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Oskarshamn site investigations

Bird monitoring in Simpevarp 2002–2007

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Abstract

This report is a summary of the monitoring of breeding birds species in Simpevarp 2002–2007. A repeated survey of all breeding bird species in the area was done in 2007 and the results are compared with data collected in 2002–2004. The report also summarizes the population development of listed species (Swedish Red List and/or the European Unions' Birds Directive) in the area, with special focus on eight species selected for annual monitoring. The aim of the report is to evaluate possible impacts from the now completed site investigations, conducted by SKB, on the breeding bird fauna. The repeated survey of all breeding birds covered parts of the regional model area, including all of the local area. Here, the line transect method was used in exactly the same way as in 2002–2004. Selected listed species were monitored in the whole regional model area with specially designed methods. For other listed species, data from the line transects and collected during monitoring of the selected species was used to describe the population development. For most species selected for detailed monitoring proper data is now available for five years, which means that from now on data can be analysed statistically.

The general conclusion from both the repeated surveys of all breeding birds and from the more detailed monitoring of selected listed species is that the site investigations, associated potentially disturbing activities and increased human presence in the area, have had very little impact on the breeding birds of the area. For the bird fauna as a whole, a significant increase in numbers was recorded between 2003/2004 and 2007. More than three quarters of all species recorded with more than ten individuals increased in numbers or showed a stable population between the two surveys. At large, this pattern follows the general pattern at the national level during later years. A comparison between population development between the local area (with potentially disturbing site investigations) and the regional model area outside of the local area (without site investigations) did not reveal any differences. In general terms numbers of birds increased in both parts, and the increase was of similar magnitude.

For listed species in general both increases and decreases were recorded between the years 2002–2004 and 2007. In only one case, the black grouse was there any sign of a possible negative impact from the site investigations. Numbers of this species clearly decreased in the local area, but increased on the regional level. For listed species selected for detailed monitoring, the general stable or positive population development recorded in earlier years continued in 2007. Six of the eight species (honey buzzard, white-tailed eagle, wryneck, lesser spotted woodpecker, nightjar and red-backed shrike) showed stable or increasing numbers. In part this is due to that no disturbing activities has taken place close to nest sites of these species (true for the involved raptors) but for wrynecks and red-backed shrikes this is more a sign of that these seem to be rather tolerant to increased human presence in their neighbourhoods. Two species showed a decrease, osprey and eagle owl, but in none of these cases can the site investigations be the reason behind the decrease. Earlier signs of impacts on local distribution of lesser spotted woodpecker and nightjar were largely absent this year and the situation resembled the one before the site investigations started.

Sammanfattning

Denna rapport är en sammanfattning av övervakningen av häckande fåglar i Simpevarpsområdet under perioden 2002–2007. Under det gångna året upprepades en inventering av samtliga häckande fågelarter med samma utformning som användes under åren 2002–2004. Resultaten från denna upprepade inventering redovisas här med syftet att utreda om de nu avslutade platsundersökningarna har haft någon mer betydande effekt på områdets häckande fåglar i stort. Populationsutvecklingen hos listade arter (Svenska Rödlistan och/eller arter listade i EU:s Fågeldirektiv Annex 1), med fokus på åtta arter utvalda för årlig övervakning redovisas även. Den upprepade inventeringen av alla häckande fågelarter täckte delar av det regionala modellområdet, inklusive hela det lokala modellområdet. Linjetaxeringar av samtliga arter genomfördes på precis samma sätt som 2002–2004. Listade arter utvalda för årliga övervakning följdes upp med specialdesignade metoder inom hela det regionala modellområdet. För övriga listade arter insamlades data dels under linjetaxeringarna och dels i samband med uppföljning av utvalda listade arter. För de flesta utvalda listade arterna finns nu data från minst en femårsperiod vilket innebär att tidsserierna nu kan testas statistiskt.

Den övergripande slutsatsen från samtliga inventeringar är att platsundersökningarna har haft en mycket liten effekt på de häckande fåglarna. För den häckande fågelfaunan i sin helhet noterades en signifikant ökning av antalet individer från 2003/2004 till 2007. Mer än tre fjärdedelar av alla arter som registrerades med minst tio individer ökade i antal eller uppvisade stabila populationsstorlekar. Detta överensstämmer väl med mönstret som noterats i hela landet under den aktuella perioden. En jämförelse av utvecklingen det lokala området (med potentiellt störande platsundersökningar) och det regionala modellområdet utanför det lokala området (utan platsundersökningar) visade inte på några som helst skillnader mellan dessa delar. Generellt så ökade antalet fåglar i båda delarna och ökningen var av samma storlek.

När det gäller listade arter i allmänhet noterades både ökning och minskningar under perioden 2002–2007. Bara i ett fall finns indikationer på att platsundersökningarna kan ha spelat någon roll för ett minskande antal. Detta gäller för orre där en minskning noterades i det lokala området, medan en svag ökning har skett i det regionala modellområdet i övrigt. De listade arterna utvalda för mer detaljerad uppföljning fortsatte precis som tidigare år att i stort uppvisa stabila eller ökande bestånd. Sex av åtta arter (bivråk, havsörn, göktyta, mindre hackspett, nattskärra och törnskata) höll sig på en stabil nivå eller ökade i antal. För några arter (göktyta, nattskärra och törnskata) var ökningen till och med mycket kraftig. Två arter minskade i antal (fiskgjuse och berguv), men inte i något av dessa fall kan detta ha haft något att göra med platsundersökningarna. Tidigare år har tecken funnits på att mindre hackspett och nattskärra har undvikit de delar av det lokala området där de mest intensiva delarna av platsundersökningarna har utförts. Några sådana tecken fanns ej 2007 och det förefaller som om dessa arter nu åter förekommer med närmast samma utbredning som innan platsundersökningarna startades.

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1 Introduction

This document reports the data gathered within the monitoring bird surveys, one of the activities within the site investigations in Simpevarp, in 2007. The bird surveys have now been going on for six years. This year a repeated census of all breeding bird species was made in the area for comparison with data collected during the first years of the site investigations (2002–2004). For most of the species presented more in detail here, data enabling proper comparisons are available from 2003 onwards, allowing comparisons during a five-year period. The aim of this report is to evaluate the effects of the site investigations on the breeding bird fauna in the area in general and for a number of selected listed species (according to the Swedish Red List and/or the European Union Birds Directive) in particular. The surveys were made according to activity plan AP PS 400-07-038 which is SKB's internal document. The project has been conducted by the Department of Animal Ecology, Lund University. The report covers the whole regional model area east of highway E22 for selected listed species and parts of the regional model area (including the local area) for the bird fauna in general.

2 Objective and scope

The site investigations in Simpevarp started in 2002. SKB has from the start of the investigations aimed at monitoring the effects from all the activities on the fauna in the area. This in order to ensure that the site investigations were carried out in such a way that disturbances to the fauna, especially sensitive and vulnerable species, could be held at a minimum level (without hindering the essential parts of site investigations).

Simpevarp is an area rich in birds, holding high densities of both common species and more rare or threatened ones such as species listed in the Swedish Red List /Gärdenfors 2005/ and the European Union Birds Directive 79/409/EEG: Annex 1, /www.naturvardsverket.se/ (cf. /Green 2003, 2004, 2005, 2006, 2006b/). The monitoring part of the bird surveys aim at tracking changes in overall bird numbers for certain listed species (Swedish Red List and the EU:s Birds Directive) in the whole regional model area. In addition to looking at overall numbers for these species, the programme aims at investigating breeding success when this is possible.

In 2002–2004 line transects were used to get a complete overview of the breeding bird fauna of the area. These line transects were repeated in 2007 for comparison with earlier years. By this approach it is now possible to evaluate possible impacts from the site investigations (finished in 2007) on the breeding bird fauna in general.

The monitoring programme has been carried out at different levels, both geographically and regarding which birds that has been monitored. More details about these levels are presented in /Green 2003, 2004, 2005, 2006, 2006b/.

Regional model area. This is a level covering an area of about 270 km² (area of possible large-scale effects). In Simpevarp the land area of the regional model area is about 150 km². This area is shown by a thick unbroken line in Figure 2-1. Within this area a number of selected species listed in the Swedish Red List and/or the EU Birds Directive are monitored (from 2004 onwards, but during 2002 and 2003 all listed species as well as non-listed raptors and owls were monitored). The aim of the surveys is to find out the yearly number of breeding pairs within the area, and for a few species also to establish the breeding success of these. The parts of the regional model area situated west of highway E-22 (shaded in Figure 2-1) are excluded from our surveys as these are situated far away from the main activities within the site investigations. Hence, a land area of about 130 km² is monitored.

Local area. This level involves a smaller area covering all the drilling sites used in 2003–2007, the core area of the site investigations. The size of the area in Simpevarp is about 20 km² (in 2002 a larger preliminary local area of about 50 km² was used, but this was scaled down to the present one before the surveys in 2003). The local area is shown with a thick, broken line in Figure 2-1. Also in this area special attention is directed at listed species.

Line transects, used for collecting data on the complete breeding bird fauna, have been conducted both in the local area and in adjacent parts of the regional model area.

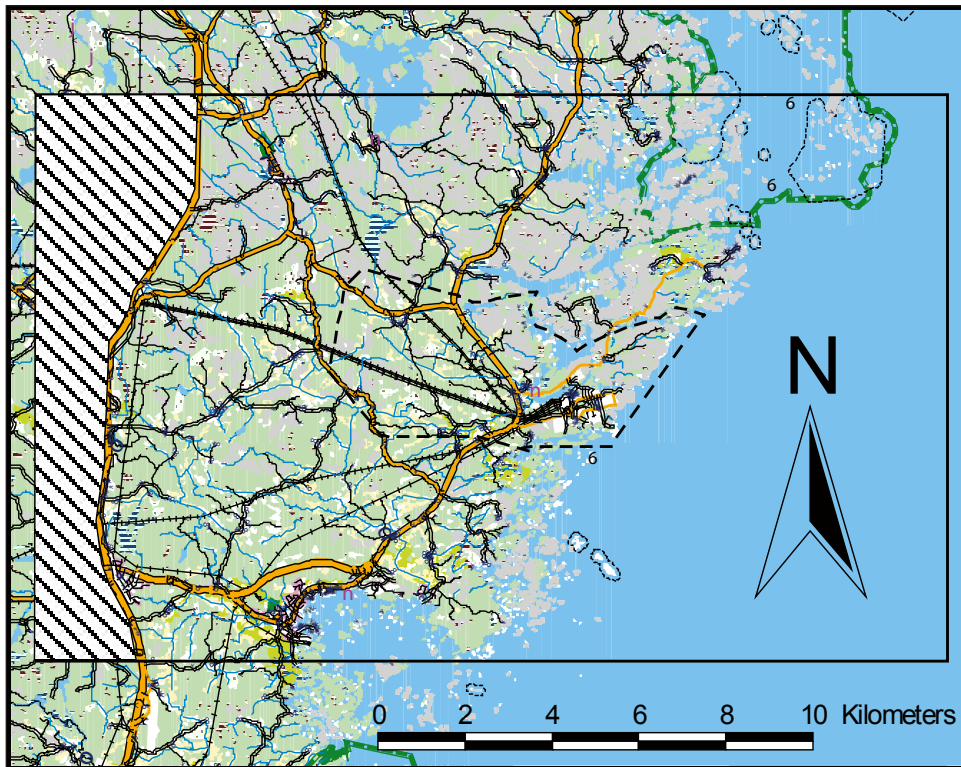


Figure 2-1. Map of the survey area in Simpevarp. The regional model area is shown with a thick unbroken line (shaded part west of highway E-22 is excluded from the surveys); the local area is shown with a thick, broken line. From GSD-Terrängkartan © Lantmäteriverket Gävle 2001. Consent M2001/5268.

3 Equipment

3.1 Description of equipment

The following equipment was used when conducting the bird surveys.

- GPS (Garmin 12 or Garmin GPS 60).
- Binoculars and telescopes.
- Field maps showing each days work.
- Note books and paper forms.
- Vehicles for transport to and from the study area.
- Cell phones (safety equipment when working alone in the field).

4 Methods

The methods used are described in detail in activity plan AP PS 400-07-038 – SKB:s internal controlling document. More information about the methods can be found at: www.biol.lu.se/zooekologi/birdmonitoring/metoder.htm as well as in /Svensson 1975/ and /SNV 1978/.

To cover the bird fauna in general, incorporating also the commoner bird species, a combination of line transects and point counts was used. The method was also used in the years 2002–2004 for gathering data of the same kind /see Green 2003, 2004, 2005/. Using this method again gives the possibility of directly comparing data gathered in 2007 with data collected in earlier years. The method is more or less directly taken from the manual for standardised breeding bird counts used by the Swedish Environmental Protection Board in the National Monitoring Programme since 1996 /<http://www.biol.lu.se/zooekologi/birdmonitoring/>.

In addition to the surveys of the complete breeding bird fauna in the area, special surveys were made for monitoring selected listed species.

An overview of the methods used for monitoring purposes is presented below.

4.1 Line transects (and point counts)

The aim of the line transects (and point counts) is to get a good overview of the breeding bird fauna in the area in a way that can yield comparisons between years (population development, if repeated in a time series trends can be calculated) and that can be compared with other areas. The surveys were based on the Swedish Grid (RT-90). The line transects were done along the north-south axis of this grid, with grid lines being 1 km apart. To get a more detailed coverage of the local area, an additional transect in between the RT-90 lines was added so that the area was covered along north-south directed lines being 500 m apart. Point counts were made at every full km, at the corners of the km-squares of the Swedish Grid. The point for the extra lines (in between the RT-90 lines) was moved to the midpoint of the km square (according to the grid) to get a better geographic coverage of the area.

In the presentation of results down below only line transect data is shown. The point count data set is not shown since the results from these completely follow the line transect results, with the only exception that fewer birds (both species and individuals) were recorded on the points. That fewer birds are recorded during the point counts is due to that a) point counts cover much less total area than line transects, b) point counts are made during a much shorter time (five minutes at each point) than line transects and c) while walking (line transects) the observer will flush birds that otherwise would have stayed obscured by vegetation. During point counts the observer is standing still and will not flush any hiding birds. Hence, line transects yield much larger data sets and cover more species and to avoid unnecessary repeating of results I have chosen to present the larger of the two data sets here. The point counts are not discussed further in this report.

