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Oskarshamn site investigations

Bird monitoring in Simpevarp 2002–2004

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April 2005

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This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the author and do not necessarily coincide with those of the client.

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Abstract

This report is a summary of the studies of breeding birds in Simpevarp 2002–2004. The report aims at evaluating possible impacts from the ongoing site investigations in the area, conducted by SKB, on local bird life. The studies cover all breeding bird species, but special emphasis is given to species listed in the national Swedish Red list and/or the European Unions Birds Directive (Annex 1). The non-listed common bird fauna in the Candidate Area has been censused annually during the three years by line transects and point counts. Two smaller (30 ha) areas around drilling sites were surveyed in amore detailed way, by territory mapping, in 2003–2004. Listed species were monitored in the whole Regional Model Area by a combination of methods based on visits to known nest sites/territories and searches of species specific suitable habitats.

No impact from the site investigations what so ever was recorded on the non-listed common bird fauna. Both the number of species and individuals/territories were similar (or even higher) in 2004 compared to the earlier years. Instead changes in numbers followed large-scale patterns found in the whole eastern Götaland. No large-scale impact was recorded for listed species either. Again, most species showed similar (or higher) numbers and breeding success in 2004 compared to 2002–2003. A few species may however be negatively affected by the site investigations. Breeding success of Eagle owls in the area is low, but it is unclear whether this is a result of increased disturbance from the site investigations or not. Nightjars tend to avoid areas with too high levels of human activity (i.e. active drilling sites). But this did not result in any decrease in overall population size, but just in a small-scale change in distribution.

Sammanfattning

Denna rapport sammanfattar förändringar i fågelfaunan mellan 2002 och 2004 i Simpevarp. Syftet är att utvärdera den eventuella påverkan som SKB:s platsundersökningar kan ha på de häckande fåglarnas numerär och i vissa fall häckningsframgång. Rapporten behandlar den total fågelfaunan, dvs inkluderande även talrika arter, men särskild uppmärksamhet ägnas åt ett urval av de arter som förekommer i området och är upptagna i den Svenska Rödlistan och/eller i EU:s Fågelskyddsdirektiv Annex 1. Under de tre åren har den allmänna fågelfaunan följts genom linje- och punkttaxeringar inom Kandidatområdet. Den allmänna fågelfaunan har också studerats mer detaljerat genom revirkartering i mindre områden kring borrhplatser under 2003 och 2004. Här redovisas resultat och eventuella förändringar i fågelfaunan från två borrhplatser (Ävrö och Hålö), eftersom det endast är vid dessa två som revirkarteringar genomförts under mer än ett enskilt år. Listade arter har följts upp i hela det Regionala modellområdet genom särskilt eftersök. De resultat som presenteras i denna rapport ska ses som indikationer över eventuell korttidspåverkan på fågelfaunan. Vad som händer i ett längre tidsperspektiv är ännu för tidigt att uttala sig om. En utvärdering av eventuella långtidseffekter kräver en betydligt längre undersökningsperiod.

För fågelfaunan i stort kunde ingen större påverkan alls konstateras från de pågående platsundersökningarna. Både antalet häckande arter och deras numerär inom Kandidatområdet var likartat eller högre under 2004 jämfört med närmast föregående år. Samtliga tre använda metoder (linjetaxering, punkttaxering och revirkartering) visade på relativt samstämmiga resultat även om det skilde en del mellan metoderna i de noterade förändringarnas storlek. En jämförelse med resultat insamlade från hela östra Götaland visade att utvecklingen i Simpevarp var likartad den som registrerades i ett större regionalt perspektiv. Inte ens på en mycket lokal skala kunde några större förändringar i artantal eller antal revir noteras i borrhplatsernas närhet efter genomförd borrhningsaktivitet. Antalet arter och par var högre under 2004 (efter borrhning) jämfört med 2003 (innan borrhning) men skillnaderna var ej statistiskt säkerställda. Det fanns inte heller några tecken på att den geografiska fördelningen av fågelrevir påverkades av platsundersökningarna inom dessa områden, dvs fåglarna undvek inte de mest störda delarna kring borrhplatserna.

När det gäller de listade arterna har ingen allmän, storskalig påverkan skett inom det Regionala modellområdet eller inom Kandidatområdet. De flesta studerade listade arter uppvisar samma, eller t o m något högre numerär under 2004 jämfört med 2002–2003. Ett fåtal arter visar möjligen tendenser till att påverkas. Häckningsframgången hos berguv är fortsatt låg inom området, men det är mycket osäkert om detta över huvudtaget har något att göra med platsundersökningarna eftersom den var dokumenterat låg även innan dessa startade. Nattskärrorna tenderar att undvika områden där de mest störande momenten av platsundersökningarna genomförs. Detta har dock inte haft någon effekt på den lokala populationsstorleken.

Sammantaget blir slutsatsen av de första analyserna av platsundersökningarnas eventuella påverkan på häckfågelfaunan som följer:

- Fågelfaunan i stort påverkas inte alls.
- Ingen generell, storskalig påverkan har skett på listade arter inom det Regionala modellområdet eller inom Kandidatområdet.

- De flesta listade arter förefaller vara mycket toleranta och visar inga tecken på att störas.
- Ett fåtal listade arter uppvisar tecken på att påverkas negativt, exempelvis genom att undvika områden med störande aktiviteter.

De här redovisade resultaten kan ses som ett kvitto på att platsundersökningarna i Simpevarp inte orsakar några omedelbara negativa effekter på den häckande fågelfaunan. Det är dock viktigt att komma ihåg att vi här endast betraktar eventuella korttidseffekter. Hur påverkan (om någon?) blir i ett längre perspektiv är ännu så länge ej möjligt att uttala sig om. För att utreda denna fråga krävs en betydligt längre undersökningsperiod.

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1 Introduction

This document reports the data gathered within the monitoring part of the bird surveys, one of the activities within the site investigations in Simpevarp, during 2002–2004. The bird surveys started in 2002 and has continued through 2003 and 2004, allowing comparisons between the years. The aim of this report is to evaluate the effects of the ongoing site investigations on the breeding bird fauna in the area. The surveys were made according to activity plan AP PS 400-02-01 version 2.0. The project has been conducted by the Department of Animal Ecology, Lund University. This document is a summary of the data gathered in the local model area in 2002, 2003 and 2004 regarding the complete breeding bird fauna. For listed species the report covers the whole regional model area.

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 ongoing activities on the fauna in the area. This in order to ensure that the site investigations are carried out in such a way that disturbances to the fauna, especially sensitive and vulnerable species, can 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 ones such as species listed in the Swedish Red List /Gårdenfors, 2002/ and European Unions Birds directive 79/409/EEG: Annex 1, /www.viron.se/ /cf Green, 2003, 2004/. It is inevitable that site investigations as those conducted by SKB will affect the bird fauna in some way. The investigations are not only likely to affect the specific sites where drilling is made or new roads are constructed. In addition to these direct impacts, involving small, but none the less direct losses of available areas for birds (both directly in a pure physical sense and indirectly through high, long-lasting levels of disturbance), the general level of human activity in the area is increased with more traffic on the roads, more people out in the landscape sampling different things etc.

The monitoring part of the bird surveys aim at tracking changes in overall bird numbers (densities) in the areas in close contact with the most disturbing parts of the site investigations (drilling sites) as well as in the local model area at large. To be able to disentangle changes caused by other factors than the site investigations, the results from Simpevarp will be compared with results gathered in the whole eastern Götaland (collected through the national monitoring programme of the Swedish Environmental Protection Agency, /<http://www.biol.lu.se/zooekologi/birdmonitoring/>, /Lindström and Svensson, 2004/. For certain listed species (Swedish Red List and the EU's Birds Directive) the monitoring aim at following the population development 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.

The results shown in this report only concern short-time effects from the site investigations. The long-time effects will not be possible to analyse for many years yet. Hence, the results presented here should be taken as indications of possible effects more than as firm conclusions about long-time effects.

The monitoring programme is carried out at different levels, both geographically and regarding which birds that are monitored. More details about these levels are presented in /Green, 2003, 2004/ and in the activity plan (AP PS 400-02-001 version 2.0).

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's 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.

Candidate area

This level involves a smaller area covering all the potential drilling sites, and is the core area of the site investigations. The size of the area in Simpevarp is about 20 km² (in 2002 a larger preliminary local model area of about 50 km² was used, but this was scaled down to the present one before the surveys in 2003). The local model area is shown with thick broken lines in Figure 2-1. Overall, the local model area is surveyed by a combination of line transects and point counts to establish the population development of the total breeding bird fauna. The area is surveyed twice each season for monitoring purposes. Also in this area special attention is directed at listed species. In order to study direct impacts from drilling activities smaller areas (about 30 ha) around a couple of selected sites are censused by territory mapping.

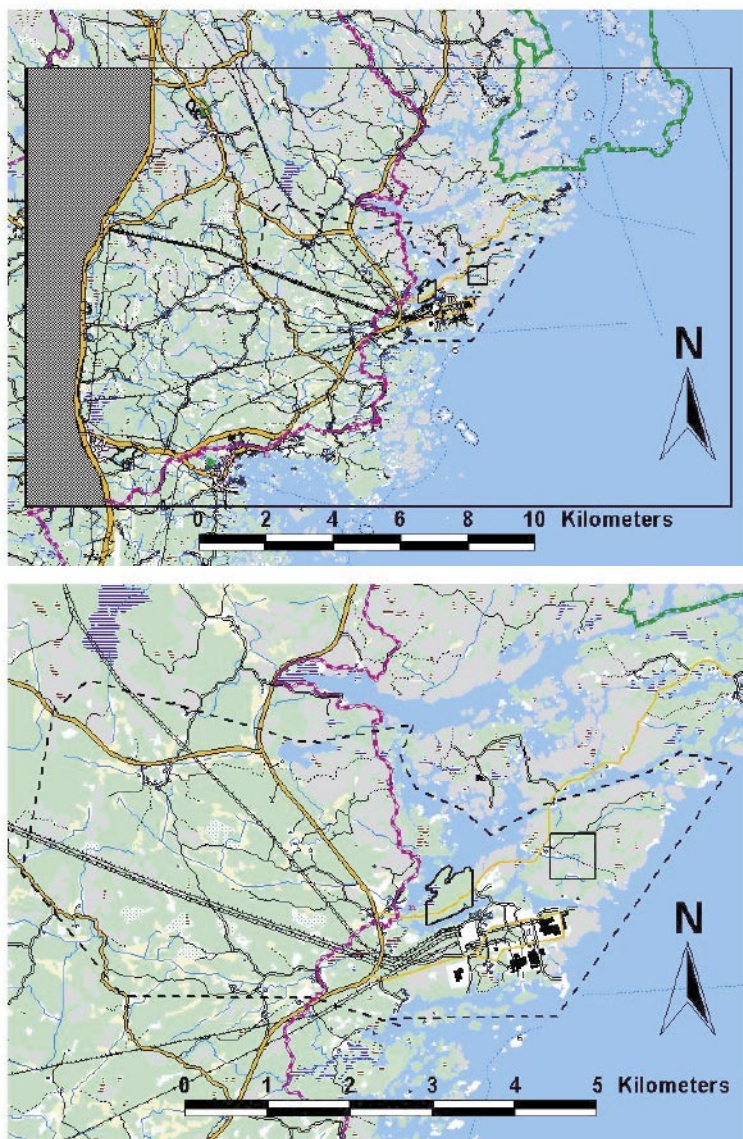


Figure 2-1. Map of the survey area in Simpevarp (upper). The regional model area is shown with a thick unbroken line (shaded part west of highway E-22 is excluded from the surveys), the local model area is shown with thick broken lines. The preliminary larger, candidate area used in 2002 is shown with dotted, red lines. The territory mapping areas (1, 2) are also shown. The lower map shows the local model area (enlarged). 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).
- Binoculars.
- Field maps showing each days work.
- Note books and protocols.
- 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 400-02-001 version 2.0. 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/.

An overview of the methods used for monitoring purposes are presented below. To cover the bird fauna in general, incorporating also the commoner bird species, a combination of line transects and point counts is used. The method is more or less directly taken from the manual for standardised breeding bird counts used by the Swedish Environmental Protection Board in their National Monitoring Program since 1996 /Lindström and Svensson, 2004/. By using the identical methods as in these surveys we get the possibility of making direct comparisons with the data gathered at national and regional level (at a larger scale than the surveys presented here). Territory mapping is used in smaller areas around three drilling sites. Special surveys of listed species are also made.

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) and that can be compared with other areas. The surveys are based on the Swedish Grid (RT-90). The line transects are made along the north-south axes of this grid, with grid lines being 1 km apart. To get a detailed coverage of the local model area, an additional transect in between the RT-90 lines is added so that the area is gone through along north-south directed lines being 500 m apart. Point counts are made at every full km, the corners of the km-squares of the Swedish Grid. The point for the extra lines (in between the RT-90 lines) is moved to the midpoint of the km square (according to the grid) to get a better geographic coverage of the area (Figure 4-1).

