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Oskarshamn site investigations

Bird monitoring in Simpevarp 2002–2005

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April 2006

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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 monitoring of selected listed breeding bird species in Simpevarp 2002–2005. In addition to the surveys of selected listed species, results from territory mapping of the complete breeding bird fauna in a smaller area around a drilling site (before- and after drilling) is reported. The aim of the report is to evaluate possible impacts from the ongoing site investigations, conducted by SKB, on the breeding bird fauna. Selected listed species were monitored in the whole regional model area. Territory mapping was made in a 30 ha area at Sandö, in the local area.

In general, the results from the surveys in 2005 very much corroborate indications given from surveys in earlier years (2002–2004). No general impact on the breeding bird fauna could be detected. In the territory mapping area the number of breeding birds increased from the ‘before drilling’ situation to ‘after drilling’. There was no difference in the distribution of territories between the before- and after situation, showing that the birds did not in general avoid the area close to the drilling site.

Most listed species show stable numbers in the regional model area, but there are indications of possible negative impacts for some species. Breeding success of ospreys was low in 2005 and breeding success of eagle owls continues to be low. In both cases results were compared to surrounding reference areas and results in Simpevarp differed from these in a negative direction. Still, with the present knowledge we can not tell whether this has anything to do with the site investigations or not. Nightjars and lesser spotted woodpeckers seem to avoid the areas with the most disturbing activities within the site investigations. In both cases however, general numbers on a regional scale have not been changing in a negative direction.

Sammanfattning

Denna rapport sammanfattar populationsförändringar och i en del fall häckningsframgång hos ett urval listade (Svenska Rödlistan och/eller EU:s Fågeldirektiv) fågelarter i Simpevarp under perioden 2002 till 2005. Syftet är att utvärdera den eventuella påverkan som SKB:s platsundersökningar kan ha på de häckande fåglarnas numerär och i vissa fall häckningsframgång. Utvalda listade arter har följts upp i hela det *Regionala modellområdet* (inklusive det lokala området) genom att besöka tidigare kända revir och/eller genom eftersök i lämpliga biotoper för aktuella arter. Förutom dessa listade arter behandlar rapporten även eventuella förändringar mellan 2004 och 2005 i den totala häckfågelfaunan i anslutning till en borrhplats (Sandö). 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 längre undersökningsperiod åtminstone ca 5 år.

Resultaten från 2005 följer i princip helt och hållet de indikationer som givits av tidigare års undersökningar. Revirkarteringarna vid Sandö visade inga negativa effekter på vare sig antalet häckande arter eller antalet revir från tiden före borrhplatsen anlades till efter att den använts. Samma resultat har erhållits vid de två tidigare undersökta borrhplatserna (Ävrö och Hålö) i området. Det fanns inte heller några tecken på att den geografiska fördelningen av fågelrevir påverkades av platsundersökningarna inom något av dessa områden, dvs fåglarna undvek inte de mest störda delarna kring borrhplatserna.

Även för de listade arterna följer resultaten från 2005 tidigare års resultat. De flesta studerade arter uppvisar stabila populationsstorlekar i området. För ett fåtal arter finns det dock tendenser till viss negativ påverkan. Häckningsframgången hos berguv är precis som tidigare lägre inom undersökningsområdet jämfört med närliggande referensområden. Nattskärorna fortsätter att undvika områden där de mest störande momenten av platsundersökningarna genomförs. Detta har dock inte haft någon effekt på den lokala populationsstorleken och det ska bli mycket intressant att se om de delar som skärorna nu tycks undvika kommer att återbesättas efter avslutade platsundersökningar. Mindre hackspettarna förefaller precis som nattskärorna att undvika de delar av området där borrhningar genomförs, vilket egentligen är något förvånande eftersom arten ej är känd för att vara direkt känslig för störningar annat än i ett litet område runt själva boplatsen. Fiskgjusarna hade en låg häckningsframgång i området under 2005. Om detta hade något med platsundersökningarna att göra är osäkert.