Each line transect within the local area was done twice each season, one early round in April–early May and one late round in late May–June, respectively. Routes within the regional model area outside of the local area were done once per season in May–June. Along the lines all birds seen and heard were counted while the observer was walking at slow speed, stopping, listening and looking around when needed. The observer should as long as possible try to follow the pre-determined route (line). If the pre-determined route can not be followed, if impassable obstacles are encountered, counting of birds is allowed as long as the observer does not deviate more than 250 m from the route. If the observer has to deviate more from the pre-determined route bird counting should stop, and be started again when reaching within 250 m of the route.

The observer register bird species, number of individuals and the local time. To allow rapid data gathering in the field, all common species were summed (by the observer in the field) per five minute period. The registration of time is important for linking the bird observations to the GPS-registered route and hence for positioning all bird observations correctly (see below). Observations of selected listed species (see Section 4.2), were registered individually with data on time and position (from GPS) directly in the field.

During line transects a GPS was used for registration of the route. The GPS logged position data automatically every five minutes and after each days field work the logged positions (all with data on time as well) were down-loaded and stored as conventional text files in PC-format.

Selection of routes (transects) for the census in 2007 was based on routes covered in earlier years by the observers participating in the field work in 2007. By doing so, inter-observer differences could be ignored. This is otherwise a well-known source of (sometimes large!) variation in data sets of this kind. To get full coverage of a large enough area in the data from earlier years, routes made in 2003 and 2004 was pooled. By doing so all of the local area and a reasonably large part of the regional model area were available for comparison. Most of the planned routes could be covered during 2007 (Figure 4-1, 4-2). In addition to the planned north-south directed routes, some observers also counted birds along transport segments in other directions. Data from these segments has also been included in the analysis as this corresponds to the way earlier surveys where made. The western-most routes in the regional model area were somewhat adjusted in 2007 compared to earlier surveys because the local land-owner did not allow access for doing site investigation-related work on his land.

Line transects do not give direct measures of absolute bird densities within an area. The density values given are though possible to re-calculate to absolute densities using different assumptions.

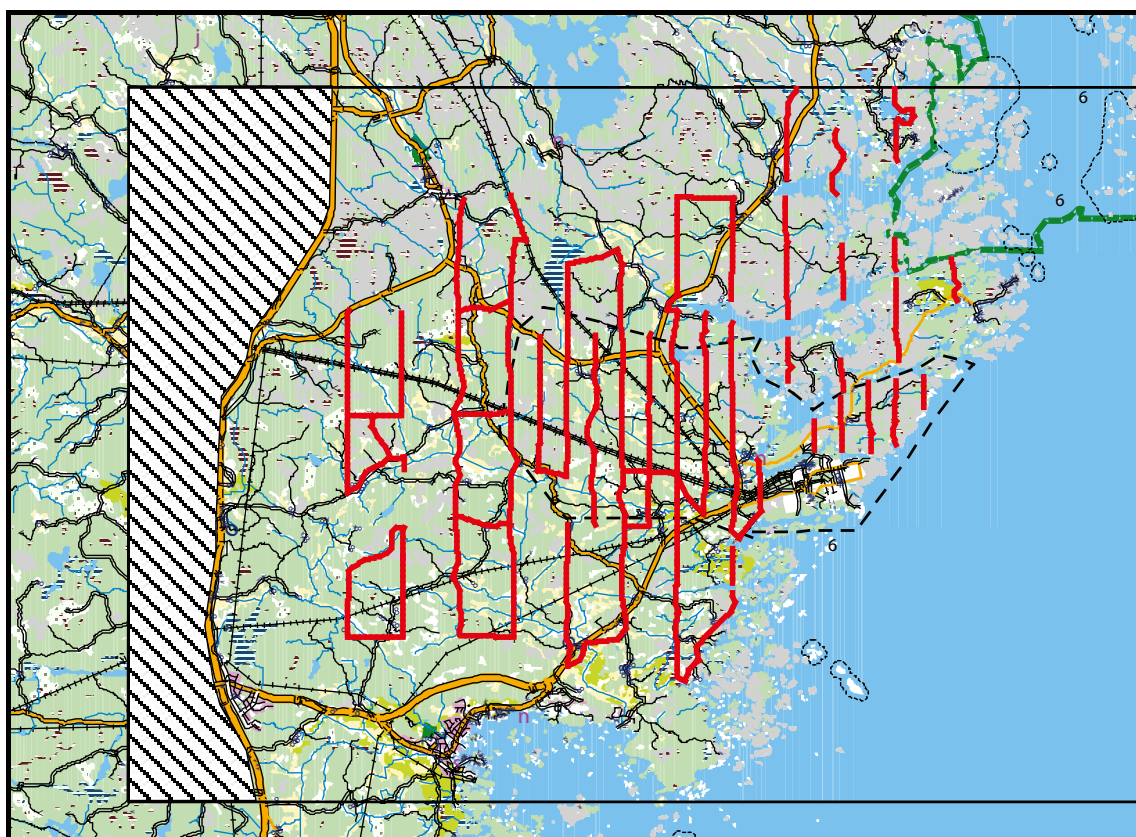


Figure 4-1. Line transects conducted in 2007 (red dotted lines). Note that transects within the local area were censused twice during the season. The regional model area is shown with a thick unbroken line (shaded part west of highway E-22 is excluded from the surveys), the local area is shown with a thick, broken line. From GSD-Terrängkartan © Lantmäteriverket Gävle 2001. Consent M2001/5268.

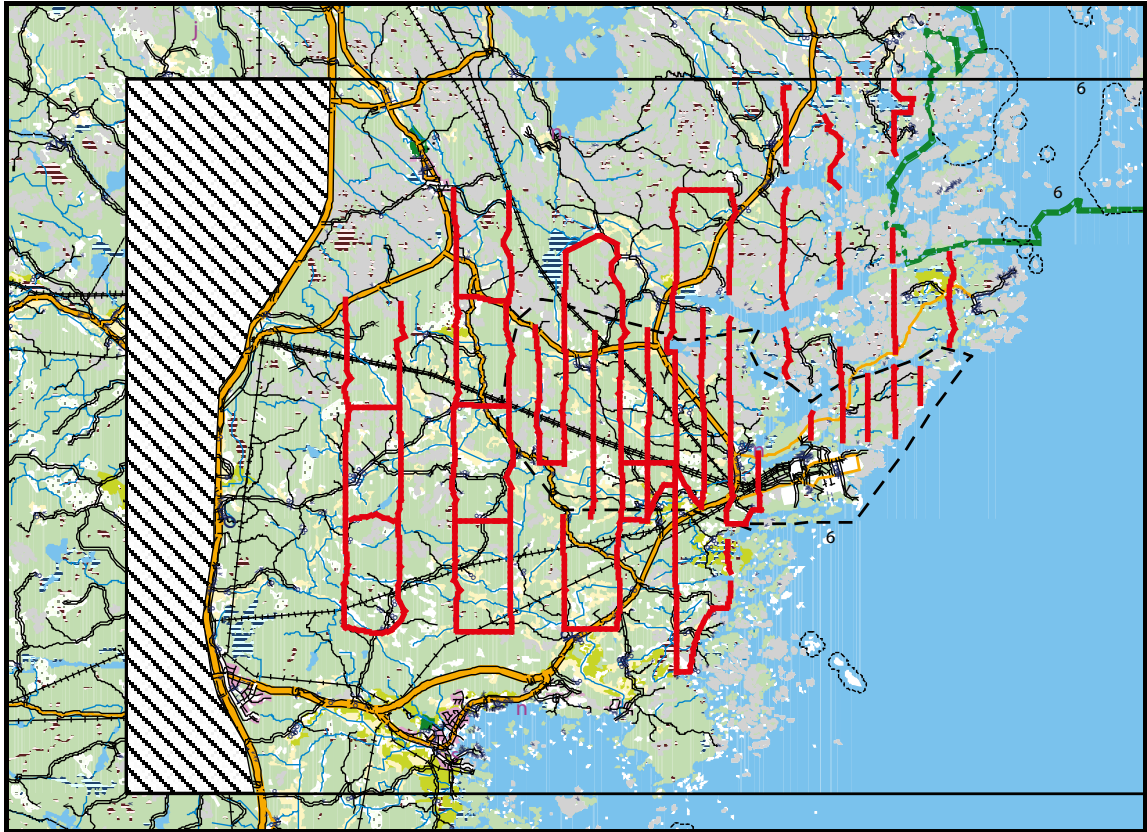


Figure 4-2. Line transects conducted in 2003–2004 (red dotted lines). Note that transects within the local area were censused twice during the season. The regional model area is shown with a thick unbroken line (shaded part west of highway E-22 is excluded from the surveys), the local area is shown with a thick, broken line. From GSD-Terrängkartan © Lantmäteriverket Gävle 2001. Consent M2001/5268.

4.2 Listed species (Swedish red list; EU Birds directive annex 1)

The species occurring in Simpevarp and included in the Swedish Red List and/or the EU Birds Directive, together with the latest updates on estimated local population size in Simpevarp are shown in Appendix 1.

Starting from 2004, a selection of these species has been monitored on a yearly basis. The species in question are shown in Table 4-1. Selection of monitoring species was made according to a set of different criteria. A species was included for further monitoring if one or several of these criteria were fulfilled: **i)** Simpevarp is a vital area for the species in a larger (e.g. national) perspective; **ii)** The species in question is suspected to be sensitive to disturbances and could thus possibly have been affected in a negative way by the site investigations; **iii)** The species show a negative long-term population trend at the national level (but not necessarily in Simpevarp and not necessarily during later years); **iiii)** Simpevarp holds high densities of the species.

Table 4-1. Listed species selected for monitoring in the Simpevarp area during 2004–2007.

English name	Swedish name
Honey buzzard	Bivråk
White-tailed eagle	Havsörn
Osprey	Fiskgjuse
Eagle owl	Berguv
Wryneck	Göktyta
Lesser spotted woodpecker	Mindre hackspett
Nightjar	Nattskärra
Red-backed shrike	Törnskata

These species were monitored in 2007 by visiting known nesting places/territories used in 2002–2006, combined with visits to habitats suspected to possibly hold the species in question. Visits to nest sites/territories/suitable habitats were made during relevant periods, that are when presence of the birds is expected to be easy to detect. Detailed following up of breeding results was made for some species, i.e. white-tailed eagle, osprey and eagle owl. All observations of the selected listed species were registered with data on bird species, number of birds, position (from GPS or recorded on field maps) and local time during the field work. For one of the more numerous species, monitoring was not made in the whole regional model area but in a selected part of this (red-backed shrike).

4.3 Execution

The monitoring field work in 2007 was carried out between 2007-04-11–2007-08-15. The field work was partly made by local ornithologists, mainly Tommy Larsson but also Leon Axelsson and Åke Nilsson, and partly by the project leader. Arne Schönbeck and Tommy Larsson made the surveys and follow ups of breeding results of white-tailed eagles, ospreys and eagle owls. The white-tailed eagle work is carried out within the ongoing national project concerning this species (through Björn Helander, Swedish Museum of Natural History, Stockholm). Tommy Larsson also made the main part of the honey buzzard field work. Martin Green carried out the remaining part of the surveys of listed species (lesser spotted woodpecker, wryneck, nightjar and red-backed shrike).

4.4 Data handling

In the field (line transects, listed species) all registered birds were recorded in notebooks with data on species, number of individuals and time together with additional data on bird behaviour and circumstances where such data were relevant. During line transects, common (numerous) species were summed already in the field in five minute periods while more scarce, and especially selected listed species were recorded with individual data for each observation. At the same time position and time were automatically registered by GPS every fifth minute. Observations of selected listed species were registered with exact position individually taken directly from the GPS in the field. After each days field work the bird and time data were transferred to pre-made paper forms. The logged position and time data were down-loaded from the GPS to text files in PC-format with the programme *Waypoint1803*. Bird and time data were then entered into Excel-files from paper forms where after the files were cross-checked against the field notes by the project leader. After this, the bird and time data were linked to the position/time data whereby each observation where given a geographic position. The time resolution (five minutes for common species) gives a geographical resolution of about 100–150 m for these. Positions for selected listed species have

the same resolution as the GPS-system. This base-file with data on species, numbers and positions can then be used for different GIS applications, for evaluating bird densities and further calculations.

4.5 Analyses and interpretations

The results gathered during line transects in 2007 are compared with results gathered in an identical way in 2003–2004 (data from both years combined), with the aim of evaluating possible impacts from the site investigations on bird numbers in the local model area, the regional model area and in the Simpevarp area at large. Data collected in 2002 are referred to, but no statistical testing is made between 2002 and later years this time as earlier analyses /Green 2004, 2005/ showed that bird numbers in general increased quite strongly from 2002 to 2004. With this method, statistical testing is not possible at the species level as only two data points (2003/2004 and 2007) exists. For any meaningful statistical analysis on species level one need data from at least five years to evaluate trends in the local population size. For the breeding bird community as a whole however, the number of recorded birds can be tested to look for differences between 2003/2004 and 2007. As the data do not conform to normal distributions, non-parametric tests are generally used. All statistical testing was made in the software SPSS for Windows version 12.0.1 (SPSS Inc.).

The following statistical comparisons were made:

- a) Number of recorded bird individuals per km and species during line transects in the local model area during 2003–2004 taken together vs. 2007.
- b) Number of recorded bird individuals per km and species during line transects in the regional model area, excluding the local model area, during 2003–2004 taken together vs. 2007.
- c) Number of recorded bird individuals per km and species during line transects in the whole area during 2003–2004 taken together vs. 2007.

Any general decrease or increase in the bird fauna would turn up as statistical differences using this approach. The tests do in reality check whether the number of decreasing and increasing species is significantly different from each other. If the total bird community should decrease one would expect that more species are decreasing than increasing etc. The normal, undisturbed level would be that similar numbers of increasing and decreasing species are found (i.e. no significant differences).