Each line transect, and the point counts along these, within the local model area are made twice each season. One early round and one late round respectively. Along the lines all birds seen and heard are counted while the observer is walking at slow speed, stopping, listening and looking around when needed. The observer register bird species, number of individuals and the local time. To allow rapid data gathering in the field, all common species are 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 listed species (see **Appendix 2, Table 1 and 2** in the activity plan AP PS 400-02-001 version 2.0.), are registered individually with data on time and position (from GPS) directly in the field.

During the point counts all heard and seen birds are counted during five minutes (disregarding what has been recorded along the line transects). The start and stop time of each counting period as well as the position from where the count is made is recorded. The count is, if possible, conducted from the pre-determined location. If the pre-determined location can not be reached, counting from a location not deviating more than 250 m from the pre-determined one is allowed.

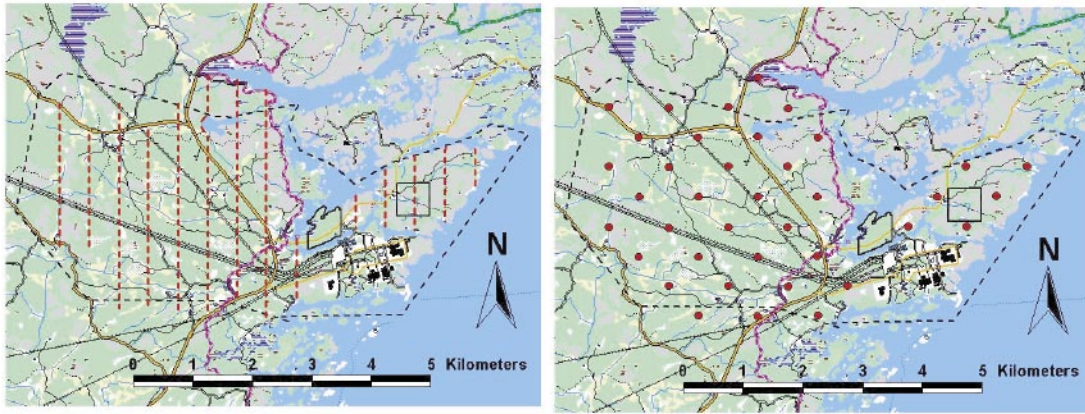


Figure 4-1. Map of the local model area in Simpevarp showing planned line transects (broken, red, north-south directed lines, left) and planned positions for point counts (red dots, right) in 2003–2004. From GSD-Terrängkartan © Lantmäteriverket Gävle 2001, Consent M2001/5268.

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

Line transects and point counts 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. The bird density measures yielded by the line transects and point counts in Simpevarp are however directly comparable to the ones collected through Swedish Environmental Protection Boards' National Monitoring Program (<http://www.biol.lu.se/zoekologi/birdmonitoring>) as the methods used are identical.

4.2 Territory mapping in areas around drilling sites

In a small area around selected drilling sites, about 30 ha in size, all breeding birds are mapped with the territory mapping method. Each area is visited at least five times during the time when the highest activity of breeding birds can be expected. The method gives a direct measure of bird densities /for detailed descriptions see Svensson, 1975; SNV 1978/ and hence possibilities of a detailed picture of changes in relation to ongoing activities. At each visit the observer walks through the area in such a detailed way that no part of the area is more than 50 m away from the observer (100 m in open habitats). The observer marks all individual observations of birds likely to breed in the area on a field map with different symbols showing species identity and behaviour of the bird. All observations are then transferred to species maps (one for each species) where after the number of territories is evaluated following standardised criteria after the field work is completed. Territory mapping has been made in four areas in Simpevarp during 2003–2004, but only two of those (Ävrö; 30.25 ha and Hålö ;26.32 ha) has been censused in both years, allowing comparisons between before and after/during drilling, and are thus reported on here (Figure 2-1). The Hålö area is smaller, as parts of it are water and it is only the land area that is surveyed.

4.3 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's Birds Directive are shown in /Green, 2003, 2004/. Starting from 2004, a selection of these species is 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: 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 thus possibly affected in a negative way by the ongoing site investigations; iii) The species show a negative population trend at the national level (but not necessarily in Simpevarp); iii) Simpevarp holds high densities of the species.

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

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
Wood lark	Trädlärka
Red-backed shrike	Törnskata

These species were monitored in 2004 by visiting known nesting places/territories used in 2002–2003, combined by visits to habitats suspected to possibly hold the species in question. Visits to nest sites/territories/good habitats were made during relevant periods, that is when presence of the birds is expected to be easy to detect. Detailed following up of breeding results were made for some species, i.e. white-tailed eagle, osprey and eagle owl. For honey buzzards, a special census was made during mid summer in order to establish the number of active territories within the area, as such information was lacking from the earlier years. For some of the more numerous species, monitoring was not made in the whole regional model area but in a selected part of this (wood lark and red-backed shrike). 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.

4.4 Execution

The monitoring field work in 2004 was carried out during the period 2004-02-14 to 2004-07-24. The field work was mainly made by local ornithologists and the main part was done by Tommy Larsson, Leon Axelsson, Åke Nilsson, Johan Brenander, Arne Schönbeck, Stefan Sehlstedt and Johanna Grönroos. 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. In addition to the people mentioned above the project leader Martin Green carried out part of the territory mapping work and part of the surveys of listed species.

4.5 Data handling

In the field (line transects, point counts, 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 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 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 protocols. 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 protocols 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 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.

During territory mapping all bird observations (seen or heard) within the mapping areas were registered on pre-made field maps. The observations were then transferred to species maps after each field visit. After the field season, these species maps were evaluated and the number of territories for each species in the area was decided. The evaluation was used following guide-lines from /SNV, 1978/. The evaluation was made by two persons independently from each other (the field personnel, in this case Tommy Larsson, and the project leader). Deviations between the different evaluators (usually non-existent or in some cases very minor) were then discussed between us before the final number of territories was established. Each territory for all bird species was then digitalised and given a position according to the Swedish Grid (RT-90).

4.6 Analyses and interpretations

The results gathered in 2004 during line transects, point counts and territory mapping are compared with results gathered in an identical way in 2002–2003, with the aim of evaluating possible effects in bird numbers both in the areas close to drilling sites and for the local model area at large. With both methods, statistical testing is not possible at the species level as only two-three data points (2002, 2003, 2004 or 2003, 2004) exists. For any meaningful statistical analysis on species level we 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 breeding territories (territory mapping) and breeding birds (line transects and point counts) are tested to look for differences between 2002, 2003 and 2004. As the data do not conform to normal distributions, non-parametric tests are used. All statistical testing was made in the software SPSS for Windows version 10.0 (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 2002 vs 2003 and 2003 vs 2004.
- b) Number of recorded bird individuals per point and species during point counts in the local model area during 2002 vs 2003 and 2003 vs 2004.
- c) Number of territories per species in two territory mapping areas during 2003 vs 2004.

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).

For each territory mapping area, the distribution of bird territories (regardless of species) within circular sectors with different distance from the centre of the drilling site was compared between 2003 (before) and 2004 (after/or during on-going activities). The following sectors were used (see Figure 5-1 to 5-2):

- a) 0–50 m
- b) 50–100 m
- c) 100–150 m
- d) 150–200 m
- e) > 200 m

The idea behind this test is to analyse whether the activities at the drilling site in any way affect the geographical distribution of bird territories. If birds are disturbed by the activities one would expect that the distribution would be shifted towards the outer parts of the area (with a longer distance to the drilling site). If birds on the other hand should be attracted to the activities the reverse would be expected.

Statistical tests of the line transect and point count data gathered at the large regional level (eastern Götaland, data from the National Monitoring Programme) were analysed in the same way as the Simpevarp data.

Changes in numbers of territories and/or individuals at species level for listed species are compared and discussed but not statistically tested in this report. The same procedure is also used for comparing breeding results in a few cases.

5 Results

English and Swedish names of the birds are used throughout the results part. Latin names are given the first time a species is mentioned. A complete list of English, Latin and Swedish names for all bird species breeding in Sweden is given in Appendix 1.

5.1 Line transects

Within the local model area a total of 69.6 km (36.7 + 32.9 km during the first and second round respectively) of line transects were made in 2004. Corresponding figures from earlier years were 76.6 km (36.8 + 39.8 km) in 2003 and 107 km in 2002. Note that the line transects in 2002 covered a larger, preliminary candidate area. Both in 2003 and 2004 the conducted line transects exceeded the planned ones (63.6 km) in distance as some observers counted birds also along the transport stretches between planned transects. The two rounds of line transects were made 13 April–2 May and 11–28 June in 2004. In 2003 the two rounds were made 15 April–2 May and 26 June–10 July. The late season round in 2003 was delayed because of rainy weather in June. In 2002 only one round was made of the larger, preliminary local model area and this was conducted 8 May–29 June.

4,909 birds of 103 species were recorded during the line transects in 2004, giving an overall density of 70.5 birds/km. This density is almost identical to the one recorded in 2003 when a total of 5,415 birds of 89 species yielded a density of 70.7 birds/km. Much fewer birds/km were recorded in 2002, 44.9 birds//km based on 4,804 individuals of 93 species. All together 117 species has been recorded during the line transects in the three years. If the analysis is restricted to include only 'land birds' (excluding all birds primarily associated with water such as grebes, swans, geese, ducks, gulls and terns) the general pattern remains the same with 44.3 birds/km in 2002, 65.2 birds/km in 2003 and 66.16 birds/km in 2004. Here it should be remembered that no coastal areas were included in the line transects in 2002. The results from the line transects within the local model area are shown in full detail in Appendix 2.

The statistical testing indicates a general increase in the overall bird fauna during the study period 2002–2004. When comparing the number of recorded individuals/km per species, there was a tendency for that more species increased than decreased in number between 2002 and 2003 (Wilcoxon signed ranks test, $Z = 1.90$, $p = 0.058$, $N = 117$). Z is the test value computed by the test, a high absolute value of Z means that there is a large difference between the two tested data sets; p is the probability level, a low value of p indicates that there is a high probability that the two data sets differ (and a low probability that they are similar). Following international conventions on statistics, the level used to say that the two data sets differ significantly from each other is set at 0.05. The lower the value of p , the more the two data sets differ. N is the total number of species entered into the comparison. Between 2002 and 2003, 61 species increased in number of birds/km and 48 species decreased in number of birds/km. There was a highly significant difference between 2003 and 2004 (Wilcoxon signed ranks test, $Z = 3.78$, $p = 0.0002$, $N = 117$) with 77 species showing an increase in numbers and only 28 species decreasing.

A more relevant comparison is perhaps the one including only 'land birds' since no coastal parts were included in the line transects in 2002. Also when making this analysis the general picture remains the same. There was however no significant difference between 2002 and 2003 (Wilcoxon signed ranks test, $Z = 0.84$, $p = 0.40$, $N = 96$) when 48 species increased in numbers and 45 species decreased. As when including all species in the analysis above numbers/km and species in 2004 was significantly higher than in 2003 (Wilcoxon signed ranks test, $Z = 3.77$, $p = 0.0002$, $N = 96$). Results remained the same also when looking only at the 55 most numerous species, i.e. the ones for which the results are most likely to be robust and least likely to be influenced by stochastic sampling errors (statistical details not shown, see above).

In other words, there was no significant difference in the number of increasing and decreasing species between 2002 and 2003. However significantly more species were increasing than decreasing between 2003–2004, indicating a general increase in the breeding bird community in Simpevarp between the latter years.

An analysis of the data from the whole region of eastern Götaland (mainly Småland) showed the same general pattern as in Simpevarp. There was no statistical difference between 2002 and 2003 (but a tendency for a decrease, $Z = 1.86$, $p = 0.062$, $N = 124$), a significant increase between 2003 and 2004 ($Z = 4.34$, $p = 0.00001$, $N = 124$), when looking at all species registered during the line transects in this area. In general words the number

of birds/km and species in the whole region were similar between 2002 and 2003 but increased significantly between 2003 and 2004. Making the same comparisons for only 'land birds' and for only the most common species gave the same results (all statistical details not shown), although this test did actually show a significant decrease between 2002 and 2003 ($Z = 2.31$, $p = 0.021$, $N = 104$ for all 'land birds'; $Z = .58$, $p = 0.010$, $N = 68$ for only the most common species). Hence the results on the large regional level seem rather robust. The overall bird community of eastern Götaland remained stable or increased during the period 2002–2004 according to the line transect data.

5.2 Point counts

77 point counts were made in the local model area in 2004. In the earlier years 119 point counts were made in 2002 (larger preliminary local model area) and 79 in 2003. The point counts were conducted simultaneously with the line transects in all years (for dates see above). During the point counts, 1,356 birds of 82 species were registered in 2004 compared to 1,102 birds of 64 species in 2003 and 1,217 birds of 66 species in 2002. In total, 89 bird species were registered during the point counts in the three years. The results from the point counts within the local model area are shown in full detail in Appendix 3.