Sammantaget blir slutsatsen av denna analys av platsundersökningarnas eventuella påverkan på häckfågelfaunan som följer:

- Fågelfaunan i stort påverkas inte alls, inte ens i borrhplatsers absoluta närhet.
- Ingen generell, storskalig påverkan har skett på listade arter inom det *Regionala modellområdet* eller inom *det lokala området*.
- Ett fåtal listade arter uppvisar tecken på att påverkas negativt, exempelvis genom att undvika områden med störande aktiviteter.

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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 2005. The bird surveys has now been going on for four years, allowing comparisons between the years. For most of the species presented here however, good data is available from 2003 onwards, allowing comparisons during a three-year period. The aim of this report is to evaluate the effects of the ongoing site investigations on the breeding bird fauna in the area for a number of selected listed species (according to the Swedish Red List and/or the EU Birds Directive). The surveys were made according to activity plan AP PS 400-05-13 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.

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 2005/ and European Unions Birds directive 79/409/EEG: Annex 1, /www.naturvardsverket.se/ /cf /Green 2003, 2004, 2005/. 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 area at large. 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, 2005/ and in the activity plan (AP PS 400-05-13).

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.

Local 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 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 thick, red broken lines in Figure 2-1. 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.

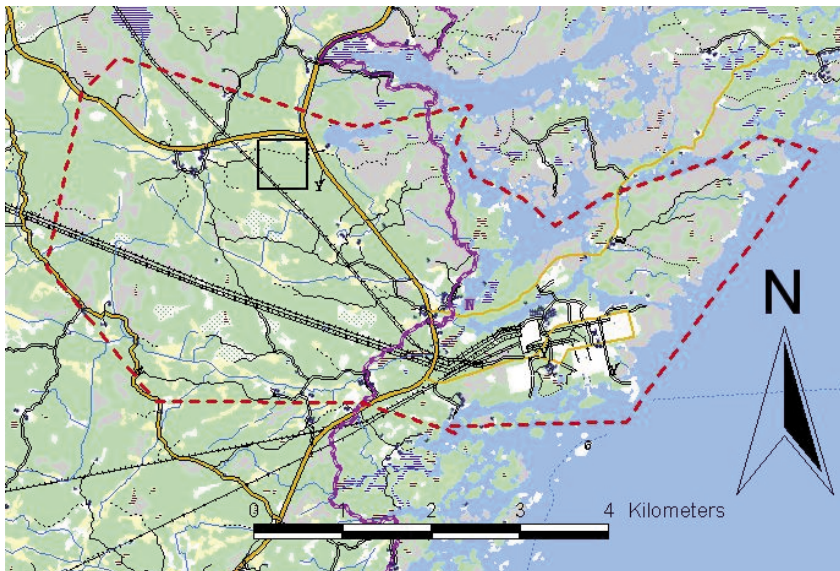
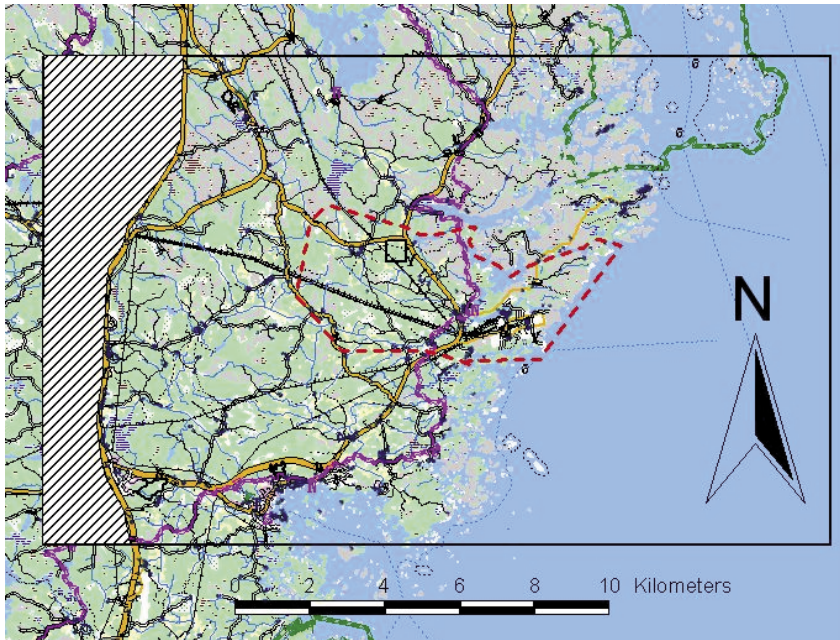