Patterns (increases, decreases or stability) in bird numbers recorded in Simpevarp were compared with national trends for the last ten year period (data from the Swedish Bird Survey, the national breeding bird monitoring programme /<http://www.biol.lu.se/zooekologi/birdmonitoring/>).

Possible differences in bird population development between the local area and the regional model area from 2003–2004 combined to 2007 was analysed by simple Pearson's' correlation and by paired t-tests.

Changes in numbers of territories at the species level for selected listed species are now for the first time statistically tested in this report. The same procedure is also used for comparing breeding results in a few cases. The rationale for this is that with a time series of (in most cases) five years, testing is now possible. Statistical power will however still be low (i.e. there is a low probability of finding statistically significant results even though true, biologically significant changes may have occurred), due to the short time frame. Another way to put it is that really large differences is required (strong trends) to reach statistical significance.

For most species the actual numbers of recorded territories/nests/pairs are reported and shown in figures. For the red-backed shrike however, population change is shown in the form of a chain-index. The reason for not using the recorded number of territories directly in this case is that the monitored areas have not remained exactly the same during the years. To come around

this problem, but still be able to compare the population development in an easily understandable way, a chain index is constructed. The chain index is created by comparing *areas checked equally well* in two following years and calculating the change in percent between these two. Then the procedure is repeated for next two following years and the new change (in percent) is added/subtracted to/from the figure. In the red-backed shrike case the calculation was made as follows (in this case with regional model area, excluding the local area as an example).

- Index for the start year is set to 1. This is the basis for all future comparisons.
- In our first year with a reasonable coverage of shrikes in Simpevarp (2003), 34 occupied territories were recorded. Of these, 13 were in areas covered equally well also in the following year (index calculations can only be made when at least two years of data is collected, since it is made in a back-wards calculating mode).
- In 2004, our second year of good coverage, 54 occupied territories were recorded. Of these, 19 were in parts checked equally well in 2003.
- The index for 2004 is calculated as: $((19-13)/13) + 1 = 1.46$. Interpreted as a 46% increase in numbers between 2003 and 2004.
- There were 35 recorded territories in 2004 in areas covered equally well also in 2005.
- 30 occupied territories were recorded in these parts in 2005.
- The index for 2005 is then calculated as: $((30-35)/35) + 1.46 = 1.32$. Interpreted as a 14% decrease in numbers between 2004 and 2005 (but still on average a 32% increase from 2003 to 2005!).
- Coverage in 2006 was identical to 2005. 24 occupied territories were registered. Hence, the index will be $((24-30)/30) + 1.32 = 1.12$.
- In 2007, 53 occupied shrike territories were found in areas covered during 2006. Coverage in both years was identical. The index for 2007 will then be $((53-24)/24) + 1.12 = 2.33$.

5 Results

5.1 The breeding bird fauna in Simpevarp (Line transects)

General

A total of 142.8 km of line transects were conducted in 2007. Of these, 72.3 km were done in the local area (35.6+36.7 km during the first and second round respectively) and 70.5 km in the regional model area outside of the local area. These figures should be compared with that a total of 174.6 km of line transects were made by *the same observers* in the same areas in 2003–2004. During these years a total of 101.8 km of line transects were conducted in the local area and 72.8 km in the regional model area. Line transects were also made already in 2002. In the parts covered in 2007, a total of 108.3 km was covered in 2002 (44.4 km in the local area and 63.9 km in the remaining parts). Statistical comparisons with the 2002 data are not made here as data from that year already has been compared with data from 2003–2004 /Green 2004, 2005/.

The two rounds of line transects in the local area were made 11 April–8 May and 2–22 June in 2007 (13 April–2 May and 11–28 June in 2004; 15 April–2 May and 26 June–10 July in 2003). The late season round in 2003 was delayed because of rainy weather in June. The line transects in the regional model area were conducted between 12 May and 1 July in 2007, with the bulk of the routes made 21 May–19 June (> 70%). In 2003 the six routes made in the regional model area were made between 2 May and 3 June and in 2004 the nine routes made that year, were made between 16 May and 20 June. In 2002 the line transects were conducted 8 May–29 June. Hence there is a general correspondence in seasonal timing of the surveys between years, with most transects done in the later part of May and in June. This is another factor that is important for a proper comparison between years. If different parts of the season are covered in different years, results will differ purely because of that the activity of different species varies during the season.

Summary data of numbers of species, individual birds and densities is shown in Table 5-1. Total numbers of birds and densities per species recorded during the line transects in 2003/2004 and 2007 are shown in Appendix 2.

14,462 birds of 116 species likely to breed in the area were recorded during the line transects in 2007, giving an overall density of 101.3 birds/km. As seen in Table 5-1, both numbers of recorded species per year and the density of bird individuals increased greatly during the covered period. The low values recorded in 2002 are somewhat surprising, but can at least partly be explained by that no coastal areas were covered in that year. This means that very few water birds were recorded in 2002, and many more of these were recorded in later years. Furthermore also land bird densities are higher in the coastal parts (within a few km from the coast) compared to more inland parts (due to greater variation in habitat availability), also leading to more birds of more species being recorded in later years compared to 2002. There is however an equally large difference between 2003/2004 and 2007 and in this case there was no difference in coverage between the years, indicating a true increase in bird numbers.

Table 5-1. Number of species, number of individual birds and total bird densities recorded during line transects in the Simpevarp area during 2002, 2003–2004 (combined) and 2007.

Year	No. of species	No. of individuals	Density (no. of individuals/km)
2002	93	4,382	44.3
2003–2004	112	12,823	73.4
2007	116	14,462	101.3
Total	130	31,667	74.4

Including all species in a comparison between 2003–2004 and 2007 we find that 80 species increased and 45 decreased in density, meaning that there were significantly more species that were increasing than decreasing between the two surveys (Wilcoxon signed rank test, $Z = 4.111$, $p < 0.001$, $N = 125$).

Dividing the data set in land birds and water birds revealed that while there was a highly significant difference for land birds (62 species increasing, 33 decreasing, Wilcoxon signed rank test, $Z = 4.235$, $p < 0.001$, $N = 95$), there was no such difference for water birds (18 species increasing, 12 species decreasing, Wilcoxon signed rank test, $Z = 0.710$, $p = 0.478$, $N = 30$). In other words, while there were significantly more land bird species that were increasing than decreasing in numbers between 2003/2004 and 2007, there was no significant difference in numbers of increasing and decreasing species of water birds during the same period.

Some species are recorded in very low numbers because they are rare, because they have secretive habits or because they have their activity peaks during other parts of the year or day than covered by the surveys. The variation in recorded numbers of these species is likely to depend not only on their true abundance in the area, but also on purely stochastic factors. Excluding these species and re-running the analysis only for land birds recorded with at least ten individuals in at least one of the two years of the comparison, did however show more or less the same result as above. 66 species met the required criteria for inclusion and among these there were 48 species that increased in density and 18 that decreased in density, the difference being highly significant (Wilcoxon signed rank test, $Z = 4.558$, $p < 0.001$, $N = 66$).

The tests above do not take *the size* of the increase or decrease in numbers (density) into account and this is of course a very important aspect in a comparison like this one. There is always variation in numbers between years and part of this variation can be considered as being so small that we can not really say whether a species has increased in numbers or not. Normal annual variation is in many cases as large as 30% and hence a division based on this criterion may shed some light on this aspect of the changes in bird numbers between the studied years. Including all species in the comparison we find that 59 species (47%) increased in density with $> 30\%$, 37 species (29%) increased or decreased with less than 30% and 30 species (24%) decreased with more than 30%. Classifying the three categories as ‘clearly increasing’, ‘stable’ and ‘clearly decreasing’ gives that over three quarters of all species have been stable or increasing in numbers between the two surveys in Simpevarp.

For water birds eleven species (37%) clearly increased, ten species (33%) showed stable densities and nine species (30%) decreased in density, further emphasising the pattern found above. For this group of birds taken together no major changes took place between the surveys. For land birds, and only including the most numerous ones (recorded with more than 10 individuals in any of the years), 35 species (53%) clearly increased in numbers, 22 species (33%) showed stable numbers and nine species (14%) clearly decreased in numbers.

Summarizing the results above, the surveys showed that birds in general increased in numbers in the Simpevarp area between 2003/2004 and 2007, and that the increase mainly occurred among land birds, while water birds showed relatively stable numbers during the period.

Comparison with national population development

In order to evaluate the situation recorded in Simpevarp in relation to the one recorded for the whole of Sweden, a comparison was made with data from the Swedish Bird Monitoring project, (see <http://www.biol.lu.se/zoekologi/birdmonitoring/>). Here we used the subset of species for which we have the best data, i.e. land birds with more than 10 individuals recorded in any of the survey years, and compared the development of these in Simpevarp with the national population trend for the last ten years. At the national level, data up until 2006 were available; the data from 2007 is being processed right now and will not be available until early next year. Dividing the data in the same categories as above (increasing, stable and decreasing), the national patterns for the same 66 species were as follows: 26 species (39%) increased, 24 species (37%) were stable

and 16 species (24%) decreased in numbers in Sweden as a whole. Testing the two distributions against each other (Sweden vs. Simpevarp) showed a small, but still significant difference (chi²-test, $p = 0.042$). So even though the national tendency was in the same direction, the bird fauna in Simpevarp showed a somewhat more positive development than what has been recorded on the national level. One should bear in mind, that we partly compare different time periods here (1997–2006 at the national level, 2003–2007 on the regional level), and part of the small difference may be a result of this.

Going more into detail and making comparisons of population development species for species, we found that 29 of 66 species (44%) show exactly the same development on both levels (nationally and in Simpevarp), but only 8 (12%) species show totally opposite trends. Of these, four are decreasing nationally but increasing in Simpevarp (black woodpecker, thrush nightingale, willow tit and treecreeper). Four species increase nationally but decrease in Simpevarp (buzzard, common snipe, woodcock and fieldfare). In the latter case, data collected during other surveys indicate stable numbers for buzzard and woodcock. Few individuals of these are observed during the line transects. The remaining 29 species show different but adjoining trends (increase in Simpevarp-stable nationally etc).

Taken together, this short and quick comparison shows that there is a fairly good correspondence between what is happening in Simpevarp and patterns found in the whole of Sweden. The conclusion from this is that the increase in bird numbers found in Simpevarp is part of a larger pattern and not just something happening locally. However, as showed above, if anything, the tendency is that the bird fauna in general is doing even better in Simpevarp than in Sweden as a whole.

Comparison between the local- and the regional model area

The comparisons above showed that bird numbers in the whole surveyed area increased during later years, a pattern in good correspondence with national population developments. An interesting question is of course also to look for possible differences within the surveyed area, and in this case especially between the local area (where the site investigations were carried out in 2003–2007) and the surrounding regional model area (without site investigations). In this case the regional model area can be thought of as a reference area to the local area, experiencing the same general factors in terms of weather and other things. General results of recorded numbers of bird species and numbers are shown below in Table 5-2. Total numbers of birds and densities per species recorded during the line transects in 2002, 2003/2004 and 2007 in the local area and the regional model area are shown in Appendix 3 and 4 respectively.

Table 5-2. Number of species, number of individual birds and total bird densities recorded during line transects in the local area (Local) and the regional model area (Regional) in Simpevarp area during 2002, 2003–2004 (combined) and 2007.

Year	Area	No. of species	No. of individuals	Density (no. of individuals/km)
2002	Local	77	1,766	39.8
2003–2004	Local	103	7,529	74.0
2007	Local	104	7,858	108.7
2002	Regional	74	2,622	41.0
2003–2004	Regional	98	4,764	65.4
2007	Regional	104	6,669	94.6

The general picture from the whole area was shown both in the local area and the regional model area. Bird numbers increased through the surveyed years in almost equal proportions (a 47% increase in density in the local area between 2003/2004 and 2007, a 45% increase in the regional model area during the same period). Bird densities were generally somewhat higher in the local area compared to the regional model area. Probably as result of that the covered parts of the latter are mostly homogenous coniferous forest (with lower bird densities) while the former has a larger general habitat variation holding higher bird densities.

Making the same comparisons as above (for the whole area) for the local area and the regional model area separately showed that there were significantly more species increasing in numbers than decreasing in numbers in both areas. In the local area 75 species showed an increase in density and 37 a decrease (all species, Wilcoxon signed rank test, $Z = 4.256$, $p < 0.001$, $N = 112$). In the regional model area 76 species increased in density and 36 decreased (all species, Wilcoxon signed rank test, $Z = 4.558$, $p < 0.001$, $N = 112$). Analysing only the most 63 numerous species (at least five individuals counted in any year in each of the areas) essentially yielded the very same results (statistical results not shown).

Even more interesting is of course to compare the absolute change in density between 2003/2004 and 2007 between the two areas. This analysis showed strong correlations between the numerical change in density in the local area and corresponding change in the regional model area (Pearson's correlation, $r = 0.825$, $p < 0.001$, $N = 126$, when including all species; Pearson's correlation, $r = 0.903$, $p < 0.001$, $N = 65$; when including only species observed with at least five individuals in both areas in any of the years).