The figures above translate into overall bird densities of 17.6 birds/point in 2004, 13.9 birds/point in 2003 and 10.2 birds/point in 2002. Restricting the analysis to 'land birds', as above for line transects (excluding all 'water birds', see above), gave densities of 16.8 'land birds'/point in 2004 compared to 12.7 'land birds'/point in 2003 and 10.1 'land birds'/point in 2002. Densities of 'land birds' hence increased during the study period and numbers in 2004 were 32% higher than the ones in 2003 and 27% above the average for the three years combined.

Looking at all species together, there was no significant difference between 2002 and 2003 in numbers per point and species (Wilcoxon signed ranks test, $Z = 1.20$, $p = 0.23$, $N = 89$). 39 species increased in number of birds/point while 36 decreased. There was a highly significant increase in numbers of birds per point and species between 2003 and 2004 (Wilcoxon signed ranks test, $Z = 4.35$, $p = 0.00001$, $N = 89$). 65 species increased and 23 species decreased in number of birds/point. Results were almost identical if looking at 'land birds' only (statistical details not shown). Furthermore, the results were very much the same if looking at the 29 most numerous 'land birds' only, but here there was a tendency for an increase between 2002 and 2003 (Wilcoxon signed ranks test, $Z = 1.96$, $p = 0.05$, $N = 29$). In general terms, the point counts indicate basically stable overall bird numbers between 2002 and 2003 followed by a larger increase between 2003 and 2004.

Regional point count data from the whole eastern Götaland showed no significant differences in numbers of birds/point and species between 2002 and 2003 ($Z = 0.10$, $p = 0.92$, $N = 110$) or between 2003 and 2004 ($Z = 1.26$, $p = 0.21$, $N = 110$) when looking at all species together. The result were very similar when looking at only 'land birds' and only the most numerous species (statistical details not shown). In general terms the bird community of eastern Götaland remained stable 2002–2004 according to the point count data.

5.3 Territory mapping

Territory mapping in the smaller areas at Ävrö and Hälö (Figure 2-1) were conducted in May–June in both years. Each area was visited five times/year during this period. In both areas no possibly disturbing activities were conducted before or during the territory mapping in 2003, hence this year serves as a 'undisturbed' back ground year in both cases. The results from the territory mapping are shown in detail in Appendix 4.

Territory mapping area 1; Ävrö

In area 1 the construction of roads and other things around the drilling site were made in September 2003. Drilling activities then took place between October 2003 and mid May 2004, i.e. into the breeding season 2004 but not into the territory mapping period. 193 bird territories of 33 species were recorded in 2003 and 208 bird territories of 39 species were recorded in 2004. There was no statistical difference in the number of territories per species between the years (Wilcoxon signed ranks test, $Z = 0.19$, $p = 0.85$, $N = 42$, N is the total number of species recorded during the two years combined). 19 species increased in numbers and 15 species decreased in numbers from 2003 to 2004. For 8 species the number of territories was identical during the two years. Three territories of listed species were registered in 2003, one of lesser spotted woodpecker *Dendrocopos minor* (mindre hackspett), one of black woodpecker *Dryocopus martius* (spillkråka) and one of red-backed shrike *Lanius collurio* (törnskata). Also in 2004 three territories of listed species were recorded: lesser spotted woodpecker (mindre hackspett) (1); black woodpecker (spillkråka) (1) and wryneck *Jynx torquilla* (göktyta) (1).

The geographical distribution of all bird territories in the two years are shown in Figure 5-1. There was no statistical difference in the distribution of territories between the years (Chi²-test, $\chi^2_{(1,5)} = 2.11$, $p = 0.66$). In other words, the birds did not in general change their distribution within the area between the years, avoiding certain parts in any particular year.

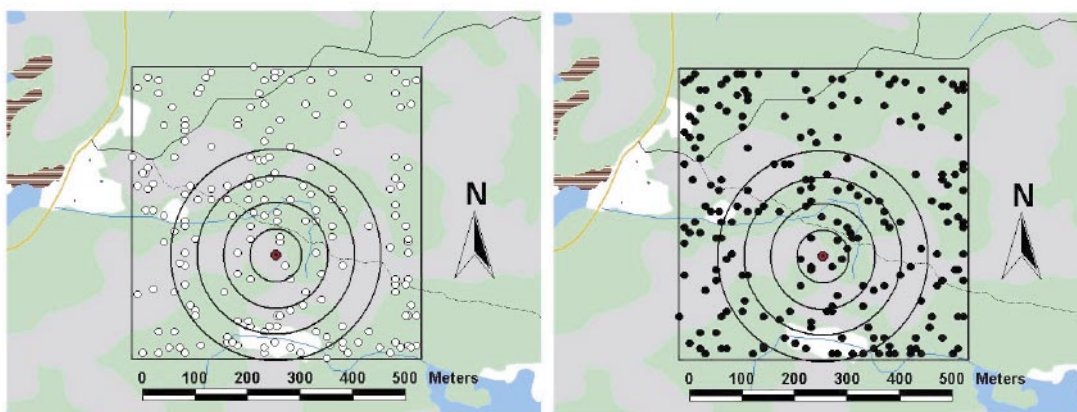


Figure 5-1. Geographical distribution of all bird territories in mapping area 1 (Åvrö, bold black line) in 2003 (left; white dots) and 2004 (right; black dots). The centre of each territory is shown, real territories are of various size and shape and bigger than the dots shown here. Note that more than one territory can have the same centre point, i.e. more than one territory are in some cases hiding behind the same dot. The drilling site is shown with a red dot. Circles are drawn at 50, 100, 150 and 200 m from the drilling site (see Analysis and interpretation). From GSD-Terrängkartan © Lantmäteriverket Gävle 2001, Consent M2001/5268.

Territory mapping area 2; Hålö

The road construction and preparation work for drilling were made in Dec 2003 and the drilling site was active only for a brief period between Jan and early Feb 2004, i.e. completely before the breeding season of 2004. No drilling was made during the later part of the breeding (the territory mapping) season in 2004. 136 bird territories of 30 species were recorded in 2003 and 149 bird territories of 34 species were recorded in 2004. There was no statistical difference in the number of territories per species between the years (Wilcoxon's signed ranks test, $Z = 0.76$, $p = 0.44$, $N = 37$, N is the total number of species recorded during the two years combined). 16 species increased in numbers and 14 species decreased in numbers from 2003 to 2004. For seven species the number of territories was identical between the years. No territories of listed species were registered in 2003. One territory of black woodpecker (spillkråka) had parts within the territory mapping area in 2004.

The geographical distribution of all bird territories in the two years are shown in Figure 5-2. There was no statistical difference in the distribution of territories between the years (Chi²-test, $\chi^2_{(1,3)} = 2.67$, $p = 0.44$). In other words, the birds did not in general avoid the area close to the drilling site in 2004 compared to the undisturbed situation in 2003.

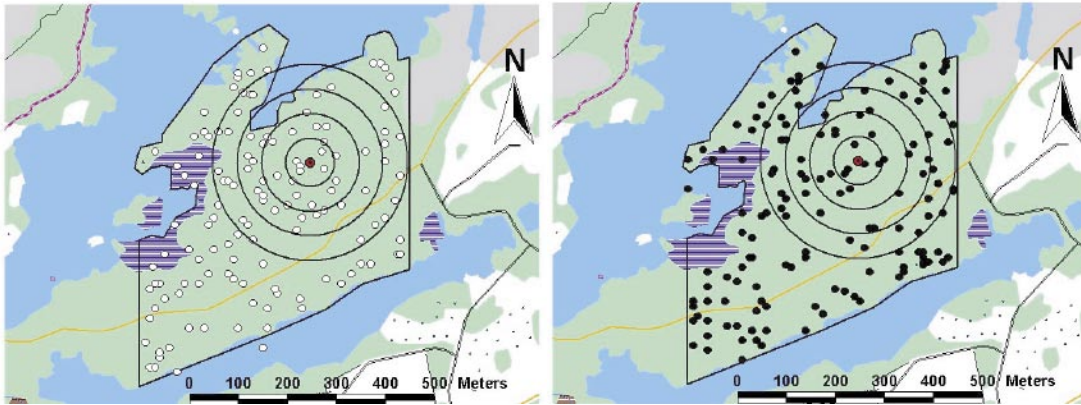


Figure 5-2. Geographical distribution of all bird territories in mapping area 2 (Hålö, bold black line) in 2003 (left; white dots) and 2004 (right; black dots). The centre of each territory is shown, real territories are of various size and shape and bigger than the dots shown here. Note that more than one territory can have the same centre point, i.e. more than one territory is in some cases hiding behind the same dot. The drilling site is shown with a red dot. Circles are drawn at 50, 100, 150 and 200 m from the drilling site (see Analysis and interpretation). From GSD-Terrängkartan © Lantmäteriverket Gävle 2001, Consent M2001/5268.

5.4 Listed species

The following section gives a summary of the population development in the last two–three years of nine selected species listed as endangered, threatened or vulnerable according to the Swedish Red List /Gärdenfors, 2000/, and/or species listed in the European Unions’ Birds Directive Annex 1 (79/409/EEG) within the Simpevarp area. These nine 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 three years (2002–2004) although a complete coverage of the regional model area was not gained until 2003.

The text about the White-tailed Eagle is written by Björn Helander.

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

The full picture of the occurrence and distribution of this species, notoriously difficult to survey, was not retained until a proper special survey was made in summer 2004. In the earlier years (2002–2003) a few observations were made during other field work in the area showing that the species does occur but not giving any detailed information about numbers present. At least nine territories were found within the regional model area in 2004, yielding a density of 0.08 pairs/km². This density is in the same range as densities found in Forsmark (0.07–0.11 pairs/km², own data) and in southern Uppland (0.09–0.12 pairs/km² /Amcoff et al. 1994/. Even though no territory is confined only to the local model area, at least four territories have parts reaching into this. The results from 2004 will form the background for future monitoring of this species in Simpevarp.

The Honey Buzzard is declining quite rapidly on both national and continental level. The latest estimate of the Swedish population is about 5,000–6,000 pairs, which probably shows a decline of about 40% just in the last decades. The factors behind the decline is not known in detail but a combination of low breeding output, illegal hunting along the migration routes and deforestation of the winter quarters in tropical Africa may all have played their role into the rapid decline.

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

After the drop in breeding success for white-tailed eagle in the Simpevarp area in 2003, when a strong increase in human activities in the area followed upon the start of the site investigations by SKB and with additional disturbance from forestry activities near one nest site, breeding success was again as high in 2004 as it was before 2003. The breeding success in 2004, 2003, 2002 and 1998–2001 in the Simpevarp area and in a reference area to the north and south of Simpevarp is summarised below.

Table 5-1. Per cent successfully breeding pairs of white-tailed eagle in 2003, 2002 and 1998–2001.

(n = number of checked breeding attempts during the entire period).

Area	2004	2003	2002	1998–2001	n
Simpevarp	100	0	100	88	14
Reference	86	83	86	78	43

It will take several years to evaluate the magnitude of an impact on the breeding success of the eagles from the site investigation activities in Simpevarp.

Osprey *Pandion haliaetus* Fiskgjuse (EU Annex 1)

Four known nests in the area with at least some activity of birds in and around them, exactly the same number as in 2003. In addition to this there were indications of another pair in the local model area in 2004, but the nest was never found. Furthermore there is another nest (with a breeding pair in 2004) just outside the regional model area.

Breeding results for Ospreys has been surveyed along the coast in eastern Småland by Tommy Larsson and Arne Schönbeck since 1999 (1998 was a startup year with a smaller coverage). Each year 15–25 nests are checked, the number of breeding attempts registered and the number of large young are counted and ringed. Breeding results during 1999–2004 for the whole surveyed area (including the SKB regional model area) are shown in Table 5-2.

The number of nests have increased during the study period. Whether this is due to an increase in survey effort or to an increasing number of ospreys is not completely clear, but the general impression is that osprey numbers are actually increasing in the area. Breeding success has been generally good over the study period.

The breeding results in the SKB regional model area (SKB RMO) is showed in Table 5-3 in comparison with results from the remaining study area (REF), here used as a reference area.

Table 5-2. Breeding results of Ospreys along the Mönsterås–Oskarshamn–Simpevarp coast (including the SKB regional model area) during the last six 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
Mean	19	14	10	72	1.3

Table 5-3. Breeding success of ospreys in the regional model area at Simpevarp compared to the reference area south of this in 2003–2004.