Figure 2-1. Map of the survey area in Simpevarp (upper). The regional model area is shown with a thick unbroken line (shaded part west of highway E-22 is excluded from the surveys), the local area is shown with a thick, red broken line. The territory mapping area censused in 2005 (and 2004) is also shown as a square in the northern part of the local area. The lower map shows the local 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 400-05-13 – SKB’s internal controlling document.

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

4.1 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 are evaluated following standardised criteria after the field work is completed. Territory mapping has been made in four areas in Simpevarp during 2003–2005, but only results from one of these (Sandö; 30.25 ha) is reported here. Earlier results can be found in /Green 2004, 2005/.

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 are shown in Appendix 1. Since the Swedish Red List was updated in 2005, with some earlier listed species being removed from the list and some new species being added /Gärdenfors 2005/, both species being red-listed before- and after 2005 are shown together with the latest updates on estimated local population size in Simpevarp.

Starting from 2004, a selection of these species are monitored on a yearly basis. The species in question are shown in Table 4-1. Selection of monitoring species were 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); **iiii)** Simpevarp holds high densities of the species.

Table 4-1. Listed species selected for monitoring in the Simpevarp area during 2005. Wood lark (Trädläarka) was also planned to be monitored in 2005 but could not be so due to lack of resources.

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 2005 by visiting known nesting places/territories used in 2002–2004, 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 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. 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 2005 was carried out during the period 2005-04-27–2005-08-6. The field work was partly made by local ornithologists 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. Tommy Larsson also made the main part of the territory mapping- and honey buzzard field work. Martin Green carried out part of the territory mapping work and 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 (listed species) all registered birds of the selected species 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. Observations were registered with exact position individually taken directly from the GPS in the field. Positions have the same resolution as the GPS-system. After each days field work all the data were transferred to pre-made protocols. Data were then entered into an Excel-file from protocols where after the file was cross-checked against the field notes by the project leader. 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).

4.5 Analyses and interpretations

The results gathered in 2005 during territory mapping are compared with results gathered in an identical way in 2004, with the aim of evaluating possible effects in bird numbers in an area close to a drilling site. Statistical testing is not possible at the species level as only two data points (2004 and 2005) 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) are tested to look for differences between 2004 and 2005. 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 territories per species in the Sandö territory mapping area during 2004 vs 2005.

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 are 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).

- b) The distribution of bird territories (regardless of species) within circular sectors with different distance from the centre of the drilling site was compared between 2004 (before) and 2005 (after drilling activities). The following sectors were used (see Figure 5-1):
 - 1) 0–50 m
 - 2) 50–100 m
 - 3) 100–150 m
 - 4) 150–200 m
 - 5) > 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.

Changes in numbers of territories at species level for selected 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. The rationale for this is that with a time series of only three-four years, any such test is non-sensical. Statistical testing will be possible after a time series of five years, although statistical power will 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.

For most species the actual number 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 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!).

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.

5.1 Territory mapping

Territory mapping was made around a drilling site at Sandö (Figure 2-1) in May–June 2004 (before establishment of the drilling site) and 2005 (after drilling). The area was visited five times in 2004 and six times in 2005 during this period. In the area no possibly disturbing activities were conducted before or during the territory mapping in 2004, hence this year serves as a ‘undisturbed’ background year. The results from the territory mapping are shown in detail in Appendix 2.