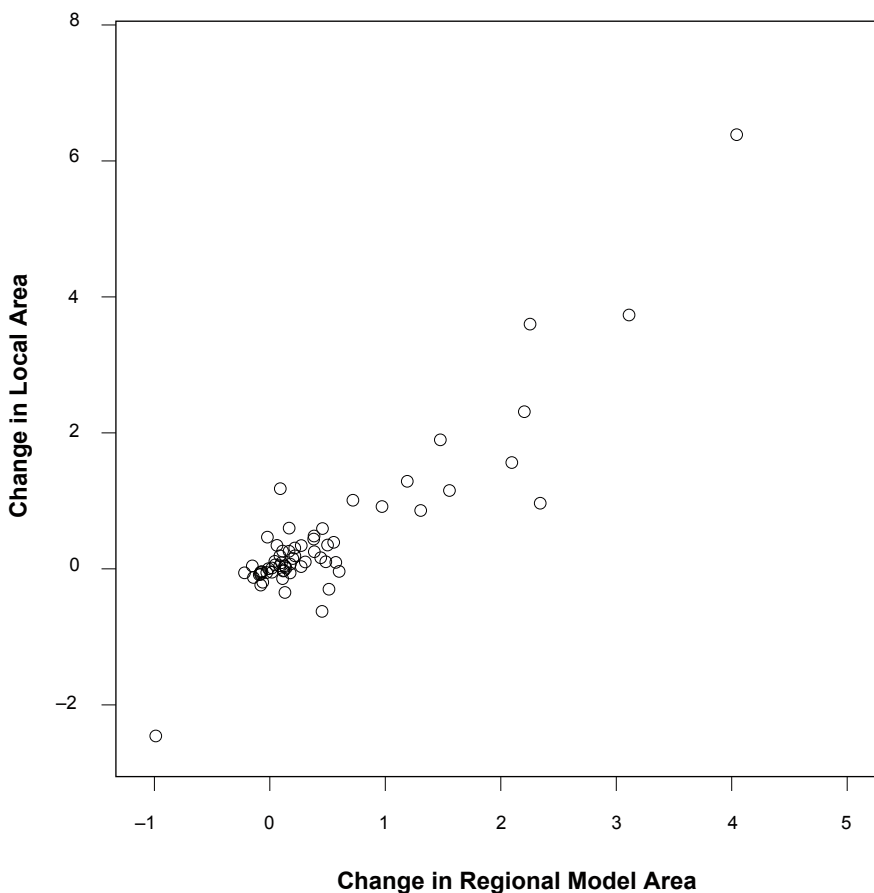


Figure 5-1. Relationship between density changes in the regional model area vs. density changes in the local area. Each circle represents a bird species. Shown here are the 63 species where at least five individuals were recorded during any year in both areas. The relationship is highly significant (Pearson's correlation, $r = 0.903$, $p < 0.001$, $N = 65$).

Testing the density changes for each species for the local area vs. the regional model area did not reveal any differences at all (paired t-test, $t = 0.795$, $p = 0.428$, $N = 126$ for all species, $t = -0.506$, $p = 0.614$, $N = 65$ for all species observed with at least 5 individuals in both areas in any of the years).

These analyses taken together clearly show that there were no major differences in the development of the number of breeding birds between the two areas. Population changes followed a general pattern, both in the local area and in the regional model area.

5.2 Listed species

Listed species selected for monitoring

The following section gives a summary of the population development in the last four-six years of eight selected species listed as endangered, threatened or vulnerable according to the Swedish Red List /Gärdenfors 2005/, and/or listed in the European Unions' Birds Directive Annex 1 (79/409/EEG) within the Simpevarp area. These eight species were selected for monitoring because they are of high conservation concern or because the Simpevarp area is a stronghold for the species in question. The information presented is based on data gathered in all six years (2002–2007) although a complete coverage of the regional model area was not gained until 2003.

The text covering breeding success of white-tailed eagles is written by Björn Helander, Swedish Museum of Natural History, Stockholm.

Honey buzzard *Pernis apivorus* Bivråk (Sw. Red List; EU Annex 1)

The numbers of honey buzzards in the regional model area remained at the same level as in the preceding years. Eleven territories were registered and three of these had parts within the local area (four in 2006, three in 2005 and four in 2004). We have now followed the honey buzzards in a more detailed way during four years in the area and the emerging picture is one of stability (see /Green 2005, 2006, 2006b/). Around ten pairs have been present annually and very little variation in occupancy between individual territories has been recorded. 2007 was the first year that we extended the surveys into the later part of the breeding season and by doing so at least two successful breeding attempts, each producing one fledged juvenile, were recorded. There was by no means a full coverage of the area during this part of the season though, and the result should more be seen as an example of that honey buzzards are reproducing successfully within the area than as an exact figure of the number of successful breeding attempts.

Honey buzzards are hardly observed at all during the line transects and this method does not produce any information on this species.

Simpevarp hold relatively high densities of honey buzzards (about 0.10 pairs/km²). It is likely that the small-scaled landscape dominated by forest with many small agricultural areas interspersed, together with a high number of sun-hours during summer (typical for the south-east coast of Sweden) promotes a high insect abundance. Honey buzzards are dependent on larger social insects like wasps, bees and bumble-bees for successful breeding. The young honey buzzards are mainly raised on a diet consisting of insect larvae.

There are no indications of that the honey buzzards should have been affected by the site investigations in any way. This was not expected either since no intensive parts of the site investigations were conducted in areas in close association with honey buzzards.

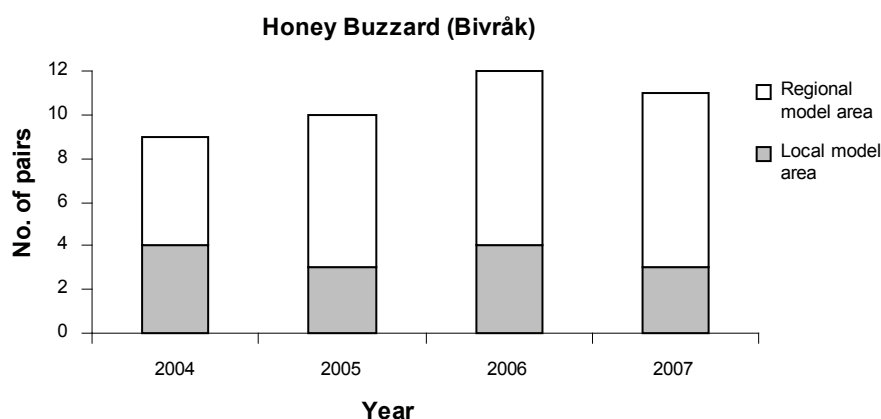


Figure 5-2. Number of territorial pairs of honey buzzards in Simpevarp in 2004–2007. Shaded parts show the number of territories with parts extending into the local area.

The honey buzzard is classified as ‘Endangered’ (starkt hotad) in the Swedish Red List. National population size has declined with 50–70% during the last three decades and was estimated to about 5,000 pairs in 2004. The main causes of the decline are thought to be large-scale landscape changes due to both agriculture and forestry, at the same time as conditions along the migration routes and in the wintering areas have deteriorated /Artdatabanken 2005/.

White-tailed eagle *Haliaeetus albicilla* Havsörn (Sw. Red List; EU Annex 1)

The white-tailed eagle had lower breeding success in 2007 the Simpevarp area compared to the background level from 1998–2001, and to the average for the period 2002–2007. The main reason is believed to be aggressive interactions between territorial pairs, as one eagle pair built a new nest much closer to its nearest neighbour. Both these pairs were unproductive this year. The breeding success of the reference population was this year slightly below the background level, and below the average for the period 2002–2007, but this could well be a natural fluctuation. The averages for both the Simpevarp area and the reference area 2002–2007 are very close to the estimated natural background level for white-tailed eagle on the Baltic coast before 1950, when this population began to be affected by chemicals like DDT.

Table 5-3. Per cent succesfully breeding pairs of white-tailed eagle in 1998–2001 (background, before site investigations) and in 2002–2007 (during site investiagtions) at Simpevarp (N = number of checked territorial pairs).

Area	1998–2001	2002	2003	2004	2005	2006	2007	2002–2007	N
Simpevarp	88	100	0	100	100	100	33	71	22
Reference	77	88	75	88	75	57	60	75	70

(Report by Björn Helander, Swedish Museum of Natural History, Stockholm)

Osprey *Pandion haliaetus* Fiskgjuse (EU Annex 1)

The number of active nests decreased further to only two in 2007. Three nests were active in 2006, and four in 2003–2004. Unlike in the two years before 2007 no signs of inland breeders were registered in 2007. Observations indicating this were done in 2005 and 2006 but no nests were found. As in earlier years, there was an occupied nest just outside the regional model area. This nest did not produce young in 2007, but did so in 2004–2006. Both pairs within the regional model area produced large young in 2007 and four young were fledged. Breeding success of the present pairs was hence good (above average).

Breeding results for ospreys has been surveyed along the coast of eastern Småland by Tommy Larsson and Arne Schönbeck since 1999 (1998 was a start-up year with a smaller coverage). Each year 15–25 nests are checked; the number of breeding attempts registered, the number of large young is counted and the young are ringed. Breeding results during 1999–2007 for the whole surveyed area (including the SKB regional model area) are shown in Table 5-4.

The number of breeding attempts increased slightly compared to 2005–2006. Breeding success was lower than in most years during the covered period. Overall there is a close to significant increasing trend in the recorded number of breeding attempts from 1999 to 2007 (Spearman’s rank correlation $r_s = 0.633$, $p = 0.067$, $N = 9$). There has however not been any significant changes in the proportion of successful breeding attempts (Spearman’s rank correlation $r_s = -0.326$, $p = 0.391$, $N = 9$) or in the number of produced large young per breeding attempt (Spearman’s rank correlation $r_s = 0.127$, $p = 0.746$, $N = 9$).

The breeding results in the SKB regional model area (SKB RMO) is showed in Table 5-5 in comparison with results from the remaining study area (REF), here used as a reference area.

Table 5-4. Breeding results of Ospreys along the Mönsterås- Oskarshamn-Simpevarp coast (including the SKB regional model area) during the last nine years.

Year	Controlled nests	Breeding attempts	Successful nests	% successful breeding attempts	No. of large young per breeding attempt
1999	15	11	7	64	1.0
2000	20	12	10	83	1.8
2001	17	12	11	92	1.2
2002	18	15	12	80	1.4
2003	21	18	11	61	1.4
2004	23	18	10	56	1.2
2005	22	15	11	73	1.8
2006	18	14	9	64	1.5
2007	19	17	11	65	1.1
Mean	19	15	10	71	1.4

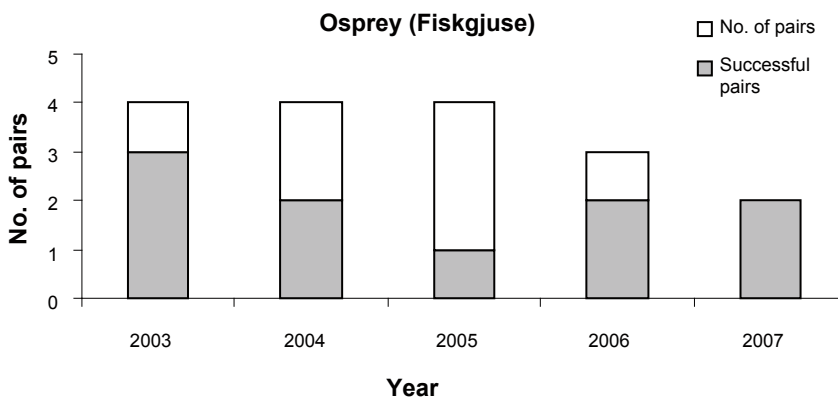


Figure 5-3. Number of breeding pairs of Ospreys (Fiskgjuse) in the regional model area at Simpevarp 2003–2007. Shading shows the number of successful pairs.

Table 5-5. Breeding success of ospreys in the regional model area at Simpevarp compared to the reference area south of this in 2003–2006.

Year	SKB RMO % successful breeding attempts	SKB RMO No. of large young per breeding attempt	REF % successful breeding attempts	REF No. of large young per breeding attempt
2003	75	2.0	50	1.1
2004	50	1.0	57	1.3
2005	25	0.8	91	2.2
2006	67	1.3	64	1.5
2007	100	2.0	60	1.0
Mean	63	1.4	64	1.4

There is no statistical difference in the proportion of successful breeding attempts (Wilcoxon's sign rank test, $Z = 0.135$, $p = 0.893$, $N = 5$) or in breeding success (Wilcoxon's sign rank test, $Z = 0.135$, $p = 0.893$, $N = 5$) between the regional model area and the surrounding reference area during 2003–2007.

Local population size (within the regional model area) has decreased in the last two years. This is shown also by the line transects, even though recorded numbers are low. In this data set a 59% decrease (compare with Figure 5-2!) was registered between 2003/2004 and 2007. At the same time regional population size (within the reference area) shows tendencies of an increase during the last nine years. This indicates that the decrease in numbers within the regional model area is more a result of a re-distribution of birds than a general population decrease. None of the pairs 'missing' from the SKB area in later years are likely to have been disturbed by the site investigations, as none of the nests are in areas close to where these has been conducted. Still, it is likely that human disturbances are responsible for the loss of at least one pair as these had their territory in an area with high levels of human presence. Ospreys are sensitive to prolonged disturbances around nest sites, especially during the early stages of the breeding cycle.

Eagle owl *Bubo bubo* Berguv (Sw. Red List; EU Annex 1)

The number of occupied territories decreased from four to three. This is far from surprising as breeding output has been extremely low all through the period from 2002 onwards. 2007 was no exception from this general scenario and no young were produced within the regional model area.

Breeding output for the regional model area and the reference area as a comparison is shown in Table 5-6.

Another really lousy year when it comes to breeding output within the SKB regional model area. In contrast to 2006, breeding output was good in the surrounding reference area. For the period 2002–2006 there is a significant difference between the SKB-area and the reference area (Wilcoxon's sign rank test, $Z = -2,032$, $p = 0.042$, $N = 6$) with lower numbers of young produced in the former (see Table 5-6). As pointed out several times before, this was however also the case before the site investigations started and we have no reasons to suspect that the low breeding output in any way is connected to the site investigations (none of the territories are in close contact with the sites where the intensive parts of the site investigations have been conducted). The reason behind this difference is still unknown but points out that the local population can not be sustained without immigration from other areas with higher reproductive output.

Table 5-6. Breeding results (number of young/controlled territory) for Eagle owls in the regional model area (SKB RMO) and reference areas north and south of this (REF) in 2002–2007.