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	0.75	2.0	0.50	1.1
2004	0.50	1.0	0.57	1.3
Mean	0.62	1.5	0.53	1.2

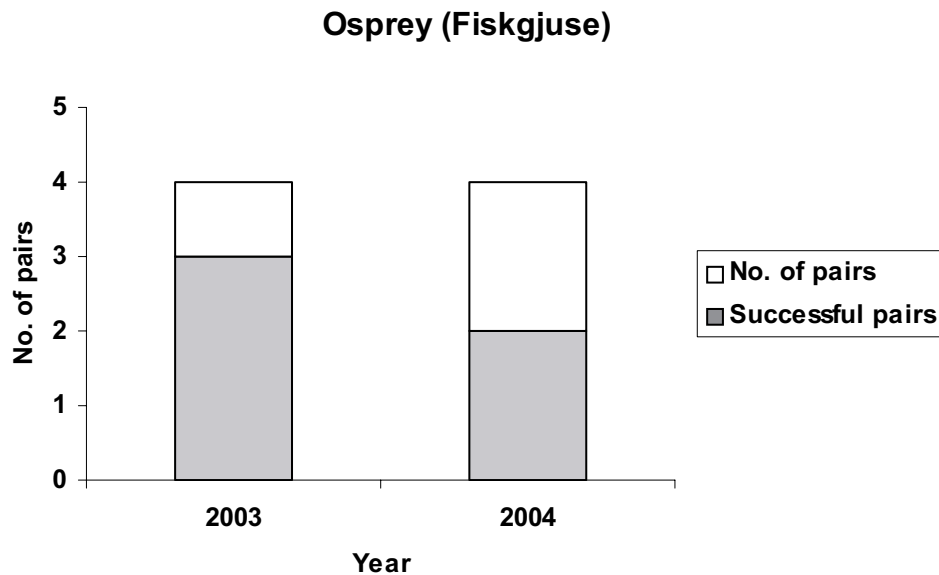


Figure 5-3. Number of breeding pairs of Ospreys (Fiskgjuse) in the regional model area at Simpevarp 2003–2004. Shading show the number of successful pairs.

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

Birds were present in all four territories during 2004, just like in 2002–2003. The breeding result was better in 2004 than in the two preceding years, as one of the pairs produced three young. Of the three pairs in the reference areas north and south of the regional model area, two produced young, in total four young. The latter pairs produced seven young in 2003.

Breeding output for the regional model area and the reference area as a comparison is shown in Table 5-4.

Breeding output seems to be lower in the regional model area, with associated site investigations, compared to the reference area. Whether this has anything to do with the site investigations is not completely clear. Looking at data from the years before the site investigations started we find that the territories in the regional model area on average produced 0.52 young/year and territory during the period 1993–2001. The corresponding figure for a territory outside the regional model area was 0.82 young/year. These figures indicate a lower breeding output in Simpevarp already before the site investigation started, although the difference is not as large as during the last three years. The reason behind this difference is presently unknown.

As mentioned in previous reports, two of the pairs in the Simpevarp area only recently established themselves there, and such pairs do rarely produce young. Also for older, well established pairs, breeding success normally varies with successful years alternating with unsuccessful ones in a two to three year cycle.

Table 5-4. Breeding results (number of young/controlled territory) for Eagle Owls in the regional model area and reference areas north and south of this in 2002–2004.

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

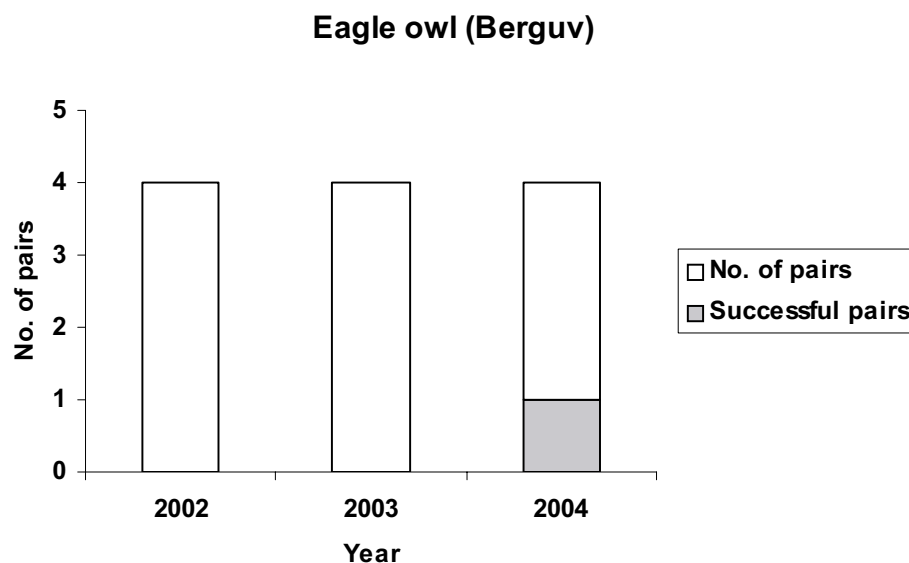


Figure 5-4. Number of Eagle owl (Berguv) pairs in the regional model area in Simpevarp 2002–2004. Shaded parts show No of successful pairs.

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

Nine territories recorded 2002–2003, and ten recorded in 2004. All territories used in 2002–2003 were checked for presence of wrynecks also in 2004 but there was hardly any correspondence between used territories in the first two years and 2004. Of the nine territories registered in 2002–2003, only one was in the local model area. In 2004 six of ten territories were in the local model area.

The wryneck obviously occurs in quite low densities throughout the area and there are no signs of any impact from the site investigation on the local population. Even though there probably are more territories present than we have registered, all available local knowledge confirms the generally low densities of this nationally declining species. If densities found in the relatively well studied local model area are the same as in the whole regional model area, the total population in Simpevarp could at most be in the order of 40–50 pairs.

Interestingly, the wryneck seems to be connected to areas close to large electrical power wires (see further discussion under red-backed shrike), as 42% (8/19) of the territories during 2002–2004 were found less than 200 m from such. Wrynecks are dependent on ground-living ants, their main diet, and the occurrence of these ants is connected to open grassy areas. Both ants and wrynecks has been shown to be connected to grazed semi-permanent pastures, a habitat that has declined greatly in area in Sweden during the last decades. It may be that areas under power wires can act as a substitute for these habitats, as also these are managed. Not necessarily by grazing, even though this occur in Simpevarp, but by other methods, probably creating a habitat beneficial to ants and hence to wrynecks.

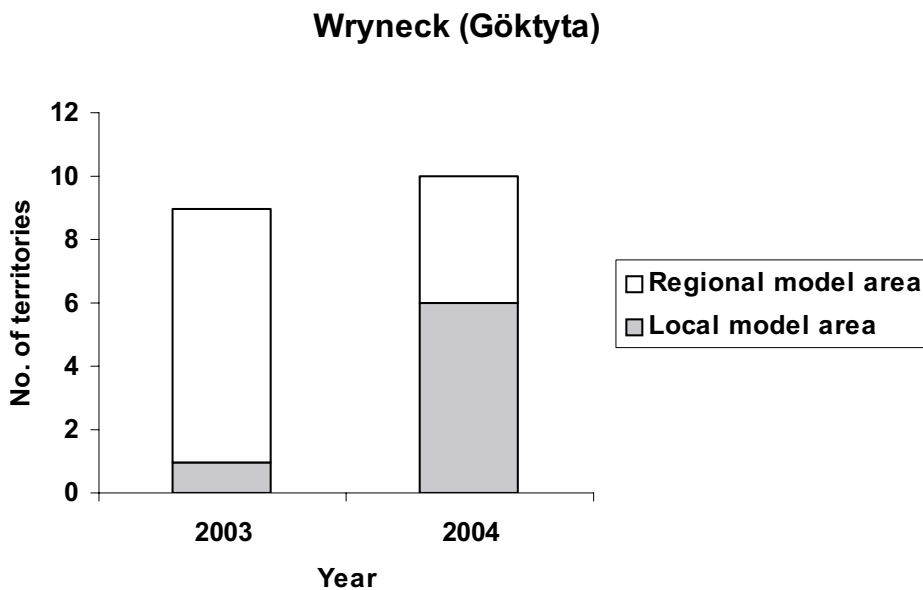


Figure 5-5. Number of recorded occupied territories of Wrynecks (*Göktyta*) in Simpevarp 2003–2004. Shaded parts show the number of territories within the local model area.

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

The early woodpecker surveys in 2004 revealed a couple of new territories of this species not recognised before. Hence, the estimate of the local population is elevated from earlier estimates. In 2002–2003 12 territories were registered in total and 16 were recorded in 2004. Of these 4 were found in the local model area in 2002–2003, in 2004 this area held 6 territories. Looking only at territories occupied 2002–2003, 75% of these were occupied also in 2004 (n=12) both in the local model area (n=4) and in the regional model area outside of the local model area (n=8).

The conclusion from these figures is that there do not seem to be any impact at all from the site investigations on the lesser spotted woodpecker so far. Birds are present in similar or, or even higher, numbers, in the area in general (regional model area) as well as in the local model area in 2004. It should however be remembered that this is only an indication of very short term effects. We do not yet know anything about whether breeding output is affected or anything about long term effects.

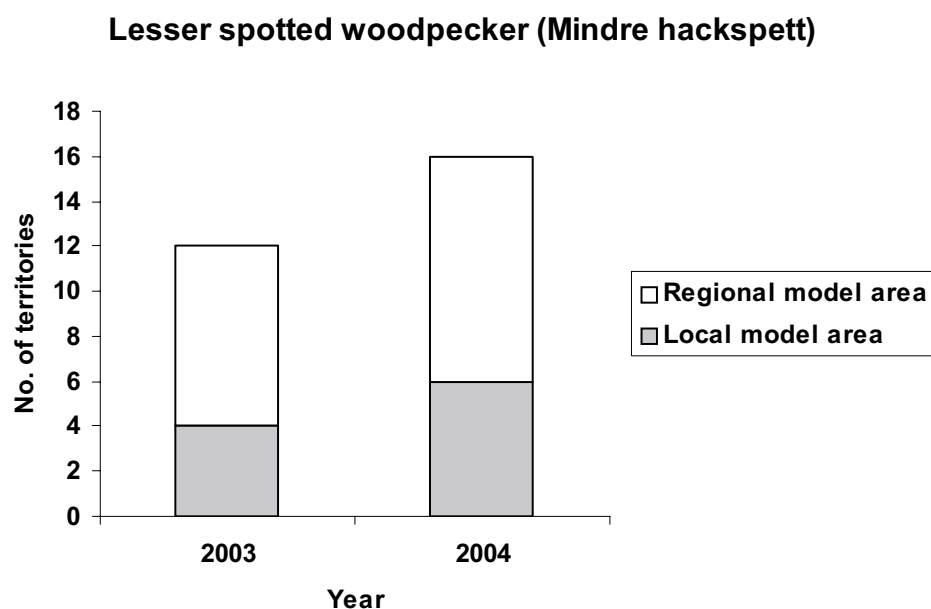


Figure 5-6. Number of occupied territories of Lesser spotted woodpecker (Mindre hackspett) in Simpevarp 2003–2004. Shaded parts show number of territories within the local model area.

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

The nightjars showed up in even higher numbers in 2004 compared to 2003! It is known from earlier studies in other parts of the country that numbers fluctuate quite markedly between years /Aronsson, 1995/ and apparently 2004 was something of a ‘peak year’, at least in the Simpevarp area. The reason behind the fluctuations is unclear but probably at least part of the variation is dependent on breeding success the previous year, conditions along the spring migration route from the African winter grounds to the breeding area, and local conditions in the breeding area at the time of territory establishment.

Numbers in Simpevarp increased from 47 territories in 2003 to 71 territories in 2004, a 51% increase! Some of the increase could be explained by an even better coverage of the area in the latter year. Still, even when comparing only the parts that were covered well enough in both years, the number of territories increased from 47 in 2003 to 64 in 2004, a 36% increase!

Nightjar (Nattskärra)

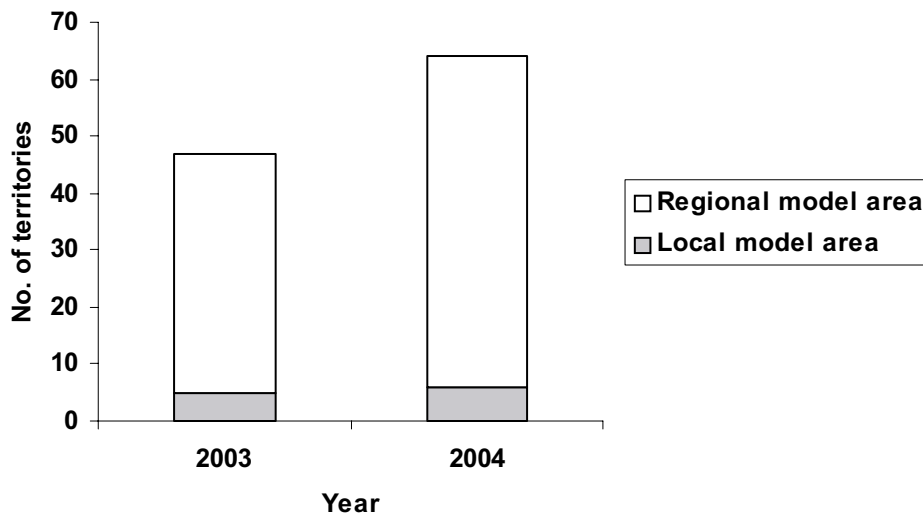


Figure 5-7. Number of occupied Nightjar (Nattskärra) territories in well studied parts of Simpevarp 2003–2004. Shaded parts show the number of pairs in the local model area.