Results

The drilling site was established in late June 2004, just after the territory mapping field work had ended. Drilling activities then took place between August 2004 and late November 2004, i.e. completely outside of the bird breeding season. After that occasional pumping has been made at the site, also during 2005. 153 bird territories of 32 species were recorded in 2004 and 180 bird territories of 37 species were recorded in 2005. There was a statistically significant increase in the number of territories per species between the years (Wilcoxon signed ranks test, $Z = 2.25$, $p = 0.025$, $N = 39$, N is the total number of species recorded during the two years combined). 20 species increased in numbers and 10 species decreased in numbers from 2004 to 2005. For 9 species the number of territories were identical during the two years. Five territories of listed species were registered in 2004, one of black woodpecker *Dryocopus martius* (spillkråka), one of wood lark *Lullula arborea* (trädlärka), two of marsh tit *Parus palustris* (entita) and one of red-backed shrike *Lanius collurio* (törnskata). In 2005 five territories of listed species were recorded: crane *Grus grus* (trana) (1), wryneck *Jynx torquilla* (göktyta) (1), wood lark (trädlärka) (1), marsh tit (entita) (1), nutcracker *Nucifraga caryocatactes* (nötkråka) (1) and red-backed shrike (törnskata) (1). There was a black woodpecker (spillkråka) territory in the vicinity of the territory mapping area also in 2005, but just outside of this. Similarly, cranes (tranor) and nutcrackers (nötkråkor) were present just outside of the area in 2004.

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, $\chi^2_{(1,3)} = 2.34$, $p = 0.50$). 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.

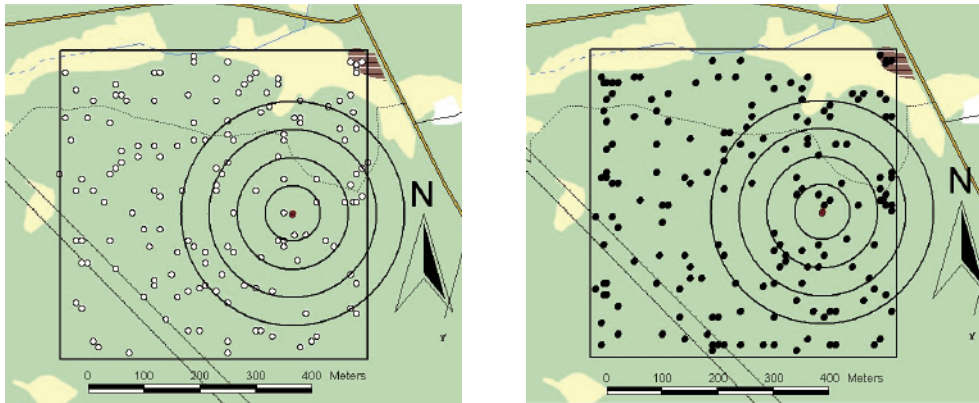


Figure 5-1. Geographical distribution of all bird territories in the Sandö mapping area (bold black line) in 2004 (left; white dots) and 2005 (right; black dots). The centre of each territory is shown, real territories are of various size and shape and bigger than the dots shown here. Note that more 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.

5.2 Listed species

The following section gives a summary of the population development in the last three-four 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 four years (2002–2005) 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.

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

2005 was only the second year with good coverage of the honey buzzards in Simpevarp, see /Green 2005/. Number of occupied territories remained at the same level as last year, 9–10 in 2005 compared to at least 9 in 2004. Also at the geographical level the situation was very stable between the years. During 2005 birds were registered in eight of the nine territories occupied in 2004. One-two new territories, where no birds were seen in 2004, were recorded in 2005 and in one of the territories used in 2004 no birds were found in 2005. At least three territories extend into the local area (four in 2004). Breeding results could not be monitored in 2005. There are so far no indications of that the honey buzzards should be affected by the site investigations in any way. So far, no intensive parts of the site investigation has been conducted in areas in close association with honey buzzards.