Year	SKB RMO No. of large young per territory	REF No. of large young per territory
2002	0	1.0
2003	0	2.3
2004	0.8	1.3
2005	0.8	1.3
2006	0	0
2007	0	1.2
Mean	0.3	1.2

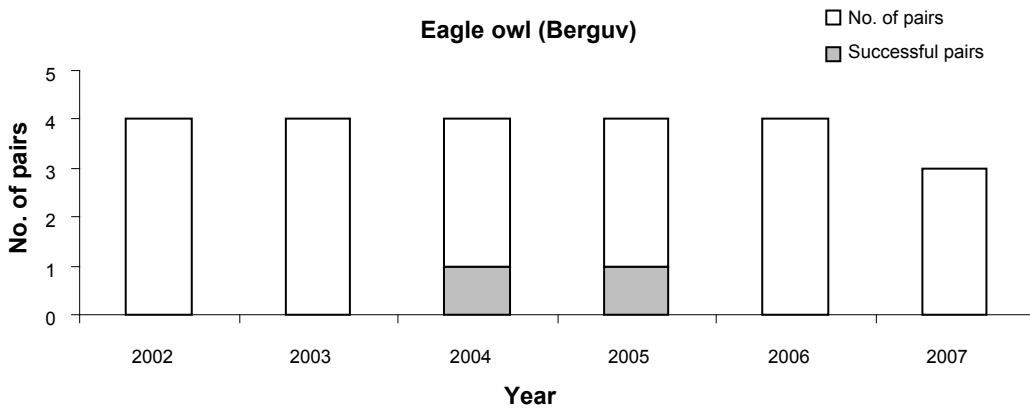


Figure 5-4. Number of Eagle owl (Berguv) pairs in the regional model area in Simpevarp 2002–2007. Shaded parts show number of successful pairs.

Wryneck *Jynx torquilla* Göktyta (Sw. Red List)

Wryneck numbers increased with no less than 80% compared to 2006. The increase was especially marked in the local area, but a large increase was also registered in the regional model area outside of this (Figure 5-5). The recorded increase 2003–2007 is statistically significant, despite the short time period covered (Spearman’s rank correlation $r_s = 0.900$, $p = 0.037$, $N = 5$). Also the line transect data indicate a strong increase in numbers from 2003–2004 to 2007. This smaller data set indicates a 90% increase during the period.

Distribution of wrynecks in 2007 essentially followed the pattern registered in earlier years. The majority (71%) were registered in areas within a three km from the coast.

The wryneck is classified as ‘Near-Threatened’ (missgynnad) in the Swedish Red List /Gärdenfors 2005/. The number of wrynecks in Sweden decreased with over 50% between 1975 and the late 1990-ies, but the numbers have started to increase again in later years /Lindström and Svensson, 2007/. National numbers are still way below the numbers found in the mid 1970-ies, despite the recent increase. The reason behind the large decline is probably loss of suitable habitats as a large proportion of small-scale farms in largely forested areas were abandoned in the mid 1900-s. National population size is estimated to be 5,500–15,000 pairs /Artdatabanken 2005/.

There are no signs what so ever of that wrynecks should have been negatively affected by the site investigations. Local population trend is positive and seemingly following the present national trend, even though the observed increase in Simpevarp is much stronger than the one recorded on the national level.

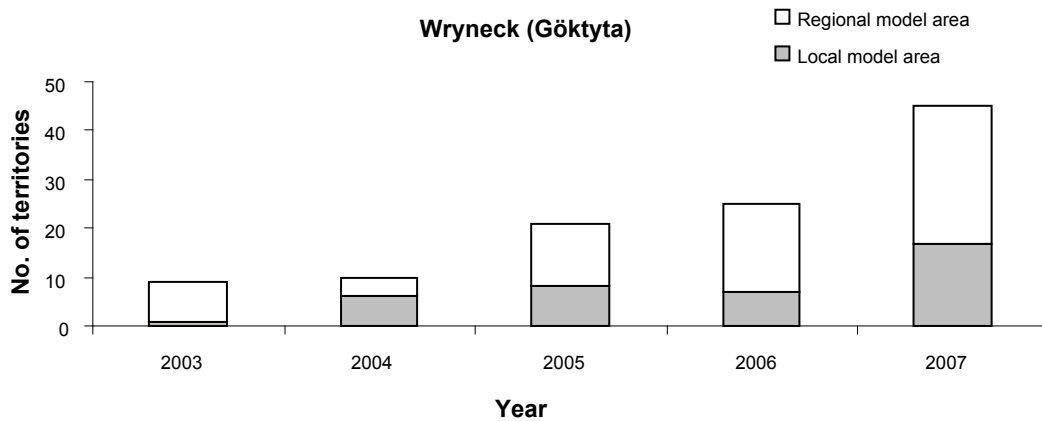


Figure 5-5. Number of recorded occupied territories of Wrynecks (*Göktyta*) in Simpevarp 2003–2007. Shaded parts show the number of territories within the local area.

Lesser spotted woodpecker *Dendrocopus minor* Mindre hackspett (Sw. Red List)

Also the lesser spotted woodpecker continued to increase in numbers in Simpevarp. Overall, there was an increase from 25 to 32 occupied territories (28%) between 2006 and 2007.

Numbers increased both in the local model area and in the regional model area outside of this cf. /Green 2006, 2006b/, although the increase was stronger in the local area (50% vs. 30%). However, for the whole period from 2003 to 2007 numbers in the local area have remained constant, or at least without any statistically significant trend (Spearman’s rank correlation $r_s = 0.474$, $p = 0.474$, $N = 5$), while numbers in the regional model area outside of the local model area have increased strongly (Spearman’s rank correlation $r_s = 0.999$, $p < 0.001$, $N = 5$).

Too few lesser spotted woodpeckers are recorded during the line transects to produce reliable estimates of population development. The peak activity period of this species is in the earlier parts of spring when few line transects are being done. In this context it is worth mentioning that in the local area, where line transects have been conducted during the early parts of spring a small increase (17%) in lesser spotted woodpecker density was registered between 2003/2004 and 2007

Earlier years indicated that population development differed between the regional model area (without site investigations) and the local area (with on-going site investigations). This could now be analysed more in detail as we have a time series long enough for allowing at least

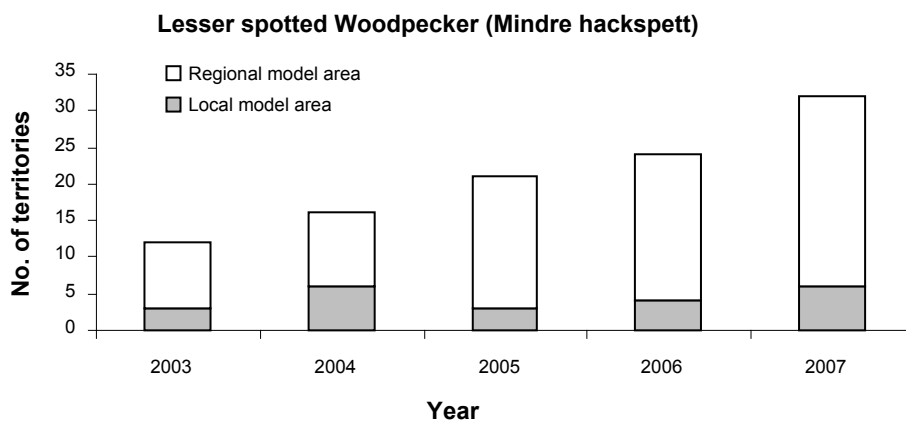


Figure 5-6. Number of occupied territories of Lesser spotted woodpecker (*Mindre hackspett*) in Simpevarp 2003–2007. Shaded parts show number of territories within the local area.

simple statistical testing. The indicated difference was corroborated by this analysis with a strong increase in numbers in the regional model area, but almost constant numbers in the local area. However, numbers increased back to the previously highest recorded level in the local area in 2007 after two years of lower numbers, and it will be interesting to see if numbers now will start to follow the general regional trend when the site investigations are finished. Although we have found differences between areas with different disturbance levels (from the site investigations), this is not the same as pinpointing the site investigations as the driving force behind the differences. There may still be other factors behind this. If, for example the suitable parts (for lesser spotted woodpeckers) in the local area have been saturated with birds already from the start, we would not expect any increase in these parts even if total population size increased. The increase would rather take place and be noticed in areas having 'vacant possible territories' and it might be that in the case of our study area, the regional model area had just this.

The lesser-spotted woodpecker is classified as 'Near-Threatened' (missgynnad) in the Swedish Red List. National numbers decreased with about 50% between 1975 and 1990, but recovered remarkably during the last decade, especially during last few years. The lesser-spotted woodpecker was negatively affected by the loss of dead wood due to modern forestry and also by the conversion of mixed and deciduous forests to monoculture conifer forests. National population size was earlier, after the strong decrease, estimated to about 3,000 pairs /Artdatabanken 2005/, but may now again be even higher than in the mid 1970-ies. The reasons behind the recent increase have not been studied in detail but the new forestry policy introduced in the 1990-ies have resulted in that the amount of deciduous trees and the amount of dead wood, both factors favouring lesser spotted woodpeckers, have increased again in later years
[/http://www-riksskogstaxeringen.slu.se/](http://www-riksskogstaxeringen.slu.se/).

Nightjar *Caprimulgus europaeus* Nattskärja (Sw. Red List; EU Annex 1)

In last years report /Green 2006b/ I termed 2006 as a possible peak year for the 'flagship species' of the Simpevarp area. 87 territories were registered during 2006, the highest number recorded so far. Not without a certain amount of surprise this record was shattered by a new record from the survey in early June 2007 resulting in no less than 144 'singing males' (!), a further 66% increase from the level of 2006. The increase 2003–2007 is highly significant (Spearman's rank correlation $r_s = 0.999$, $p < 0.001$, $N = 5$). One should bear in mind though that coverage was not complete in 2003, probably inflating the estimate of the observed increase. Still, that the numbers of nightjars have increased in last five years is absolutely clear. An even higher proportion of the nightjars than usual were registered in the northern half of the regional model area, this year 92% were registered in that part (annual variation 2003–2006: 71–89%).

This nocturnal species is of course not observed much during the line transects. Still, occasional birds are being flushed during day-time now and then.

Seen over all the five years the increase in numbers have been of the same magnitude both in the local area and in the regional model area further away from the site investigations. Looking at the geographical distribution of birds it seems as if the nightjars perhaps are starting to return to areas they avoided during the most intensive period of the of the site investigations (cf. /Green 2005, 2006, 2006b/).

Nightjar densities in Simpevarp are the highest recorded in Sweden over such large areas. In the northern half of the regional model area (50 km²) there were 2.7 nightjar-territories/km² in 2007. Even within these parts there is some variation and including only the parts with the very highest densities (38 km²) yielded densities of 3.2 territories/ km². Normal densities are reported to be 0.1–0.2 territories/km², but in optimal habitats 2–5 territories/km² can be found /BWP 1985/.

The nightjar is classified as 'Vulnerable' (sårbar) in the Swedish Red List. National numbers have probably decreased with up to 20% during the last decades, but regionally the decrease has been much higher. This applies to the more northern parts of the distribution range in Norrland

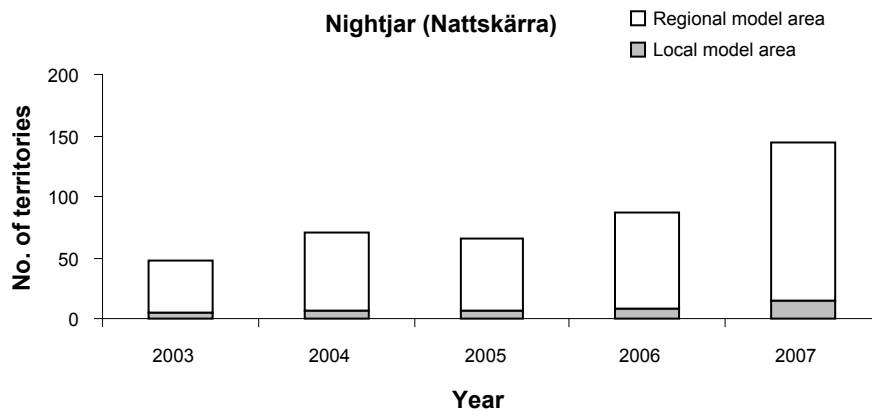


Figure 5-7. Number of occupied Nightjar (*Nattskärja*) territories in the regional model area of Simpevarp 2003–2007. Shaded parts show the number of pairs in the local area. Note that coverage of the area was not complete in 2003, probably making showed numbers in that year an underestimate of true numbers.

and Svealand. The factors behind the decrease are probably related to large-scale changes in forestry and agricultural practises. The latest estimate of the national population size is 2,000–2,500 pairs, but these figures are quite uncertain /Artdatabanken 2005/. If correct, this means that around 6–7% of the national population occur in the Simpevarp regional model area and hence, as pinpointed earlier, that the area is of national importance for the species.

Red-backed shrike *Lanius collurio* Törnskata (Sw. Red list, EU Annex 1)

Also Red-backed shrike numbers showed a marked increase between 2006 and 2007. The population development of red-backed shrikes in Simpevarp is shown below in Figure 5-8. As in the reports from 2005 and 2006 /Green 2006, 2006b/, population development is shown by an index where the percent change between areas checked equally well in years following each other are compared. Index for 2003 (the first year with decent coverage of the species) is set to one. The figure should be read as there on average has been a 126% increase in red-backed shrike numbers within the local area between 2003 and 2007 (index series 1-1.09-0.93-1.36-2.26) etc.

Even though there has been an increase in recorded numbers over the five-year period, this increase is not statistically significant (Spearman’s rank correlation $r_s = 0.700$, $p < 0.188$, $N = 5$), mainly due to that the short period covered would need even larger changes to correctly classify the change as significant. Numbers within the local area and the regional model area outside of the local area has followed each other through the years and there are absolutely no indications of any negative effect from the site investigations. Also the line transects indicate a clear increase in shrike numbers between 2003/2004 and 2007. This method estimates the increase to 60%, much lower than what was found with the special studies. In part this probably depends on that the line transects are conducted mainly during early morning hours, a time of the day when the shrikes are less active. The main activity period of shrikes is from late morning to early evening, coinciding with the period when their main prey (large flying insects) is most active.

The red-backed shrike is classified as ‘Near-Threatened’ (*Missgynnad*) in the Swedish Red List /Gärdenfors 2005/. National numbers have decreased with over 50% during the last 30 years /Lindström and Svensson 2007/ and numbers in a well-studied, predominantly farmland area outside Uppsala decreased from 120 to 60 pairs during 1998–2003 /Artdatabanken 2005/. Reasons for the decrease at a general level is thought to be due to habitat loss, as many semi-natural grazing pastures have disappeared during later decades. In recent years shrike numbers have started to increase again and the trend in the Simpevarp nicely follows the national pattern. National population size of red-backed shrikes is estimated to be about 23,000 pairs /Artdatabanken 2005/.