Numbers of nightjars did not increase evenly over the Simpevarp area though. In the local model area numbers were in essence unchanged between the years, five in 2003 compared to six in 2004. Furthermore, the distribution within the local model area show signs of that the nightjars avoid the areas close to active drilling sites. Two sites in the central parts were actively used for drilling during the early part of the summer 2004. This area held two nightjar territories in 2003, but both were vacant in 2004. A very close at hand explanation for the found pattern is that the nightjars were disturbed by the ongoing drilling activities and decided not to establish territories in these parts in this year. It will be very interesting to follow the behaviour of nightjars in the area in the years to come. Will they re-establish themselves in areas they abandoned in this year after the drilling activities are finished??

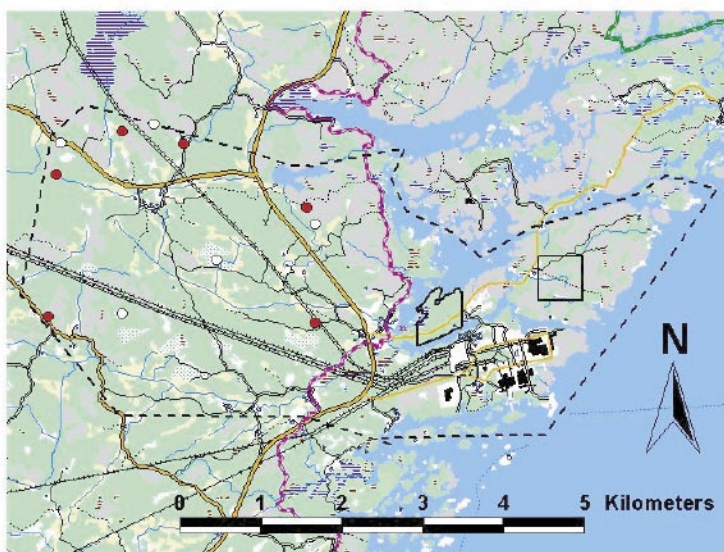


Figure 5-8. Nightjar territories within the local model area in 2003 (white) and 2004 (red). Note that no territories outside of the local model area are shown in this map, even though there in reality are several. From GSD-Terrängkartan © Lantmäteriverket Gävle 2001, Consent M2001/5268

In summary, at the regional scale the nightjars seems to do just fine and there are no signs of any impact from the site investigation on overall population size. At a very local level however, the nightjars seem to be disturbed by drilling activities and territories within close proximity to such seem to be abandoned.

As mentioned in earlier reports numbers found in the Simpevarp area are of national importance for the species, as the '1% criteria' is fulfilled. This criteria is a commonly used way of classifying the importance of areas for nature conservation purposes, and states that if an area holds 1% or more of a total population (in this case the Swedish nightjar population), the area is an important one for the population in question. The latest estimate of the Swedish nightjar population shows that overall there are at most 4,000 nightjar territories in the country. This means that numbers found in Simpevarp correspond to 1–2% of the whole Swedish population! Not surprisingly, densities found in the north part of the regional model area are among the highest recorded ones for nightjars in Sweden. In addition more territories are found outside (north of) the regional model area.

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

Numbers of wood larks remained virtually unchanged between 2003 and 2004. Looking only at areas checked equally well in both years, there were 29 territories in these in 2003 and 31 territories in 2004. For the local model area the corresponding figures were 9 in 2003 and 11 in 2004.

Another species with high numbers in the area. Since the wood lark has similar habitat requirements as the nightjar, this is not surprising when knowing the abundance of nightjars. Also the geographic distribution of wood larks is very similar to the one for nightjars with most territories found in the north and fewer in the southernmost parts.

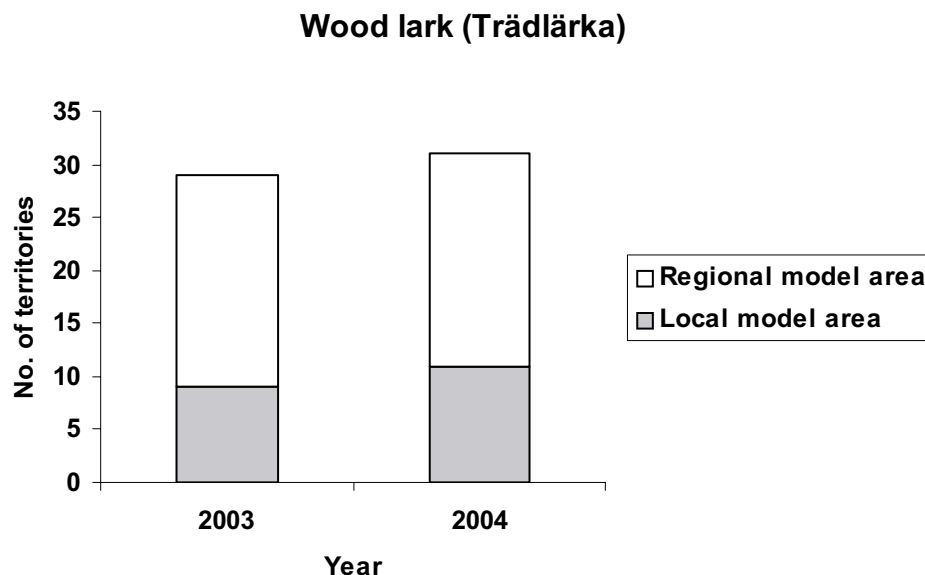


Figure 5-9. Number of occupied Wood lark (*Trädlärka*) territories in well studied parts of Simpevarp 2003–2004. Shaded parts show the number of pairs in the local model area.

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

In parts checked equally well during 2003 and 2004 the number of territories were similar between the years, or even increasing slightly from 36 to 44 (an increase of 22%). Of these 23 territories were found in the local model area in 2003 and 25 in 2004 (a 9% increase).

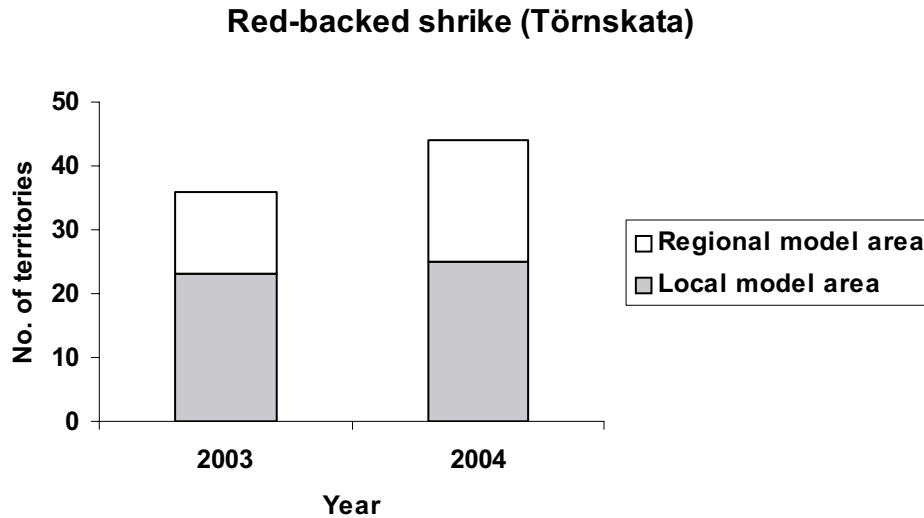


Figure 5-10. Number of occupied territories of Red-backed shrike (Törnskata) in well studied parts of Simpevarp 2003–2004. Shaded parts show the numbers within the local model area. Note that the figure do not show the total number of pairs in Simpevarp, just the numbers within the parts that has been studied well enough to allow comparisons between the years (covered to the same extent in both years). Total numbers are not higher in the local model area than in the regional model area outside of this (as this figure might give the impression of).

Another species with unpredicted very high densities. The total number of territories found 2002–2004 is now 92 and the true number surely exceed 100. Interestingly a large part of registered territories are found under electrical power wires (67%). This proportion may be a bit biased as more attention has been paid to this habitat in 2003–2004 in order to find shrikes. Never the less, even when looking at the line transects that cover all available habitats equally well, 44% of the shrikes registered during these are found in areas under power wires. Apparently this is as very inviting habitat to shrikes if these areas are grazed or managed in some other way, keeping them open with scattered bushes. As for the wryneck, these areas may function as a substitute for semi-permanent pastures, a habitat that decreased greatly in area in Sweden during later decades. Shrikes need areas with high densities of larger insects (their main food) in combination with thorny bushes where they hide their nest and which they use as look out posts during hunting. At least for the human eye, areas under power wires seems to be more or less perfect for shrikes during the years immediately following upon management actions (removal of young birch and aspen sprouts).

Table 5-5. Population changes of selected listed species in Simpevarp between 2002/2003 and 2004. 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 model area	Whole area
Honey Buzzard	?	?	?
White-tailed Eagle	0		0
Osprey	0	(+)*	0
Eagle Owl	0	0	0
Wryneck	0?	0?	0?
Lesser Spotted Woodpecker	0/+	0/+	0/+
Nightjar	+	0**	+
Woodlark	0	0	0
Red-backed shrike	+	0/+	+

** no change in numbers but an indication of a distributional change.

6 Discussion

The present report is the first trying to evaluate any effects from the ongoing site investigations on the breeding bird fauna in Simpevarp. The site investigations started in 2002, and the bird surveys started in the same year. Hence, no 'pre site investigation' base-line studies were made in order to establish what the conditions were like before the investigations started. However, the general level of possibly disturbing activities (from the birds' point of view) were higher in 2003 and especially in 2004 compared to 2002. What kind of effects are the site investigations likely to have on the breeding birds? In areas where drilling sites are established, roads are constructed etc, there is of course a certain loss of habitat, preventing birds from using these for breeding in a way they possibly did before. These areas are however small and any such effect is probably negligible. More important is probably the general increase in human activities in the area and especially around the drilling sites. Long-lasting human presence in previously undisturbed areas may cause breeding birds, especially sensitive species, to abandon such areas altogether. If this should be the case one would expect decreases in breeding bird numbers in the areas most heavily affected, i.e. where most activities are made. More short-lasting human presence in a breeding area could affect breeding success, as the likelihood of losses of eggs or young through cold, bad weather in general or predators increase with time spent away from the nest by the adults. Effects may also be different at different time scales. At this stage, in this report, one can only evaluate short-time effects. For most species we can not monitor breeding success (for practical reasons), but if breeding success is decreased by too high levels of disturbance, effects on the population level (numbers) is likely to lag behind. In order to evaluate any long-term effects it is necessary to carry on monitoring for a much longer period than covered here (as long as the site investigations are lasting, and preferably some time after they have been finished). Finally, different species may be affected in different ways. Among the breeding birds, some species are tolerant to disturbances while others are more sensitive. Some need only small areas to conduct a successful breeding, others need vast areas that are relatively undisturbed. In other words, the effects are not likely to be the same for all breeding birds.

In this report I aim at answering the following questions:

- Was there any general difference (decrease or increase) in bird numbers between the relatively undisturbed 2002 and more disturbed 2003 and 2004?
- Were there any signs of that bird distribution were affected by the most intense parts of the site investigations? (i.e. at the drilling sites).
- Are there any signs of that specific species are affected more (or less) than others? If so, which ones? Here I concentrate on selected species listed in the Swedish Red List and/or the EU Birds Directive.

Neither the line transects and point counts nor the territory mapping approach showed any general decrease in breeding bird numbers between 2002–2004. Rather the contrary. Line transects and point counts showed a significant increase in bird numbers between 2003 and 2004, with a less clear pattern between the two earlier years 2002–2003. Also in the territory mapping areas numbers were higher in 2004 compared to 2003, although the difference was not statistically significant. Results in Simpevarp do in essence conform with results gathered in the whole region of eastern Götaland, indicating that there were no local effects on bird populations in general. Furthermore, most results indicate that 2004 was a 'good' year with higher numbers present compared to earlier years during the study period.

The conclusion from these results must be that the activities within the site investigations do not cause any immediate, short-time negative effects on the general bird fauna. Both species- and territory numbers seems to be unaffected irrespective of the ongoing activities. Whether this also holds in a more long-time perspective remains to be shown. It could be argued that the most disturbing parts of the site investigations did not start until 2004 and that any negative effects will not appear until later. At the moment we can not know the long term effects. If we want to know for sure what the effects will be, if any, the only way to find out is to continue to monitor the bird fauna in future years of the site investigations as well.

Perfectly in line with the results mentioned above, there were no indications of that the breeding birds avoided the most heavily disturbed parts close to the drilling sites. The geographical distribution of bird territories was similar between the two years in both territory mapping areas. This does further emphasise the conclusion that when talking about the general bird fauna taken together, there are no short-term negative effects from the activities of the site investigations in terms of decreasing bird numbers or changes in the distribution.

Looking at the selected listed species, most of these seem totally unaffected by the site investigations. Again, we can only talk about short time effects and what happens in the long run is yet to be found out. The present results for listed species may however indicate certain differences in how different species react. Species such as lesser spotted woodpecker (mindre hackspett), wryneck (göktyta), wood lark (trädlärka) and red-backed shrike (törnskata) all bred in relatively close contact with active drilling sites, and no indications for any decrease in numbers were registered.