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/.

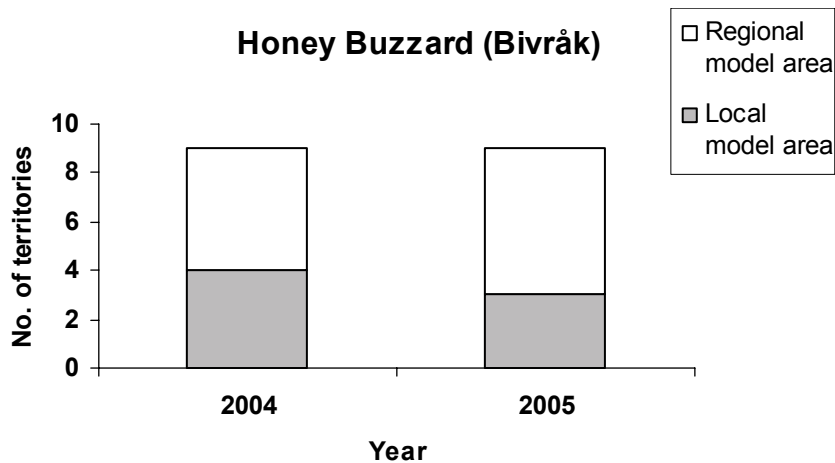


Figure 5-2. Number of territorial pairs of Honey Buzzards in Simpevarp in 2004 and 2005. Shaded parts show the number of territories with parts extending into the local area.

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

The breeding success for white-tailed eagle in the Simpevarp area in 2005 was again as high as in 2002 and in 2004, and the breeding success in surrounding reference areas was in level with previous years. There were no indications of disturbance or other complications in the region this year. 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 (written by BH).

The white-tailed eagle is presently classified as ‘Near Threatened’ (missgynnad) in the Swedish Red List. The species is one of the recent success-stories of Swedish bird conservation. Eagle numbers decreased heavily during the last century due to both persecution and the use of organo-chloric substances (such as DDT and PCB). After these substances were banned, persecution pressure lowered and supplementary winter feeding was conducted, the eagles slowly started to recover. By the turn of the century the recovery picked up momentum and today the eagles are increasing in numbers with about 8% annually. National numbers are slowly getting closer to the estimated level they had before the large decline. Present national population is about 400 pairs. Globally, the white-tailed eagle is still very much threatened and the world population is ‘only’ about 7,000 pairs, whereof hence about 6% are found in Sweden /Artdatabanken 2005/ (written by MG).

Table 5-1. Per cent successfully breeding pairs of white-tailed eagle in 2003, 2002 and 1998–2001 (n = number of checked breeding attempts).

Area	1998–2001	2002	2003	2004	2005	n
Simpevarp	88	100	0	100	100	16
Reference	78	86	83	86	75	57

Osprey *Pandion haliaetus* Fiskgjuse (EU Annex 1)

As in previous years four nests were active in the area during 2005. There are probably one or two more pairs breeding in the inland parts of the regional model area but these nests have not yet been found. As in 2004, there was an occupied nest just outside the regional model area as well. Breeding results were poor in Simpevarp during 2005. Only one of the four pairs produced large young, while the remaining three pairs failed. At the same time, the successful pair produced three large young which is a large brood for ospreys.

Breeding results for ospreys has been surveyed along the coast in 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 and the number of large young are counted and ringed. Breeding results during 1999–2005 for the whole surveyed area (including the SKB regional model area) are shown in Table 5-2.

Somewhat fewer breeding attempts were recorded in 2005 compared to the last two years, but in terms of breeding success this was one of the better years during the period for the whole study area at large.

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 seven 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
Mean	19	14	10	73	1.4

Table 5-3. Breeding success of ospreys in the regional model area at Simpevarp compared to the reference area south of this in 2003–2005.