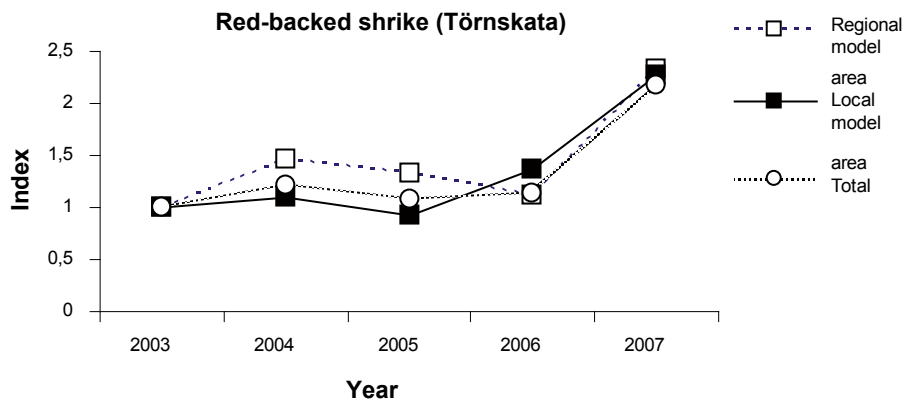


Figure 5-8. Population development of red-backed shrikes in Simpevarp 2003–2007 shown as a chain index. Index for year 2003 is set to 1. See text for further explanations.

Table 5-7. Population changes of selected listed species in Simpevarp between 2005 and 2006. A + sign means that the number of territories has increased, a – sign means that it has decreased, a 0 that there is no major change and ? denotes that the situation is unclear.

Species	Regional model area	Local area	Whole area
Honey buzzard	0	0	0
White-tailed eagle	+		+
Osprey	–	0	–
Eagle owl	–	0	0
Wryneck	+	+	+
Lesser spotted woodpecker	+	+	+
Nightjar	+	+	+
Red-backed shrike	+	+	+

Other listed species

The following section gives a short summary of the population development in the last six years of species listed as endangered, threatened or vulnerable according to the Swedish Red List /Gärdenfors 2005/, and/or listed in the European Unions' Birds Directive Annex 1 (79/409/EEG), but not selected for detailed monitoring within the Simpevarp area. This group contains 27 species and as no detailed monitoring is made, the data for these species are mainly based on observations made during the line transects and/or during surveys for the selected eight species handled in the previous section. This means that data quality is not as good as for the latter group of birds. In the presentation below, species only occurring in the archipelago of the area are omitted. The outer archipelago is however monitored annually within the regional environmental monitoring scheme (Länsstyrelsen i Kalmar län, field work conducted by Tommy Larsson) and data from these parts are included in Appendix 1. Owls, Pygmy owl (Sparvuggla) and Tengmalm's owl (Pärluggla), are not dealt with either in this presentation as no special surveys for owls have been made in recent years. Estimates of population size for these species are shown in Appendix 1.

Whooper swan *Cygnus cygnus* Sångsvan (EU Annex 1)

Pairs were present already six years ago, and numbers seem to be at the same level in 2007 as well. Breeding has been registered from at least two sites within the regional model area and is possible at some more. Three pairs were recorded in 2002–2003 and three-four pairs were recorded in 2007. One pair produced five young in the restored Lake Gäster in 2007. The line transects indicate a small increase from 2003/2004 to 2007, but this is based on very few birds.

Hazelhen *Bonasia bonasia* Järpe (EU Annex 1)

Just one bird was observed during the line transects in 2007. This can be compared with two individuals in 2003/2004. However, for this very secretive bird these figures do not say much. The hazelhen is clearly not a common bird in Simpevarp, but the findings above give no room for saying anything about the population development in the area. The population was earlier estimated to about 10 pairs, based on special surveys made in 2003.

Black grouse *Tetrao tetrix* Orre (EU Annex 1)

The line transects indicate a small general decrease (–18%) between 2003/2004 and 2007. A closer examination of the data reveals that the decrease has occurred completely within the local area. In this, five birds were seen in 2003/2004 and not a single bird in 2007. In the regional model area outside of the local area, where most of the black grouse occur, there has instead been a small increase (15%) during the period. Hence, total numbers may not have changed much in the whole area (remember that the line transects did not cover the whole regional model area!). The population was estimated to around 20 ‘pairs’ a few years ago, and as no complete survey has been made of all parts of the area having black grouse since then, we do not really know the full story at present. If anything, it seems as if overall numbers have been stable but that numbers have decreased in the local area.

Capercaillie *Tetrao urogallus* Tjäder (EU Annex 1)

Line transect data showed a substantial increase in numbers between 2003/2004 and 2007. As for many other listed species, few individuals (two in 2003/2004 and six in 2007) were registered during the transects and we do not know the true significance of the recorded increase. Total numbers in the area have earlier been estimated to 5–10 ‘pairs’. Based on the observations in 2007, this figure should perhaps be raised to 10–15 ‘pairs’.

More detailed investigations of capercaillies in the area would be interesting for several reasons. Large parts of the regional model area hold suitable habitats for capercaillies and could hold a larger population than we expected earlier. Furthermore, this is one of the so called ‘flagship’ species for forest biodiversity. Areas holding capercaillies do usually hold other forest species of conservation concern as well. Finally, there is an ongoing debate about capercaillie numbers in Götaland. There are several signs of that numbers have gone down quite dramatically during later decades, probably mainly due to forestry activities. In this light, the seemingly stable (or even increasing?) numbers in the regional model area are certainly intriguing.

Finally, we can note that although capercaillie numbers in the local area are low, they have seemingly been stable during the site investigation period. Single birds were observed in 2002, 2003, 2004 and 2007, e.g. in all survey years.

Black-throated diver *Gavia arctica* Storlom (EU Annex 1)

The situation has been extremely stable during since 2002. There have been two pairs in Lake Götumaren during all years, so also in 2007. No more detailed studies of this species have been made.

Bittern *Botaurus stellaris* Rördrom (Sw. Red List, EU Annex 1)

A new-comer to the area in 2007, probably as a result of the restoration of Lake Gäster. One territory was present there during 2007 (no observations in earlier years).

Marsh harrier *Circus aeruginosus* Brun kärrhök (EU Annex 1)

Not a well-studied bird in the area, but two breeding sites are known from earlier years. Not more than one pair has however been recorded in any single year before, but in 2007 two pairs were present and probably bred in the area. One of the breeding sites was also new in this year.

Crane *Grus grus* Trana (EU Annex 1)

An increasing species everywhere in Sweden nowadays! The first estimate of the population size in the whole regional model area was 20 pairs (2003). Based on the records from 2007 it seems likely that the present population size is between 30 and 40 pairs! Line transects indicate a 64% increase between 2003/2004 and 2007, and numbers have increased both in the local area and in the regional model area outside of this.

Stock dove *Columba oenas* Skogsduva (Sw. Red List)

A species that we do not have very good data on. Line transects show a decrease in the regional model area, but stable numbers within the local area. Additional observations, made during other field work, indicate stable numbers during later years. Earlier estimates of the population size (20 pairs) hence remain unchanged.

Black woodpecker *Drycopus martius* Spillkråka (EU Annex 1)

Good numbers are recorded during the line transects and these show an increase of similar magnitude in both the local area and the regional model area as a whole between 2003/2004 and 2007. Total population size is now probably well over 30 pairs; the earlier estimate was 25 pairs.

Wood lark *Lullula arborea* Trädlärka (EU Annex 1)

The wood lark was originally selected for annual monitoring in the area, but it turned out to be too resource-demanding to cover also this species in a detailed way. It is however well covered by the line transects and these indicate an increase during later years. Compared to 2003/2004 numbers has increased both in the local area and in the regional model area. 36 territories were registered in 2007, compared to the earlier maximum of 31 territories. Since not all parts of the regional model area were covered in 2007, total population size is estimated to between 40 and 50 territories.

Skylark *Alauda arvensis* Sånglärka (Sw. Red List)

Not well covered by the line transects at all since most territories are to be found in parts of the regional model area not covered both in 2003/2004 and 2007. The line transects show stable numbers, but this is only based on one bird in the earlier years and one bird in 2007.

Wheatear *Oenanthe oenanthe* Stenskvätta (Sw. Red List)

Very few birds registered during the line transects, but these observation indicate a decrease. Surveys from the archipelago (holding most of the pairs in the area) do however show stable numbers.

Grashopper warbler *Locustella naevia* Gräshoppsångare (Sw. Red List)

None recorded in 2007, but yearly numbers do usually vary between 0 and one.

Red-breasted flycatcher *Ficedula parva* Mindre flugsnappare (Sw. Red List, Annex 1)

Two singing males registered in 2007 of this very hard-censused bird is a good figure. Recorded numbers are too low to allow any trend estimate. Nothing do however indicate a decrease in numbers, if anything more birds have been recorded in later years.

Marsh tit *Parus palustris* Entita (Sw. Red List)

Well covered by the line transects and recorded numbers indicate a decrease (–28%) from 2003/2004 to 2007. Actually this is one of the few species recorded in relatively good numbers that show a negative population development in the area (see the section on general population changes). Compared to 2002 however, the numbers for 2007 are of similar magnitude and the changes between the two later surveys may be within the normal variation. On the other hand this is a species showing a negative national population trend for a long time.

Nutcracker *Nucifraga caryocatactes* Nötkråka (Sw. Red List)

Very few birds recorded during the line transects, but registered numbers indicate a stable population. Further indications in the same direction are given by observations done during other field work.

Linnet *Carduelis cannabina* Hämpling (Sw. Red List)

Not recorded at all in 2007 and the line transects do indicate a decrease in numbers. If so, this unfortunately follows the overall national trend.

Scarlet Rosefinch *Carpodacus erythrinus* Rosenfink (Sw. Red List)

Few birds recorded but the situation seems to be rather stable in the area.

6 Discussion

This is now the fifth report evaluating possible effects from the site investigations on the breeding bird fauna in Simpevarp. As indicated already in earlier reports there have been very few signs of any negative effects on the birds of Simpevarp during later years. The results from 2007 emphasize this statement even more. This year both the bird fauna in general as well as a set of selected listed species were covered. Population trends of most species in the area are positive and there are actually few things to discuss more in detail in this section. Looking at the eight listed species selected for detailed monitoring, six of these have increased in numbers through the site investigation period. Only two species showed a decrease in the last or last two years, but these decreases are probably not related to the site investigations at all (nest sites/territories being deserted are situated well away from any site investigation activity). Of other listed species only one shows a negative population development that may be connected to the site investigations, the black grouse has decreased in numbers within the local area but increased or remained stable in the regional model area. Still, this by no means shows that the site investigations are the reason behind this decrease. Furthermore, two species (lesser spotted woodpecker and nightjar) that in earlier years showed tendencies of avoiding parts of the local area where some of the most intensive parts of the site investigations were conducted showed distributions in 2007 that were very much as the ones recorded before the site investigations started.

It is interesting to note the close resemblance between patterns recorded in Simpevarp and patterns in the whole of Sweden when it comes to general population changes of the breeding bird fauna. There has been a general increase in bird numbers in Sweden during later years and the same has been registered in Simpevarp, both in the local area and in the regional model area.

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Appendix

1. List of all listed (Swedish Red List, SRL, and EU Birds Directive Annex 1, EU) bird species, possibly breeding in Simpevarp and recorded during 2002–2007. The listing follow the updated version of the Red List /Gärdenfors 2005/.

English name	Swedish name	Latin name	Listing	Estimated population size (pairs/territories) in Simpevarp (regional model area)
Whooper swan	Sångsvan	<i>Cygnus cygnus</i>	EU	3–4
Shoveler	Skedand	<i>Anas clypeata</i>	SRL	0–1
Velvet scoter	Svärta	<i>Melanitta fusca</i>	SRL	5
Hazelhen	Järpe	<i>Bonasia bonasia</i>	EU	10
Black grouse	Orre	<i>Tetrao tetrix</i>	EU	20
Capercaillie	Tjäder	<i>Tetrao urogallus</i>	EU	10–15
Black-throated diver	Storlom	<i>Gavia arctica</i>	EU	2
Bittern	Rördrom	<i>Botaurus stellaris</i>	SRL, EU	1
Honey buzzard	Bivråk	<i>Pernis apivorus</i>	SRL, EU	10–12
White-tailed eagle	Havsörn	<i>Haliaeetus albicilla</i>	SRL, EU	4
Marsh harrier	Brun kärrhök	<i>Circus aeruginosus</i>	EU	2
Osprey	Fiskgjuse	<i>Pandion haliaetus</i>	EU	2
Crane	Trana	<i>Grus grus</i>	EU	30–40
Turnstone	Roskarl	<i>Arenaria interpres</i>	SRL	5
Common tern	Fisktärna	<i>Sterna hirundo</i>	EU	30
Arctic tern	Silvertärna	<i>Sterna paradisaea</i>	EU	180
Caspian tern	Skräntärna	<i>Sterna caspia</i>	SRL, EU	1
Stock dove	Skogsduva	<i>Columba oenas</i>	SRL	20
Pygmy owl	Sparvuggla	<i>Glaucidium passerinum</i>	EU	13
Tengmalms owl	Pärluggla	<i>Aegolius funereus</i>	EU	0–2
Eagle owl	Berguv	<i>Bubo bubo</i>	SRL, EU	3
Nightjar	Nattskärna	<i>Caprimulgus europaeus</i>	SRL, EU	65–150
Wryneck	Göktyta	<i>Jynx torquilla</i>	SRL	45–50
Black woodpecker	Spillkråka	<i>Dryocopus martius</i>	EU	> 30
Lesser spotted woodpecker	Mindre hackspett	<i>Dendrocopus minor</i>	SRL	32
Wood lark	Trädlärka	<i>Lullula arborea</i>	EU	40–50
Skylark	Sånglärka	<i>Alauda arvensis</i>	SRL	10
Wheatear	Stenskvätta	<i>Oenanthe oenanthe</i>	SRL	25
Grashopper warbler	Gräshoppsångare	<i>Locustella naevia</i>	SRL	0–1
Red-breasted flycatcher	Mindre flugsnappare	<i>Ficedula parva</i>	SRL, EU	5
Marsh tit	Entita	<i>Parus palustris</i>	SRL	350–400
Red-backed shrike	Törnskata	<i>Lanius collurio</i>	SRL, EU	150–200
Nutcracker	Nötkråka	<i>Nucifraga caryocatactes</i>	SRL	10
Linnet	Hämpling	<i>Carduelis cannabina</i>	SRL	?–20
Scarlet rosefinch	Rosenfink	<i>Carpodacus erythrinus</i>	SRL	20

2. Numbers of birds and density per species during line transects in 2003/2004 (combined) and 2007 in Simpevarp. Species are ordered after abundance.