Other species may be affected as there were indications of that nightjars avoided areas close to active drilling sites. Still, this had absolutely no effect on the local population size, just on their small scale local distribution. Furthermore, the breeding success of eagle owls (berguv) has been low in Simpevarp during the site investigation period, this may or may not have anything to do with the site investigations.

A couple of other species of high conservation concern, as white-tailed eagle (havsörn), honey buzzard (bivråk) and osprey (fiskgjuse) do not breed within close contact to any of the more disturbing parts of the site investigations (as they were carried out during spring-summer 2004). Should the more intense parts of the investigations however be made in areas (at a small scale) holding nests of these species, it is likely that they would be negatively affected. Future monitoring combined with certain mitigating measures are hence desirable if SKB wants to continue to leave these birds undisturbed.

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Appendix 1

List of all bird species breeding in Sweden with Latin, Swedish and English names.

<i>Latin-Genus</i>	<i>Latin-species</i>	Swedish	English
<i>Clangula</i>	<i>hyemalis</i>	Alfågel	Long-tailed Duck
<i>Riparia</i>	<i>riparia</i>	Backsvala	Sand Martin
<i>Aythya</i>	<i>marila</i>	Bergand	Scaup
<i>Fringilla</i>	<i>montifringilla</i>	Bergfink	Brambling
<i>Bubo</i>	<i>bubo</i>	Berguv	Eagle Owl
<i>Pernis</i>	<i>apivorus</i>	Bivråk	Honey Buzzard
<i>Turdus</i>	<i>pilaris</i>	Björktrast	Fieldfare
<i>Circus</i>	<i>cyaneus</i>	Blå kärrhök	Hen Harrier
<i>Parus</i>	<i>caeruleus</i>	Blåmes	Blue Tit
<i>Anas</i>	<i>penelope</i>	Bläsand	Wigeon
<i>Fringilla</i>	<i>coelebs</i>	Bofink	Chaffinch
<i>Aythya</i>	<i>ferina</i>	Brunand	Pochard
<i>Circus</i>	<i>aeruginosus</i>	Brun kärrhök	Marsh Harrier
<i>Saxicola</i>	<i>rubetra</i>	Buskskvätta	Whinchat
<i>Acrocephalus</i>	<i>dumetorum</i>	Busksångare	Blyth's Reed Warbler
<i>Pyrrhula</i>	<i>pyrrhula</i>	Domherre	Bullfinch
<i>Actitis</i>	<i>hypoleucos</i>	Drillsnäppa	Common Sandpiper
<i>Turdus</i>	<i>viscivorus</i>	Dubbeltrast	Mistle Thrush
<i>Accipiter</i>	<i>gentilis</i>	Duvhök	Goshawk
<i>Larus</i>	<i>minutus</i>	Dvärgmåås	Little Gull
<i>Somateria</i>	<i>mollissima</i>	Ejder	Ejder
<i>Gallinago</i>	<i>gallinago</i>	Enkelbeckasin	Common Snipe
<i>Parus</i>	<i>palustris</i>	Entita	Marsh Tit
<i>Phasianus</i>	<i>colchicus</i>	Fasan	Pheasant
<i>Pandion</i>	<i>haliaetus</i>	Fiskgjuse	Osprey
<i>Larus</i>	<i>canus</i>	Fiskmåås	Common Gull
<i>Sterna</i>	<i>hirundo</i>	Fisktärna	Common Tern
<i>Locustella</i>	<i>fluviatilis</i>	Flodsångare	River Warbler
<i>Motacilla</i>	<i>cinerea</i>	Forsärla	Grey Wagtail
<i>Milvus</i>	<i>milvus</i>	Glada	Red Kite
<i>Tadorna</i>	<i>tadorna</i>	Gravand	Shelduck
<i>Phylloscopus</i>	<i>collybita</i>	Gransångare	Chiffchaff
<i>Muscicapa</i>	<i>striata</i>	Grå flugsnappare	Spotted Flycatcher
<i>Anser</i>	<i>anser</i>	Grågås	Greylag Goose
<i>Carduelis</i>	<i>flammea</i>	Gråsiska	Redpoll
<i>Passer</i>	<i>domesticus</i>	Gråsparv	House Sparrow
<i>Picus</i>	<i>canus</i>	Gråspett	Grey-headed Woodpecker
<i>Larus</i>	<i>argentatus</i>	Gråtrut	Herring Gull
<i>Anas</i>	<i>platyrhynchos</i>	Gräsand	Mallard
<i>Locustella</i>	<i>naevia</i>	Gräshoppsångare	Grashopper Warbler
<i>Tringa</i>	<i>glareola</i>	Grönbena	Wood Sandpiper
<i>Carduelis</i>	<i>chloris</i>	Grönfink	Greenfinch

<i>Picus</i>	<i>viridis</i>	Gröngöling	Green Woodpecker
<i>Carduelis</i>	<i>spinus</i>	Grönsiska	Siskin
<i>Phylloscopus</i>	<i>sibilatrix</i>	Grönsångare	Wood Warbler
<i>Emberiza</i>	<i>citrinella</i>	Gulspurv	Yellowhammer
<i>Motacilla</i>	<i>flava</i>	Gulärta	Yellow Wagtail
<i>Troglodytes</i>	<i>troglodytes</i>	Gärdsmyg	Wren
<i>Cuculus</i>	<i>canorus</i>	Gök	Cuckoo
<i>Jynx</i>	<i>torquilla</i>	Göktyta	Wryneck
<i>Larus</i>	<i>marinus</i>	Havstrut	Great Black-backed Gull
<i>Haliaeetus</i>	<i>albicilla</i>	Havsörn	White-tailed Eagle
<i>Asio</i>	<i>otus</i>	Hornuggla	Long-eared Owl
<i>Delichon</i>	<i>urbica</i>	Hussvala	House Martin
<i>Ardea</i>	<i>cinerea</i>	Häger	Grey Heron
<i>Carduelis</i>	<i>cannabina</i>	Hämpling	Linnet
<i>Hippolais</i>	<i>icterina</i>	Härmsångare	Icterine Warbler
<i>Sylvia</i>	<i>nisoria</i>	Höksångare	Barred Warbler
<i>Bonasia</i>	<i>bonasia</i>	Järpe	Hazel Grouse
<i>Prunella</i>	<i>modularis</i>	Järnsparv	Dunnock
<i>Corvus</i>	<i>monedula</i>	Kaja	Jackdaw
<i>Branta</i>	<i>canadensis</i>	Kanadagås	Canada Goose
<i>Strix</i>	<i>aluco</i>	Kattuggla	Tawny Owl
<i>Sterna</i>	<i>sandvicensis</i>	Kentsk tärna	Sandwich Tern
<i>Bucephala</i>	<i>clangula</i>	Knipa	Goldeneye
<i>Cygnus</i>	<i>olor</i>	Knölsvan	Mute Swan
<i>Turdus</i>	<i>merula</i>	Koltrast	Blackbird
<i>Crex</i>	<i>crex</i>	Kornknarr	Corncrake
<i>Corvus</i>	<i>corax</i>	Korp	Raven
<i>Anas</i>	<i>crecca</i>	Kricka	Teal
<i>Corvus</i>	<i>corone cornix</i>	Kråka	Hooded Crow
<i>Alcedo</i>	<i>atthis</i>	Kungsfiskare	Kingfisher
<i>Regulus</i>	<i>regulus</i>	Kungsfågel	Goldcrest
<i>Aquila</i>	<i>chrysaetos</i>	Kungsörn	Golden Eagle
<i>Acrocephalus</i>	<i>palustris</i>	Kärrsångare	Marsh Warbler
<i>Stercorarius</i>	<i>parasiticus</i>	Labbe	Arctic Skua
<i>Hirundo</i>	<i>rustica</i>	Ladusvala	Swallow
<i>Strix</i>	<i>nebulosa</i>	Lappuggla	Great Grey Owl
<i>Phylloscopus</i>	<i>trochiloides</i>	Lundsångare	Greenish Warbler
<i>Falco</i>	<i>subbuteo</i>	Lärfalk	Hobby
<i>Phylloscopus</i>	<i>trochilus</i>	Lövsångare	Willow Warbler
<i>Dendrocopos</i>	<i>medius</i>	Mellanspett	Middle Spotted Woodpecker
<i>Ficedula</i>	<i>parva</i>	Mindre flugsnappare	Red-breasted Flycatcher
<i>Dendrocopos</i>	<i>minor</i>	Mindre hackspett	Lesser Spotted Woodpecker
<i>Loxia</i>	<i>curvirostra</i>	Mindre korsnäbb	Crossbill
<i>Charadrius</i>	<i>dubius</i>	Mindre strandpipare	Little Ringed Plover
<i>Scolopax</i>	<i>rusticola</i>	Morkulla	Woodcock
<i>Caprimulgus</i>	<i>europaeus</i>	Nattskärva	Nightjar
<i>Luscinia</i>	<i>luscinia</i>	Näktergal	Thrush Nightingale
<i>Nucifraga</i>	<i>caryocatactes</i>	Nötkråka	Nutcracker
<i>Garrulus</i>	<i>glandarius</i>	Nötskrika	Jay

<i>Sitta</i>	<i>europaea</i>	Nötväcka	Nuthatch
<i>Buteo</i>	<i>buteo</i>	Ormvråk	Buzzard
<i>Tetrao</i>	<i>tetrix</i>	Orre	Black Grouse
<i>Emberiza</i>	<i>hortulana</i>	Ortolansparv	Ortolan Bunting
<i>Passer</i>	<i>montanus</i>	Pilfink	Tree Sparrow
<i>Aegolius</i>	<i>funereus</i>	Pärluggla	Tengmalm's Owl
<i>Perdix</i>	<i>perdix</i>	Rapphöna	Partridge
<i>Columba</i>	<i>palumbus</i>	Ringduva	Woodpigeon
<i>Carpodacus</i>	<i>erythrinus</i>	Rosenfink	Rosefinch
<i>Arenaria</i>	<i>interpres</i>	Roskarl	Turnstone
<i>Tringa</i>	<i>totanus</i>	Rödbena	Redshank
<i>Erithacus</i>	<i>rubecula</i>	Rödhake	Robin
<i>Phoenicurus</i>	<i>phoenicurus</i>	Rödstjärt	Redstart
<i>Turdus</i>	<i>iliacus</i>	Rödvingetrast	Redwing
<i>Botaurus</i>	<i>stellaris</i>	Rördrom	Bittern
<i>Gallinula</i>	<i>chloropus</i>	Rörhöna	Moorhen
<i>Acrocephalus</i>	<i>scirpaceus</i>	Rörsångare	Reed Warbler
<i>Larus</i>	<i>fuscus</i>	Silltrut	Lesser Black-backed Gull
<i>Sterna</i>	<i>paradisaea</i>	Silvertärna	Arctic Tern
<i>Pica</i>	<i>pica</i>	Skata	Magpie
<i>Anas</i>	<i>clypeata</i>	Skedand	Shoveler
<i>Columba</i>	<i>oenas</i>	Skogsduva	Stock Dove
<i>Tringa</i>	<i>ochropus</i>	Skogssnäppa	Green Sandpiper
<i>Panurus</i>	<i>biarmicus</i>	Skäggmes	Bearded Tit
<i>Larus</i>	<i>ridibundus</i>	Skrattmås	Black-headed Gull
<i>Sterna</i>	<i>caspia</i>	Skräntärna	Carpian Tern
<i>Podiceps</i>	<i>cristatus</i>	Skäggdopping	Great Crested Grebe
<i>Anthus</i>	<i>petrosus</i>	Skärpiplärka	Rock Pipit
<i>Strix</i>	<i>uralensis</i>	Slaguggla	Ural Owl
<i>Tachybaptus</i>	<i>ruficollis</i>	Smådopping	Little Grebe
<i>Mergus</i>	<i>serrator</i>	Småskrake	Red-breasted Merganser
<i>Porzana</i>	<i>porzana</i>	Småfläckig sumphöna	Spotted Crake
<i>Sterna</i>	<i>albifrons</i>	Småtärna	Little Tern
<i>Anas</i>	<i>strepera</i>	Snatterand	Gadwall
<i>Fulica</i>	<i>atra</i>	Sothöna	Coot
<i>Accipiter</i>	<i>nisus</i>	Sparvhök	Sparrow Hawk
<i>Glaucidium</i>	<i>passerinum</i>	Sparvuggla	Pygmy Owl
<i>Anser</i>	<i>brachyrhynchus</i>	Spetsbergsgås	Pink-footed Goose
<i>Dryocopus</i>	<i>martius</i>	Spillkråka	Black Woodpecker
<i>Sturnus</i>	<i>vulgaris</i>	Stare	Starling
<i>Carduelis</i>	<i>carduelis</i>	Steglits	Goldfinch
<i>Coccothraustes</i>	<i>coccothraustes</i>	Stenknäck	Hawfinch
<i>Oenanthe</i>	<i>oenanthe</i>	Stenskvätta	Wheatear
<i>Anas</i>	<i>acuta</i>	Stjärtand	Pintail
<i>Aegithalos</i>	<i>caudatus</i>	Stjärtmes	Long-tailed Tit
<i>Gavia</i>	<i>arctica</i>	Storlom	Black-throated Diver
<i>Phalacrocorax</i>	<i>carbo</i>	Storskarv	Cormorant
<i>Mergus</i>	<i>merganser</i>	Storskrake	Goosander
<i>Numenius</i>	<i>arquata</i>	Storspov	Curlew

