bullfinch | *Pyrrhula pyrrhula* | Sedentary | 0.04 | Stable | 3.50 | *** | –3.50 | *** | 0.80 | ns |
| 66 | Yellowhammer | *Emberiza citrinella* | Sedentary | –1.73 | * | –0.60 | ** | –2.10 | *** | –2.20 | ** |
| 67 | Reed Bunting | *Emberiza schoeniclus* | European | – | | –0.70 | ns | –1.90 | *** | –0.80 | ** |

Level of statistical significance of the trend: ns = nonsignificant, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.
– No data.

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# Haudelindude arvukuse muutused Eestis aastail 1983–2010

Andres Kuresoo, Hannes Pehlak ja Renno Nellis

On antud ülevaade haudelindude punktloendusprojekti läbiviimisest Eestis aastail 1983–2010. Selle üldlevinud maismaalindude loenduse eesmärgiks on lindude pesitsusaegse arvukuse muutuste pikaajaline jälgimine, mis annab teavet erinevates elupaikades ja keskkonnas toimuvate üldiste muutuste kohta. 1994. aastast tehakse

punktloendusi Eesti riikliku keskkonnaseire elusloodu se ja maastike seire allprogrammi raames.

Punktloenduste metoodika on suhteliselt lihtne, et kaasata võimalikult suurt hulka linnuvaatlejaid. Loendused viiakse läbi püsimarsruudil, millel fikseeritakse 20 loenduspunkti. Punktide vahemaa peab suletud maastikul (metsades) olema vähemalt 200 m ja avamaastikul vähemalt 300 m. Projektile on 28 aasta vältel kaastööd teinud 89 Eesti Ornitoloogiaühingu vaatlejat ja kutselist ornitoloogi, kokku on käibel olnud 143 loendusrada. Liikide populatsiooniindeksite arvutamiseks on kasutusele võetud seireandmete analüüsi programm TRIM (Trends and Indices for Monitoring Data).

Töös on esitatud populatsiooniindeksid 87 linnuliigi kohta ja esmakordselt ka Eesti metsa- ning põllulindude kompleksindeksid. Märkimisväärne arvukuse vähenemine tuvastati põllulindudel aastail 1992–1996 ja nii põllu- kui metsalindudel aastail 2007–2010. Pikaajalised haudelindude arvukustrendid Eestis, Soomes, Rootsis ja Taanis perioodil 1975–2010 sõltusid oluliselt liikide rändestrateegiast. Võrreldes lühimaarändurite (talvitavad Euroopas) ja paigalindudega kõigis neljas riigis, on kaugrändurite (talvitavad Aafrikas) hulgas enim väheneva arvukusega linnuliike. Oluline erinevus tuvastati paigalindude osas: Soomes oli kuni 2/3 liikidest tõusva arvukustrendiga, samas aga Eestis, Taanis ja Rootsis alla 1/3 liikidest.

Projekti tulemusi kasutatakse eelkõige linnuasurkondade seisundi jälgimisel ja üha enam ka looduskaitsealaste otsuste tegemisel. Eesti punktloenduste projekt on osaks üle-Euroopalisest linnuseire projektist (Pan-European Common Bird Monitoring Scheme), milles osaleb kokku 22 Euroopa riiki. Ühisprojekti väljundiks on iga-aastased haudelindude kompleksindeksid ja hiljuti ka kliimamuutuste mõju indikaatorid.