Species	Art	No. of birds 2003+2004	No. of birds 2007	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Willow warbler	Lövsångare	1,469	1,940	8.414	13.585
Chaffinch	Bofink	1,846	1,905	10.573	13.340
Robin	Rödhake	894	1,102	5.120	7.717
Song thrush	Taltrast	576	698	3.299	4.888
Great tit	Talgoxe	582	695	3.333	4.867
Blackbird	Koltrast	595	648	3.408	4.538
Tree pipit	Trädpiplärka	306	557	1.753	3.901
Wood pigeon	Ringduva	439	525	2.514	3.676
Black-headed gull	Skrattmås	73	349	0.418	2.444
Goldcrest	Kungsfågel	360	309	2.062	2.164
Blue tit	Blåmes	201	280	1.151	1.961
Crossbill	Mindre korsnäbb	76	279	0.435	1.954
Blackcap	Svarthätta	135	260	0.773	1.821
Garden warbler	Trädgårdssångare	137	251	0.785	1.758
Cuckoo	Gök	163	223	0.934	1.562
Yellowhammer	Gulspurv	245	198	1.403	1.387
Hooded crow	Kråka	201	190	1.151	1.331
Greenfinch	Grönfink	187	187	1.071	1.310
Great spotted woodpecker	Större hackspett	127	165	0.727	1.155
Herring gull	Gråtrut	145	159	0.830	1.113
Nuthatch	Nötväcka	124	158	0.710	1.106
Wren	Gärdsmyg	144	151	0.825	1.057
Starling	Stare	213	143	1.220	1.001
Wood warbler	Grönsångare	98	139	0.561	0.973
Pied flycatcher	Svartvit flugsnappare	87	136	0.498	0.952
Crested tit	Tofsmes	144	135	0.825	0.945
Grey heron	Häger	102	134	0.584	0.938
Dunnock	Järnsparv	155	124	0.888	0.868
Swift	Tornseglare	109	108	0.624	0.756
Willow tit	Tallita	37	99	0.212	0.693
Redstart	Rödstjärt	57	90	0.326	0.630
Coal tit	Svartmes	125	89	0.716	0.623
Lesser whitethroat	Ärtsångare	63	83	0.361	0.581
Siskin	Grönsiska	435	80	2.491	0.560
Jay	Nötskrika	137	80	0.785	0.560
Pied wagtail	Sädesärla	104	76	0.596	0.532
Barn swallow	Ladusvala	60	74	0.344	0.518
Raven	Korp	80	73	0.458	0.511
Spotted flycatcher	Grå flugsnappare	42	72	0.241	0.504
Mute swan	Knölsvan	79	69	0.452	0.483
Treecreeper	Trädkrypare	31	69	0.178	0.483
Mallard	Gräsand	70	67	0.401	0.469

2. continued

Species	Art	No. of birds 2003+2004	No. of birds 2007	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Crane	Trana	46	62	0.263	0.434
Common gull	Fiskmås	67	60	0.384	0.420
Goosander	Storskrake	72	58	0.412	0.406
Reed warbler	Rörsångare	29	57	0.166	0.399
Marsh tit	Entita	91	52	0.521	0.364
Long-tailed tit	Stjärtmes	20	52	0.115	0.364
Greylag goose	Grågås	71	46	0.407	0.322
Green sandpiper	Skogssnäppa	54	46	0.309	0.322
Crested grebe	Skäggdopping	48	45	0.275	0.315
Reed bunting	Sävspurv	48	45	0.275	0.315
Green woodpecker	Gröngöling	82	44	0.470	0.308
Black woodpecker	Spillkråka	32	42	0.183	0.294
Cormorant	Storskarv	122	42	0.699	0.294
House martin	Hussvala	11	39	0.063	0.273
Tufted duck	Vigg	52	37	0.298	0.259
Common sandpiper	Drillsnäppa	27	36	0.155	0.252
Goldeneye	Knipa	41	36	0.235	0.252
Pheasant	Fasan	56	34	0.321	0.238
Tree sparrow	Pilfink	34	34	0.195	0.238
Magpie	Skata	16	33	0.092	0.231
Mistle thrush	Dubbeltrast	24	31	0.137	0.217
Redwing	Rödvingetrast	24	31	0.137	0.217
Common tern	Fisktärna	23	26	0.132	0.182
Fieldfare	Björktrast	56	25	0.321	0.175
Jackdaw	Kaja	16	24	0.092	0.168
Common whitethroat	Törnsångare	21	22	0.120	0.154
Red-backed shrike	Törnskata	16	21	0.092	0.147
Snipe	Enkelbeckasin	41	18	0.235	0.126
Wood lark	Trädlärka	21	18	0.120	0.126
Wryneck	Göktyta	7	15	0.040	0.105
Thrush nightingale	Näktergal	2	13	0.011	0.091
Bullfinch	Domherre	16	12	0.092	0.084
Great black-backed gull	Havstrut	29	12	0.166	0.084
Black grouse	Orre	15	10	0.086	0.070
Whooper swan	Sångsvan	6	8	0.034	0.056
House sparrow	Gråspurv	30	7	0.172	0.049
Lesser spotted woodpecker	Mindre hackspett	9	7	0.052	0.049
Chiffchaff	Gransångare	5	6	0.029	0.042
Buzzard	Ormvråk	20	6	0.115	0.042
Arctic tern	Silvertärna	30	6	0.172	0.042
Capercaillie	Tjäder	2	6	0.011	0.042
Teal	Kricka	10	5	0.057	0.035

2. continued

Species	Art	No. of birds 2003+2004	No. of birds 2007	Density 2003-2004 (birds/km)	Density 2007 (birds/km)
Osprey	Fiskgjuse	12	4	0.069	0.028
Canada goose	Kanadagås	4	4	0.023	0.028
Woodcock	Morkulla	14	4	0.080	0.028
Coot	Sothöna	1	4	0.006	0.028
Feral pigeon	Tamduva	0	4	0.000	0.028
Winchat	Buskskvätta	7	3	0.040	0.021
Icterine warbler	Härmsångare	0	3	0.000	0.021
Scarlet rosefinch	Rosenfink	5	3	0.029	0.021
Honey buzzard	Bivråk	0	2	0.000	0.014
Goshawk	Duvhök	1	2	0.006	0.014
Tawny owl	Kattuggla	0	2	0.000	0.014
Red-breasted flycatcher	Mindre flugsnappare	1	2	0.006	0.014
Nutcracker	Nötkråka	3	2	0.017	0.014
Stock dove	Skogsduva	4	2	0.023	0.014
Rock pipit	Skärpiplärka	1	2	0.006	0.014
Red-breasted merganser	Småskrake	0	2	0.000	0.014
Hawfinch	Stenknäck	8	2	0.046	0.014
Lapwing	Tofsvipa	0	2	0.000	0.014
Water rail	Vattenrall	0	2	0.000	0.014
Marsh harrier	Brun kärrhök	0	1	0.000	0.007
White-tailed eagle	Havsörn	0	1	0.000	0.007
Hazelhen	Järpe	2	1	0.011	0.007
Nightjar	Nattskärja	2	1	0.011	0.007
Redshank	Rödbena	1	1	0.006	0.007
Bittern	Rördrom	0	1	0.000	0.007
Caspian tern	Skräntärna	17	1	0.097	0.007
Little grebe	Smådopping	0	1	0.000	0.007
Sparrowhawk	Sparvhök	5	1	0.029	0.007
Wheatear	Stenskvätta	9	1	0.052	0.007
Parrot crossbill	Större korsnäbb	0	1	0.000	0.007
Black redstart	Svart rödstjärt	0	1	0.000	0.007
Skylark	Sånglärka	1	1	0.006	0.007
Eider	Ejder	5	0	0.029	0.000
Shelduck	Gravand	2	0	0.011	0.000
Long-eared owl	Hornuggla	1	0	0.006	0.000
Linnet	Hämpling	8	0	0.046	0.000
Ortolan bunting	Ortolansparv	1	0	0.006	0.000
Black-throated diver	Storlom	1	0	0.006	0.000
Oystercatcher	Strandskata	1	0	0.006	0.000
Sedge warbler	Sävsångare	2	0	0.011	0.000
Meadow pipit	Ångsplärka	4	0	0.023	0.000
Total	Total	12,823	14,462	73.4	101.3

3. Numbers of birds and density per species during line transects in the local area in 2002, 2003/2004 (combined) and 2007 in Simpevarp. Species are ordered after abundance in 2007

Bird species	Fågelart	No. of birds 2002	No. of birds 2003/2004	No. of birds 2007	Density 2002 (birds/km)	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Chaffinch	Bofink	273	1,073	1,032	6.149	10.540	14.274
Willow warbler	Lövsångare	257	558	858	5.788	5.481	11.867
Robin	Rödhake	66	622	702	1.486	6.110	9.710
Song thrush	Taltrast	62	411	405	1.396	4.037	5.602
Great tit	Talgoxe	60	332	373	1.351	3.261	5.159
Blackbird	Koltrast	87	353	334	1.959	3.468	4.620
Black-headed gull	Skattmås	0	63	332	0.000	0.619	4.592
Wood pigeon	Ringduva	71	235	260	1.599	2.308	3.596
Tree pipit	Trädpiplärka	52	97	236	1.171	0.953	3.264
Goldcrest	Kungsfågel	18	241	183	0.405	2.367	2.531
Blue tit	Blåmes	24	145	176	0.541	1.424	2.434
Herring gull	Gråtrut	5	111	117	0.113	1.090	1.618
Hooded crow	Kråka	18	113	114	0.405	1.110	1.577
Cuckoo	Gök	18	39	113	0.405	0.383	1.563
Greenfinch	Grönfink	15	141	107	0.338	1.385	1.480
Garden warbler	Trädgårdssångare	32	56	106	0.721	0.550	1.466
Blackcap	Svarthätta	50	59	104	1.126	0.580	1.438
Crossbill	Mindre korsnäbb	13	41	99	0.293	0.403	1.369
Grey heron	Häger	5	77	98	0.113	0.756	1.355
Yellowhammer	Gulspurv	46	167	97	1.036	1.640	1.342
Great spotted woodpecker	Större hackspett	6	94	95	0.135	0.923	1.314
Nuthatch	Nötväcka	14	84	85	0.315	0.825	1.176
Starling	Stare	12	182	84	0.270	1.788	1.162
Wren	Gärdsmyg	23	102	80	0.518	1.002	1.107
Dunnock	Järnsparv	31	98	72	0.698	0.963	0.996
Unidentified crossbill	Korsnäbb	9	23	65	0.203	0.226	0.899
Willow tit	Talltit	14	27	62	0.315	0.265	0.858
Crested tit	Tofsmes	21	77	62	0.473	0.756	0.858
Coal tit	Svartmes	12	80	60	0.270	0.786	0.830
Wood warbler	Grönsångare	7	37	58	0.158	0.363	0.802
Swift	Tornseglare	89	74	55	2.005	0.727	0.761
Mallard	Gräsand	7	44	51	0.158	0.432	0.705
Mute swan	Knölsvan	1	41	48	0.023	0.403	0.664
Pied flycatcher	Svartvit flugsnappare	19	17	47	0.428	0.167	0.650
Common gull	Fiskmås	1	52	46	0.023	0.511	0.636
Siskin	Grönsiska	26	315	46	0.586	3.094	0.636
White wagtail	Sädesärta	22	78	45	0.495	0.766	0.622
Jay	Nötskrika	15	82	41	0.338	0.806	0.567
Goosander	Storskrake	1	39	39	0.023	0.383	0.539
Cormorant	Storskarv	0	106	38	0.000	1.041	0.526
Greylag goose	Grågås	32	32	37	0.721	0.314	0.512
Raven	Korp	6	51	37	0.135	0.501	0.512

3. continued

Bird species	Fågelart	No. of birds 2002	No. of birds 2003/2004	No. of birds 2007	Density 2002 (birds/km)	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Lesser whitethroat	Ärtsångare	20	17	37	0.450	0.167	0.512
Treecreeper	Trädkrypare	4	25	36	0.090	0.246	0.498
Redstart	Rödstart	3	13	34	0.068	0.128	0.470
Goldeneye	Knipa	0	28	33	0.000	0.275	0.456
Marsh tit	Entita	1	58	32	0.023	0.570	0.443
Crane	Trana	8	17	31	0.180	0.167	0.429
Tree sparrow	Pilfink	1	34	30	0.023	0.334	0.415
Long-tailed tit	Stjärtmes	2	11	30	0.045	0.108	0.415
Redwing	Rödvingetrast	0	23	29	0.000	0.226	0.401
Swallow	Ladusvala	18	24	28	0.405	0.236	0.387
Green woodpecker	Gröngöling	11	58	27	0.248	0.570	0.373
Common sandpiper	Drillsnäppa	1	13	25	0.023	0.128	0.346
Common tern	Fisktärna	1	18	25	0.023	0.177	0.346
Pheasant	Fasan	14	37	23	0.315	0.363	0.318
Reed warbler	Rörsångare	1	6	23	0.023	0.059	0.318
Crested grebe	Skäggdopping	0	33	23	0.000	0.324	0.318
Green sandpiper	Skogssnäppa	5	37	22	0.113	0.363	0.304
Magpie	Skata	2	10	21	0.045	0.098	0.290
Mistle thrush	Dubbeltrast	3	19	20	0.068	0.187	0.277
Spotted flycatcher	Grå flugsnappare	42	32	20	0.946	0.314	0.277
House martin	Hussvala	10	3	16	0.225	0.029	0.221
Reed bunting	Sävspurv	2	25	16	0.045	0.246	0.221
Black woodpecker	Spillkråka	6	14	15	0.135	0.138	0.207
Tufted duck	Vigg	0	5	15	0.000	0.049	0.207
Jackdaw	Kaja	0	15	14	0.000	0.147	0.194
Red-backed shrike	Törnskata	13	8	10	0.293	0.079	0.138
Fieldfare	Björktrast	9	48	9	0.203	0.472	0.124
Bullfinch	Domherre	0	11	8	0.000	0.108	0.111
Snipe	Enkelbeckasin	9	20	8	0.203	0.196	0.111
Thrush nightingale	Näktergal	3	0	8	0.068	0.000	0.111
Wood lark	Trädlärka	7	10	8	0.158	0.098	0.111
Wryneck	Göktyta	2	5	7	0.045	0.049	0.097
Great black-backed gull	Havstrut	1	18	7	0.023	0.177	0.097
Common white-throat	Törnsångare	7	13	7	0.158	0.128	0.097
Lesser spotted woodpecker	Mindre hackspett	0	6	5	0.000	0.059	0.069
Buzzard	Ormvråk	4	13	5	0.090	0.128	0.069
Arctic tern	Silvertärna	0	13	5	0.000	0.128	0.069
House sparrow	Gråspurv	5	27	4	0.113	0.265	0.055
Canada goose	Kanadagås	0	0	4	0.000	0.000	0.055
Coot	Sothöna	0	1	4	0.000	0.010	0.055