<i>Haematopus</i>	<i>ostralegus</i>	Strandskata	Oystercatcher
<i>Cinclus</i>	<i>cinclus</i>	Strömstare	Dipper
<i>Dendrocopos</i>	<i>major</i>	Större hackspett	Great Spotted Woodpecker
<i>Loxia</i>	<i>pytyopsittacus</i>	Större korsnäbb	Parrot Crossbill
<i>Charadrius</i>	<i>hiaticula</i>	Större strandpipare	Ringed Plover
<i>Ficedula</i>	<i>hypoleuca</i>	Svartvit flugsnappare	Pied Flycatcher
<i>Podiceps</i>	<i>auritus</i>	Svarthakedopping	Slavonian Grebe
<i>Sylvia</i>	<i>atricapilla</i>	Svarthätta	Blackcap
<i>Parus</i>	<i>ater</i>	Svartmes	Coal Tit
<i>Chlidonias</i>	<i>niger</i>	Svarttärna	Black Tern
<i>Melanitta</i>	<i>fusca</i>	Svärta	Velvet Scoter
<i>Alauda</i>	<i>arvensis</i>	Sånglärka	Skylark
<i>Motacilla</i>	<i>alba</i>	Sädesärla	White Wagtail
<i>Emberiza</i>	<i>schoeniclus</i>	Sävspurv	Reed Bunting
<i>Acrocephalus</i>	<i>schoenobaenus</i>	Sävsångare	Sedge Warbler
<i>Parus</i>	<i>major</i>	Talgoxe	Great Tit
<i>Parus</i>	<i>montanus</i>	Talltita	Willow Tit
<i>Turdus</i>	<i>philomelos</i>	Taltrast	Song Thrush
<i>Columba</i>	<i>livia</i>	Tamduva	Feral Pigeon
<i>Tetrao</i>	<i>urogallus</i>	Tjäder	Capercaillie
<i>Cepphus</i>	<i>grylle</i>	Tobisgrissla	Black Guillemot
<i>Parus</i>	<i>cristatus</i>	Tofsmes	Crested Tit
<i>Vanellus</i>	<i>vanellus</i>	Tofsvipa	Lapwing
<i>Falco</i>	<i>tinnunculus</i>	Tornfalk	Kestrel
<i>Alca</i>	<i>torda</i>	Tordmule	Razorbill
<i>Apus</i>	<i>apus</i>	Tornseglare	Swift
<i>Grus</i>	<i>grus</i>	Trana	Crane
<i>Acrocephalus</i>	<i>arundinaceus</i>	Trastsångare	Great Reed Warbler
<i>Picoides</i>	<i>tridactylus</i>	Tretåig hackspett	Three-toed Woodpecker
<i>Certhia</i>	<i>familiaris</i>	Trädkrypare	Treecreeper
<i>Lullula</i>	<i>arborea</i>	Trädlärka	Wood Lark
<i>Anthus</i>	<i>trivialis</i>	Trädpiplärka	Tree Pipit
<i>Sylvia</i>	<i>borin</i>	Trädgårdssångare	Garden Warbler
<i>Streptopelia</i>	<i>decaocto</i>	Turkduva	Collared Dove
<i>Streptopelia</i>	<i>turtur</i>	Turturduva	Turtle Dove
<i>Lanius</i>	<i>collurio</i>	Törnskata	Red-backed Shrike
<i>Sylvia</i>	<i>communis</i>	Törnsångare	Whitethroat
<i>Coturnix</i>	<i>coturnix</i>	Vaktel	Quail
<i>Lanius</i>	<i>excubitor</i>	Varfågel	Great Grey Shrike
<i>Rallus</i>	<i>aquaticus</i>	Vattenrall	Water Rail
<i>Aythya</i>	<i>fuligula</i>	Vigg	Tufted Duck
<i>Carduelis</i>	<i>flavirostris</i>	Vinterhämling	Twite
<i>Dendrocopos</i>	<i>leucotos</i>	Vitryggig hackspett	White-backed Woodpecker
<i>Anas</i>	<i>querquedula</i>	Ärta	Garganey
<i>Circus</i>	<i>pygargus</i>	Ängshök	Montagu's Harrier
<i>Anthus</i>	<i>pratensis</i>	Ängspiplärka	Meadow Pipit
<i>Sylvia</i>	<i>curruca</i>	Ärtsångare	Lesser Whitethroat

Appendix 2

Total number of birds and densities (no birds/km) registered during the line transects in the local model area in Simpevarp 2002–2004. English and Swedish names are shown. Listed species in bold text. Note that a larger, preliminary local model area was used in 2002.

Species	No of birds 2002	No of birds 2003	No of birds 2004	No of birds/km 2002	No of birds/km 2003	No of birds/km 2004
Chaffinch, Bofink	760	830	700	7.10	10.84	10.06
Willow warbler, Lövsångare	765	261	471	7.15	3.41	6.77
Robin, Rödhake	238	568	388	2.22	7.42	5.57
Song thrush, Taltrast	202	282	252	1.89	3.68	3.62
Blackbird, Koltrast	240	417	224	2.24	5.44	3.22
Great tit, Talgoxe	166	595	192	1.55	7.77	2.76
Siskin, Grönsiska	87	145	170	0.81	1.89	2.44
Starling, Stare	52	31	163	0.49	0.40	2.34
Wood Pigeon, Ringduva	174	201	157	1.63	2.62	2.26
Goldcrest, Kungsfågel	41	110	131	0.38	1.44	1.88
Yellowhammer, Gulsparv	93	122	106	0.87	1.59	1.52
Green finch, Grönfink	31	75	89	0.29	0.98	1.28
Blue tit, Blåmes	62	361	86	0.58	4.71	1.24
Tree pipit, Trädpiplärka	183	28	80	1.71	0.37	1.15
Wren, Gärdsmyg	72	32	72	0.67	0.42	1.03
Grey Heron, Häger	5	7	72	0.05	0.09	1.03
Swift, Tornseglare	119	45	70	1.11	0.59	1.01
Great spotted woodpecker, Större hackspett	25	44	67	0.23	0.57	0.96
Dunnock, Järnsparv	67	34	64	0.63	0.44	0.92
Hooded crow, Kråka	60	127	59	0.56	1.66	0.85
White wagtail, Sädesärta	42	33	59	0.39	0.43	0.85
Nuthatch, Nötväcka	26	32	58	0.24	0.42	0.83
Crested tit, Tofsmes	63	25	58	0.59	0.33	0.83
Jay, Nötskrika	49	45	53	0.46	0.59	0.76
Raven, Korp	24	9	48	0.22	0.12	0.69
Coal tit, Svartmes	41	38	42	0.38	0.50	0.60
Herring gull, Gråtrut	7	131	41	0.07	1.71	0.59
Cormorant, Storskarv	0	89	40	0.00	1.16	0.57
Blackcap, Svarthätta	86	20	39	0.80	0.26	0.56
Cuckoo, Gök	80	15	37	0.75	0.20	0.53
Marsh tit, Entita	20	23	35	0.19	0.30	0.50
Garden warbler, Trädgårdssångare	87	21	35	0.81	0.27	0.50
Fieldfare, Björktrast	18	66	34	0.17	0.86	0.49
Green woodpecker, Gröngöling	38	32	32	0.36	0.42	0.46
Goosander, Storskrake	1	25	32	0.01	0.33	0.46
Great crested grebe, Skäggdopping	0	7	27	0.00	0.09	0.39
Wood warbler, Grönsångare	22	12	26	0.21	0.16	0.37
House sparrow, Gråsparv	8	11	25	0.07	0.14	0.36
Pheasant, Fasan	17	18	24	0.16	0.23	0.34

Goldeneye, Knipa	1	4	24	0.01	0.05	0.34
Mute swan, Knölsvan	1	21	24	0.01	0.27	0.34
Spotted flycatcher, Grå flugsnappare	61	9	23	0.57	0.12	0.33
Willow tit, Talltita	33	9	23	0.31	0.12	0.33
Barn swallow, Ladusvala	61	7	22	0.57	0.09	0.32
Grelag goose, Grågås	32	11	21	0.30	0.14	0.30
Green sandpiper, Skogssnäppa	12	19	21	0.11	0.25	0.30
Tree sparrow, Pilfink	4	17	19	0.04	0.22	0.27
Common tern, Fisktärna	1	0	18	0.01	0.00	0.26
Black-headed gull, Skrattnås	0	46	18	0.00	0.60	0.26
Pied flycatcher, Svartvit flugsnappare	45	2	17	0.42	0.03	0.24
treecreeper, Trädkrypare	11	10	16	0.10	0.13	0.23
Mallard, Gräsand	12	32	15	0.11	0.42	0.22
Lesser whitethroat, Ärtsångare	51	10	13	0.48	0.13	0.19
Common sandpiper, Drillsnäppa	1	13	13	0.01	0.17	0.19
Jackdaw, Kaja		2	13	0.00	0.03	0.19
Redstart, Rödstart	8	0	13	0.07	0.00	0.19
Reed bunting, Sävsparv	4	12	13	0.04	0.16	0.19
Snipe, Enkelbeckasin	21	13	11	0.20	0.17	0.16
Common gull, Fiskmås	1	43	11	0.01	0.56	0.16
Great black-backed gull, Havstrut	1	7	11	0.01	0.09	0.16
Buzzard, Ormvråk	14	5	11	0.13	0.07	0.16
Arctic tern, Silvertärna	0	7	11	0.00	0.09	0.16
Black woodpecker, Spillkråka	0	4	11	0.00	0.05	0.16
Mistle thrush, Dubbeltrast	12	9	10	0.11	0.12	0.14
Magpie, Skata	3	5	10	0.03	0.07	0.14
Whitethroat, Törnsångare	9	3	10	0.08	0.04	0.14
Crane, Trana	28	11	10	0.26	0.14	0.14
Caspian tern, Skrântärna	17	3	9	0.16	0.04	0.13
Woodlark, Trädlärka	9	3	7	0.08	0.04	0.10
Osprey, Fiskgjuse	0	1	6	0.00	0.01	0.09
Unidentified crossbill, Obestämd korsnäbb	116	17	6	1.08	0.22	0.09
Teal, Kricka	0	4	6	0.00	0.05	0.09
Reed warbler, Rörsångare	1	1	6	0.01	0.01	0.09
Hawfinch, Stenknäck	3	0	6	0.03	0.00	0.09
Wheatear, Stenskvätta	1	2	6	0.01	0.03	0.09
Red-backed shrike, Törnskata	27	6	6	0.25	0.08	0.09
Rosefinch, Rosenfink	1	0	5	0.01	0.00	0.07
Meadow pipit, Ängspilärka		0	4	0.00	0.00	0.06
Bullfinch, Domherre	3	7	4	0.03	0.09	0.06
Wryneck, Göktyta	6	1	4	0.06	0.01	0.06
Linnet, Hämpling	0	5	4	0.00	0.07	0.06
Lesser spotted woodpecker, Mindre hackspett	0	3	4	0.00	0.04	0.06
Whinchat, Buskskvätta	5	0	3	0.05	0.00	0.04
House martin, Hussvala	28	0	3	0.26	0.00	0.04
Woodcock, Morkulla	1	4	3	0.01	0.05	0.04
Nutcracker, Nötkråka	0	0	3	0.00	0.00	0.04
Sparrowhawk, Sparvhök	0	1	3	0.00	0.01	0.04

Long-tailed tit, Stjärtmes	4	8	3	0.04	0.10	0.04
Eider, Ejder	0	16	2	0.00	0.21	0.03
Whooper swan, Sångsvan	1	0	2	0.01	0.00	0.03
Tufted duck, Vigg	0	3	2	0.00	0.04	0.03
Goshawk, Duvhök	1	2	1	0.01	0.03	0.01
Hazelhen, Järpe	0	1	1	0.00	0.01	0.01
Crossbill, Mindre korsnäbb	48	17	1	0.45	0.22	0.01
Black grouse, Orre	5	4	1	0.05	0.05	0.01
Redshank, Rödbena	0	0	1	0.00	0.00	0.01
Redwing, Rödvingetrast	2	0	1	0.02	0.00	0.01
Skylark, Sånglärka	0	0	1	0.00	0.00	0.01
Rock pipit, Skärpiplärka	0	0	1	0.00	0.00	0.01
Stock dove, Skogsduva	3	0	1	0.03	0.00	0.01
Coot, Sothöna	0	0	1	0.00	0.00	0.01
Black-throated diver, Storlom	0	0	1	0.00	0.00	0.01
Oystercatcher, Strandskata	0	0	1	0.00	0.00	0.01
Sand martin, Backsvala	1	0	0	0.01	0.00	0.00
Honey Buzzard, Bivråk	1	0	0	0.01	0.00	0.00
Marsh harrier, Brun Kärrhök	1	0	0	0.01	0.00	0.00
Grasshopper warbler, Gräshoppsångare	1	0	0	0.01	0.00	0.00
Wood sandpiper, Grönbena	1	0	0	0.01	0.00	0.00
White-tailed eagle, Havsörn	3	0	0	0.03	0.00	0.00
Icterine warbler, Härmsångare	0	2	0	0.00	0.03	0.00
Marsh warbler, Kärrsångare	1	0	0	0.01	0.00	0.00
Tawny owl, Kattuggla	1	0	0	0.01	0.00	0.00
Hobby, Lärkfalk	2	0	0	0.02	0.00	0.00
Thrush nightingale, Näktergal	4	0	0	0.04	0.00	0.00
Goldfinch, Steglits	1	0	0	0.01	0.00	0.00
Capercaillie, Tjäder	7	0	0	0.07	0.00	0.00
Lapwing, Tofsvipa	0	5	0	0.00	0.07	0.00
Razorbill, Tordmule	0	1	0	0.00	0.01	0.00
Total	4,804	5,415	4,909	44.90	70.69	70.53

Appendix 3

Total number of birds and densities (no of birds/point) registered during the point counts in the local model area in Simpevarp 2002–2004. Listed species in bold text. English and Swedish bird names are shown. Note that a larger, preliminary local model area was used in 2002.

Species	No of birds 2002	No of birds 2003	No of birds 2004	No of birds/point 2002	No of birds/point 2003	No of birds/point 2004
Chaffinch, Bofink	182	148	180	1.53	1.87	2.34
Willow warbler, Lövsångare	161	51	130	1.35	0.65	1.69
Robin, Rödhake	55	88	96	0.46	1.11	1.25
Blackbird, Koltrast	54	76	78	0.45	0.96	1.01
Song thrush, Taltrast	79	67	69	0.66	0.85	0.90
Wood pigeon, Ringduva	56	54	59	0.47	0.68	0.77
Great tit, Talgoxe	32	95	55	0.27	1.20	0.71
Siskin, Grönsiska	15	50	44	0.13	0.63	0.57
Hooded crow, Kråka	25	37	42	0.21	0.47	0.55
Goldcrest, Kungsfågel	7	18	40	0.06	0.23	0.52
Yellowhammer, Gulsparv	27	32	37	0.23	0.41	0.48
Blue tit, Blåmes	20	48	34	0.17	0.61	0.44
Cuckoo, Gök	48	10	30	0.40	0.13	0.39
Wren, Gärdsmyg	15	9	25	0.13	0.11	0.32
Raven, Korp	10	2	25	0.08	0.03	0.32
Tree pipit, Trädpiplärka	53	9	22	0.45	0.11	0.29
Greenfinch, Grönfink	10	30	20	0.08	0.38	0.26
Great spotted woodpecker, Större hackspett	8	11	19	0.07	0.14	0.25
Garden warbler, Trädgårdssångare	28	3	18	0.24	0.04	0.23
Dunnock, Järnsparv	20	12	17	0.17	0.15	0.22
Pheasant, Fasan	14	12	16	0.12	0.15	0.21
Spotted flycatcher, Grå flugsnappare	19	2	14	0.16	0.03	0.18
Blackcap, Svarthätta	14	6	14	0.12	0.08	0.18
White wagtail, Sädesärta	5	4	13	0.04	0.05	0.17
Herring gull, Gråtrut	3	42	12	0.03	0.53	0.16
Green woodpecker, Gröngöling	12	22	12	0.10	0.28	0.16
Grey heron, Häger	1	0	11	0.01	0.00	0.14
Swift, Tornseglare	20	5	11	0.17	0.06	0.14
Fieldfare, Björktrast	2	5	10	0.02	0.06	0.13
Nuthatch, Nötväcka	2	11	10	0.02	0.14	0.13
Green sandpiper, Skogssnäppa	4	5	9	0.03	0.06	0.12
Crested tit, Tofsmes	14	4	9	0.12	0.05	0.12
Starling, Stare	10	3	8	0.08	0.04	0.10
Whitethroat, Törnsångare	3	1	8	0.03	0.01	0.10
Crane, Trana	12	3	8	0.10	0.04	0.10
Marsh tit, Entita	1	6	7	0.01	0.08	0.09
Wood warbler, Grönsångare	9	2	7	0.08	0.03	0.09
Jay, Nötskrika	9	10	7	0.08	0.13	0.09
Black-headed gull, Skrattnås	0	1	7	0.00	0.01	0.09
Black woodpecker, Spillkråka	5	0	7	0.04	0.00	0.09

Willow tit, Talltita	7	2	7	0.06	0.03	0.09
Treecreeper, Trädkrypare	1	2	7	0.01	0.03	0.09
Snipe, Enkelbeckasin	9	3	6	0.08	0.04	0.08
Greylag goose, Grågås	8	5	6	0.07	0.06	0.08
Great crested grebe, Skäggdopping	0	0	6	0.00	0.00	0.08
Coal tit, Svartmes	4	8	6	0.03	0.10	0.08
Pied flycatcher, Svartvit flugsnappare	15	0	6	0.13	0.00	0.08
Unidentified crossbill, Obestämd korsnäbb	15	4	5	0.13	0.05	0.06
Teal, Kricka	0	0	5	0.00	0.00	0.06
Redstart, Rödstart	8	1	4	0.07	0.01	0.05
Cormorant, Storskarv	0	7	4	0.00	0.09	0.05
Goosander, Storskrake	0	7	4	0.00	0.09	0.05
Lesser whitethroat, Ärtsångare	12	1	3	0.10	0.01	0.04
Barn Swallow, Ladusvala	10	0	3	0.08	0.00	0.04
Black grouse, Orre	5	0	3	0.04	0.00	0.04
Tree sparrow, Pifink	2	0	3	0.02	0.00	0.04
Arctic tern, Silvertärna	0	0	3	0.00	0.00	0.04
Common sandpiper, Drillsnäppa	0	0	2	0.00	0.00	0.03
Mistle thrush, Dubbeltrast	6	1	2	0.05	0.01	0.03
Common tern, Fisktärna	0	0	2	0.00	0.00	0.03
House sparrow, Gråsparv	0	0	2	0.00	0.00	0.03
Jackdaw, Kaja	0	0	2	0.00	0.00	0.03
Goldeneye, Knipa	0	0	2	0.00	0.00	0.03
Buzzard, Ormvråk	7	3	2	0.06	0.04	0.03
Reed warbler, Rörsångare	1	0	2	0.01	0.00	0.03
Reed bunting, Sävsparv	3	4	2	0.03	0.05	0.03
Red-backed shrike, Törnskata	8	0	2	0.07	0.00	0.03
Woodlark, Trädlärka	2	1	2	0.02	0.01	0.03
Goshawk, Duvhök	0	0	1	0.00	0.00	0.01
Common gull, Fiskmås	1	1	1	0.01	0.01	0.01
Mallard, Gräsand	13	7	1	0.11	0.09	0.01
Icterine warbler, Härmsångare	0	1	1	0.00	0.01	0.01
House martin, Hussvala	3	0	1	0.03	0.00	0.01
Tawny owl, Kattuggla	0	0	1	0.00	0.00	0.01
Lesser spotted woodpecker, Mindre hackspett	1	3	1	0.01	0.04	0.01
Thrush nightingale, Näktergal	0	0	1	0.00	0.00	0.01
Skylark, Sånglärka	0	0	1	0.00	0.00	0.01
Magpie, Skata	1	0	1	0.01	0.00	0.01
Sparrowhawk, Sparvhök	0	0	1	0.00	0.00	0.01
Hawfinch, Stenknäck	0	0	1	0.00	0.00	0.01
Long-tailed tit, Stjärtmes	0	2	1	0.00	0.03	0.01
Whinchat, Buskskvätta	1	1	0	0.01	0.01	0.00
Bullfinch, Domherre	0	2	0	0.00	0.03	0.00
Wryneck, Göktyta	1	0	0	0.01	0.00	0.00
Mute swan, Knölsvan	0	1	0	0.00	0.01	0.00
Crossbill, Mindre korsnäbb	8	7	0	0.07	0.09	0.00
Redwing, Rödvingetrast	1	31	0	0.01	0.39	0.00
Whooper swan, Sångsvan	0	2	0	0.00	0.03	0.00
Water rail, Vattenrall	0	1	0	0.00	0.01	0.00
Total	1,217	1,102	1,356	10.23	13.95	17.61

Appendix 4

Number of territories per bird species in territory mapping area 1: Ävrö in 2003 and 2004. English and Swedish names are shown. Listed species in bold text.

Species	No of territories 2003	No of territories 2004	Change 2003–2004
Willow warbler, Lövsångare	42	57	15
Chaffinch, Bofink	27	28	1
Robin, Rödhake	14	16	2
Blackbird, Koltrast	9	9	0
Blackcap, Svarthätta	9	10	1
Great tit, Talgoxe	7	6	-1
Greenfinch, Grönfink	6	2	-4
Wood warbler, Grönsångare	6	4	-2
Yellowhammer, Gulsparv	6	3	-3
Goldcrest, Kungsfågel	6	4	-2
Song thrush, Taltrast	6	6	0
Garden warbler, Trädgårdssångare	6	10	4
Wood pigeon, Ringduva	5	6	1
Tree pipit, Trädpiplärka	5	4	-1
Lesser whitethroat, Ärtsångare	4	3	-1
Marsh tit, Entita	4	2	-2
Dunnock, Järnsparv	4	2	-2
Blue tit, Blåmes	3	5	2
Siskin, Grönsiska	3	4	1
Nuthatch, Nötväcka	3	1	-2
Pied flycatcher, Svartvit flugsnappare	3	1	-2
Jay, Nötskrika	2	1	-1
Crested tit, Tofsmes	2	2	0
Treecreeper, Trädkrypare	2	2	0
Cuckoo, Gök	1	1	0
Spotted flycatcher, Grå flugsnappare	1	4	3
Lesser spotted woodpecker, Mindre hackspett	1	1	0
Rosefinch, Rosenfink	1	2	1
Black woodpecker, Spillkråka	1	1	0
Great spotted woodpecker, Större hackspett	1	1	0
Goosander, Storskrake	1	0	-1
Coal tit, Svartmes	1	0	-1
Red-backed shrike, Törnskata	1	0	-1
Icterine warbler, Härmsångare	0	1	1
Wren, Gärdsmyg	0	1	1
Wryneck, Göktyta	0	1	1
Hooded crow, Kråka	0	1	1
Woodcock, Morkulla	0	1	1

Green sandpiper, Skogssnäppa	0	1	1
Hawfinch, Stenknäck	0	1	1
Willow tit, Talltita	0	2	2
Whitethroat, Törnsångare	0	1	1
Total no of territories	193	208	15

B. Number of territories per bird species in territory mapping area 2: Hålö in 2003 and 2004. English and Swedish names are shown. Listed species in bold text.

Species	No of territories 2002	No of territories 2003	Change 2002–2003
Chaffinch, Bofink	28	26	–2
Willow warbler, Lövsångare	24	32	8
Robin, Rödhake	11	14	3
Blackbird, Koltrast	7	4	–3
Goldcrest, Kungsfågel	7	4	–3
Great tit, Talgoxe	7	5	–2
Reed warbler, Rörsångare	5	8	3
Blue tit, Blåmes	4	5	1
Spotted flycatcher, Grå flugsnappare	4	7	3
Wood pigeon, Ringduva	4	3	–1
Tree pipit, Trädpiplärka	4	2	–2
Wood warbler, Grönsångare	3	3	0
Reed bunting, Sävsparv	3	0	–3
Blackcap, Svarthätta	3	2	–1
Lesser whitethroat, Ärtsångare	2	1	–1
Siskin, Grönsiska	2	1	–1
White wagtail, Sädesärla	2	2	0
Coal tit, Svartmes	2	1	–1
Song thrush, Taltrast	2	2	0
Crested tit, Tofsmes	2	2	0
Wren, Gärdsmyg	4	5	1
Common sandpiper, Drillsnäppa	1	1	0
Green sandpiper, Skogssnäppa	3	0	–3
Marsh tit, Entita	1	0	–1
Cuckoo, Gök	1	2	1
Greenfinch, Grönfink	1	0	–1
Yellowhammer, Gulsparv	1	0	–1
Goosander, Storskrake	1	2	1
Pied flycatcher, Svartvit flugsnappare	1	1	0
Willow tit, Talltita	1	1	0
Treecreeper, Trädkrypare	1	3	2
Garden warbler, Trädgårdssångare	1	3	2
Green woodpecker, Gröngöling	0	1	1
Dunnock, Järnsparv	0	3	3

Hooded crow, Kråka	0	2	2
Jay, Nötskrika	0	1	1
Nuthatch, Nötväcka	0	1	1
Redstart, Rödstart	0	2	2
Black woodpecker, Spillkråka	0	1	1
Total no of territories	136	148	12