3. continued

Bird species	Fågelart	No. of birds 2002	No. of birds 2003/2004	No. of birds 2007	Density 2002 (birds/km)	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Feral pigeon	Tamduva	0	0	4	0.000	0.000	0.055
Teal	Kricka	0	10	3	0.000	0.098	0.041
Scarlet rosefinch	Rosenfink	0	5	3	0.000	0.049	0.041
Chiffchaff	Gransångare	0	2	2	0.000	0.020	0.028
Woodcock	Morkulla	0	7	2	0.000	0.069	0.028
Rock pipit	Skärpiplärka	0	1	2	0.000	0.010	0.028
Red-breasted merganser	Småskrake	0	0	2	0.000	0.000	0.028
Whooper swan	Sångsvan	0	2	2	0.000	0.020	0.028
Goshawk	Duvhök	0	1	1	0.000	0.010	0.014
Osprey	Fiskgjuse	0	7	1	0.000	0.069	0.014
Icterine warbler	Härmsångare	0	0	1	0.000	0.000	0.014
Hazelhen	Järpe	0	2	1	0.000	0.020	0.014
Tawny owl	Kattuggla	1	0	1	0.023	0.000	0.014
Red-breasted flycatcher	Mindre flug- snappare	0	0	1	0.000	0.000	0.014
Nutcracker	Nötkråka	0	3	1	0.000	0.029	0.014
Redshank	Rödbena	0	1	1	0.000	0.010	0.014
Stock dove	Skogsduva	0	1	1	0.000	0.010	0.014
Caspian tern	Skräntärna	0	10	1	0.000	0.098	0.014
Sparrowhawk	Sparvhök	0	4	1	0.000	0.039	0.014
Hawfinch	Stenknäck	3	6	1	0.068	0.059	0.014
Black redstart	Svart rödstjärt	0	0	1	0.000	0.000	0.014
Skylark	Sånglärka	0	1	1	0.000	0.010	0.014
Capercaillie	Tjäder	0	0	1	0.000	0.000	0.014
Sand martin	Backsvala	1	0	0	0.023	0.000	0.000
Honey	Bivråk	1	0	0	0.023	0.000	0.000
Winchat	Buskskvätta	0	3	0	0.000	0.029	0.000
Eider	Ejder	0	2	0	0.000	0.020	0.000
Grasshopper warbler	Gräshoppsån- gare	1	0	0	0.023	0.000	0.000
Linnet	Hämpling	0	5	0	0.000	0.049	0.000
Marsh warbler	Kärrsångare	1	0	0	0.023	0.000	0.000
Hobby	Lärkfalk	2	0	0	0.045	0.000	0.000
Black grouse	Orre	1	5	0	0.023	0.049	0.000
Wheatear	Stenskvätta	0	8	0	0.000	0.079	0.000
Black-throated diver	Storlom	0	1	0	0.000	0.010	0.000
Oystercatcher	Strandskata	0	1	0	0.000	0.010	0.000
Meadow pipit	Ängspiplärka	0	4	0	0.000	0.039	0.000
Total		1,766	7,529	7,858	39.77	73.96	108.69

4. Numbers of birds and density per species during line transects in the regional model area, excluding the local area, in 2002, 2003/2004 (combined) and 2007 in Simpevarp. Species are ordered after abundance in 2007.

Species	Art	No. of birds 2002	No. of birds 2003–2004	No. of birds 2007	Density 2002 (birds/km)	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Willow warbler	Lövsångare	436	823	1,082	6.823	11.305	15.348
Chaffinch	Bofink	398	675	873	6.228	9.272	12.383
Robin	Rödhake	141	249	400	2.207	3.420	5.674
Great tit	Talgoxe	92	225	322	1.440	3.091	4.567
Tree pipit	Trädpiplärka	110	171	321	1.721	2.349	4.553
Blackbird	Koltrast	138	211	314	2.160	2.898	4.454
Song thrush	Taltrast	121	150	293	1.894	2.060	4.156
Wood pigeon	Ringduva	91	187	265	1.424	2.569	3.759
Crossbill	Mindre korsnäbb	136	26	180	2.129	0.358	2.554
Blackcap	Svarthätta	24	66	156	0.376	0.907	2.213
Garden warbler	Trädgårdssångare	47	79	145	0.736	1.085	2.057
Goldcrest	Kungsfågel	21	98	126	0.329	1.346	1.787
Cuckoo	Gök	54	107	110	0.845	1.470	1.560
Blue tit	Blåmes	37	55	104	0.579	0.755	1.475
Yellowhammer	Gulspurv	44	67	101	0.689	0.920	1.433
Pied flycatcher	Svartvit flugsnappare	19	64	89	0.297	0.879	1.262
Wood warbler	Grönsångare	15	56	81	0.235	0.769	1.149
Greenfinch	Grönfink	10	41	80	0.156	0.563	1.135
Hooded crow	Kråka	41	80	76	0.642	1.099	1.078
Nuthatch	Nötväcka	9	39	73	0.141	0.536	1.035
Crested tit	Tofsmes	36	53	73	0.563	0.728	1.035
Wren	Gärdsmyg	39	38	71	0.610	0.522	1.007
Great spotted woodpecker	Större hackspett	16	32	70	0.250	0.440	0.993
Starling	Stare	40	28	59	0.626	0.385	0.837
Redstart	Rödstart	4	38	56	0.063	0.522	0.794
Swift	Tornseglare	28	35	53	0.438	0.481	0.752
Spotted flycatcher	Grå flugsnappare	14	10	52	0.219	0.137	0.738
Dunnock	Järnsparv	28	44	52	0.438	0.604	0.738
Barn swallow	Ladusvala	41	33	46	0.642	0.453	0.652
Lesser whitethroat	Ärtsångare	27	43	46	0.423	0.591	0.652
Herring gull	Gråtrut	2	34	42	0.031	0.467	0.596
Jay	Nötskrika	22	46	39	0.344	0.632	0.553
Willow tit	Talltita	18	5	37	0.282	0.069	0.525
Grey heron	Häger	0	25	36	0.000	0.343	0.511
Raven	Korp	18	27	36	0.282	0.371	0.511
Siskin	Grönsiska	54	107	34	0.845	1.470	0.482
Reed warbler	Rörsångare	0	23	34	0.000	0.316	0.482
Treecreeper	Trädkrypare	7	6	33	0.110	0.082	0.468
Pied wagtail	Sädesärta	19	24	31	0.297	0.330	0.440
Crane	Trana	20	24	31	0.313	0.330	0.440
Coal tit	Svartmes	25	41	29	0.391	0.563	0.411

4. Continued

Species	Art	No. of birds 2002	No. of birds 2003–2004	No. of birds 2007	Density 2002 (birds/km)	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Reed bunting	Sävspurv	1	21	29	0.016	0.288	0.411
Black woodpecker	Spillkråka	10	15	27	0.156	0.206	0.383
Green sandpiper	Skogssnäppa	6	12	24	0.094	0.165	0.340
House martin	Hussvala	18	8	23	0.282	0.110	0.326
Crested grebe	Skäggdopping	0	15	22	0.000	0.206	0.312
Long-tailed tit	Stjärtmes	1	7	22	0.016	0.096	0.312
Tufted duck	Vigg	0	47	22	0.000	0.646	0.312
Mute swan	Knölsvan	0	38	21	0.000	0.522	0.298
Marsh tit	Entita	18	31	20	0.282	0.426	0.284
Goosander	Storskrake	0	33	19	0.000	0.453	0.270
Green woodpecker	Gröngöling	27	22	17	0.423	0.302	0.241
Black-headed gull	Skrattmåås	0	10	17	0.000	0.137	0.241
Fieldfare	Björktrast	9	7	16	0.141	0.096	0.227
Mallard	Gräsand	4	26	16	0.063	0.357	0.227
Common whitethroat	Törnsångare	2	7	15	0.031	0.096	0.213
Common gull	Fiskmåås	0	15	14	0.000	0.138	0.199
Magpie	Skata	1	6	12	0.016	0.082	0.170
Common sandpiper	Drillsnäppa	0	14	11	0.000	0.192	0.156
Mistle thrush	Dubbeltrast	8	4	11	0.125	0.055	0.156
Pheasant	Fasan	3	17	11	0.047	0.234	0.156
Red-backed shrike	Törnskata	14	8	11	0.219	0.110	0.156
Snipe	Enkelbeckasin	9	17	10	0.141	0.234	0.142
Jackdaw	Kaja	0	1	10	0.000	0.014	0.142
Black grouse	Orre	4	9	10	0.063	0.124	0.142
Wood lark	Trädläarka	2	9	10	0.031	0.124	0.142
Greylag goose	Grågås	0	39	9	0.000	0.536	0.128
Wryneck	Göktyta	2	2	8	0.031	0.027	0.113
Whooper swan	Sångsvan	1	2	6	0.016	0.027	0.085
Great black-backed gull	Havstrut	0	11	5	0.000	0.151	0.071
Thrush nightingale	Näktergal	0	2	5	0.000	0.027	0.071
Capercaillie	Tjäder	2	2	5	0.031	0.027	0.071
Bullfinch	Domherre	2	5	4	0.031	0.069	0.057
Chiffchaff	Gransångare	0	3	4	0.000	0.041	0.057
Tree sparrow	Pilfink	3	0	4	0.047	0.000	0.057
Cormorant	Storskarv	0	16	4	0.000	0.220	0.057
Winchat	Buskskvätta	5	3	3	0.078	0.041	0.043
Osprey	Fiskgjuse	0	5	3	0.000	0.069	0.043
House sparrow	Gråspurv	3	3	3	0.047	0.041	0.043
Goldeneye	Knipa	1	13	3	0.016	0.179	0.043
Honey buzzard	Bivråk	0	0	2	0.000	0.000	0.028
Icterine warbler	Härmsångare	0	0	2	0.000	0.000	0.028

4. Continued

Species	Art	No. of birds 2002	No. of birds 2003–2004	No. of birds 2007	Density 2002 (birds/km)	Density 2003–2004 (birds/km)	Density 2007 (birds/km)
Teal	Kricka	0	0	2	0.000	0.000	0.028
Lesser spotted woodpecker	Mindre hackspett	0	3	2	0.000	0.041	0.028
Woodcock	Morkulla	1	7	2	0.016	0.096	0.028
Redwing	Rödvingetrast	2	1	2	0.031	0.014	0.028
Lapwing	Tofsvipa	0	0	2	0.000	0.000	0.028
Water rail	Vattenrall	0	0	2	0.000	0.000	0.028
Marsh harrier	Brun kärrhök	1	0	1	0.016	0.000	0.014
Goshawk	Duvhök	1	0	1	0.016	0.000	0.014
Common tern	Fisktärna	0	10	1	0.000	0.069	0.014
White-tailed eagle	Havsörn	3	0	1	0.047	0.000	0.014
Tawny owl	Kattuggla	0	0	1	0.000	0.000	0.014
Red-breasted flycatcher	Mindre flugsnappare	0	0	1	0.000	0.000	0.014
Nightjar	Nattskärna	0	2	1	0.000	0.027	0.014
Nutcracker	Nötkråka	0	0	1	0.000	0.000	0.014
Buzzard	Ormvråk	10	7	1	0.156	0.096	0.014
Bittern	Rördrom	0	0	1	0.000	0.000	0.014
Arctic tern	Silvertärna	0	17	1	0.000	0.234	0.014
Stock dove	Skogsduva	3	3	1	0.047	0.041	0.014
Little grebe	Smådopping	0	0	1	0.000	0.000	0.014
Hawfinch	Stenknäck	0	2	1	0.000	0.027	0.014
Wheatear	Stenskvätta	1	1	1	0.016	0.014	0.014
Parrot crossbill	Större korsnäbb	0	0	1	0.000	0.000	0.014
Eider	Ejder	0	3	0	0.000	0.041	0.000
Shelduck	Gravand	0	2	0	0.000	0.027	0.000
Long-eared owl	Hornuggla	0	1	0	0.000	0.014	0.000
Linnet	Hämpling	0	3	0	0.000	0.041	0.000
Canada goose	Kanadagås	0	2	0	0.000	0.027	0.000
Ortolan bunting	Ortolansparv	0	1	0	0.000	0.014	0.000
Scarlet rosefinch	Rosenfink	1	0	0	0.016	0.000	0.000
Caspian tern	Skräntärna	0	7	0	0.000	0.096	0.000
Goldfinch	Steglits	1	0	0	0.016	0.000	0.000
Sedge warbler	Sävsångare	0	2	0	0.000	0.027	0.000
Total		2,622	4,764	6,669	41.0	65.4	94.6