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
2005	0.25	0.8	0.91	2.2
Mean	0.50	1.2	0.66	1.5

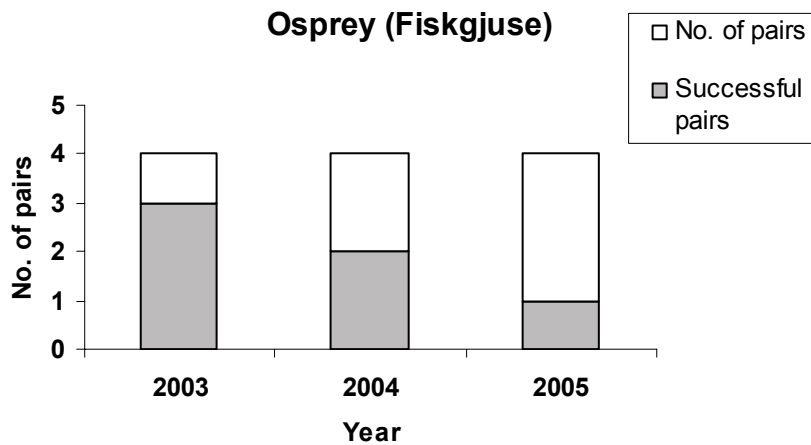


Figure 5-3. Number of breeding pairs of Ospreys (*Fiskgjuse*) in the regional model area at Simpevarp 2003–2005. Shading show the number of successful pairs.

Local population size has been constant during the last three years in Simpevarp. Breeding success seems to have a negative trend, which is at odds with the overall picture from the reference area. Whether this has anything to do with site investigations is unknown, but probably not likely since most of the possibly disturbing activities are conducted in areas well away from osprey nests. However, it may be worth mentioning that 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 situation has been very stable during the four years of site investigations. Four occupied territories in all years so far. Also breeding success in 2005 was identical to what was recorded in 2004. Three large young were produced in the same territory that was successful the year before. The three pairs in the surrounding reference area produced four young from two successful breeding attempts in 2005, also in this case an identical result to 2004.

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

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 2002–2005.

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
Mean	0.4	1.5

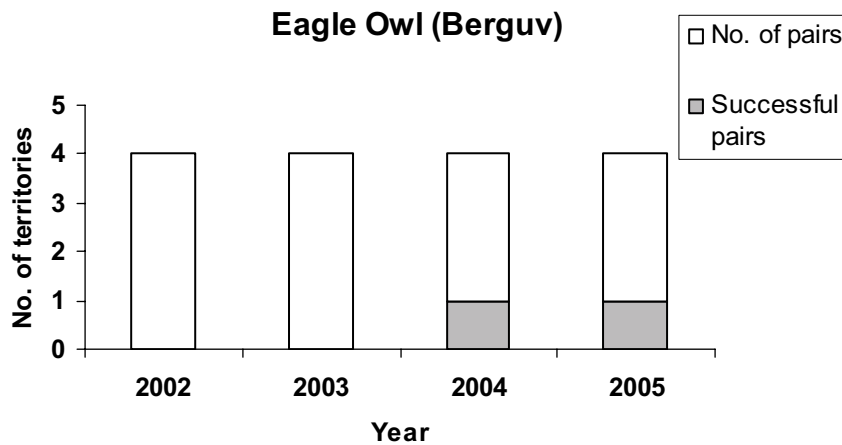


Figure 5-4. Number of Eagle owl (Berguv) pairs in the regional model area in Simpevarp 2002–2005. Shaded parts show no. of successful pairs.

Breeding output remains lower in the regional model area, with associated site investigations, compared to the reference area. It is still unclear whether this has anything to do with the site investigations. 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 four years. The reason behind this difference is presently unknown.

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

Compared to earlier years 2005 was an exceptionally good year for wrynecks! The number of recorded territories more than doubled from ten in 2004 to 21 in 2005. Numbers increased both in the local area and in the regional model area outside of this. There are no signs what so ever of that wrynecks should be negatively affected by the ongoing site investigations. Local population trend is positive.

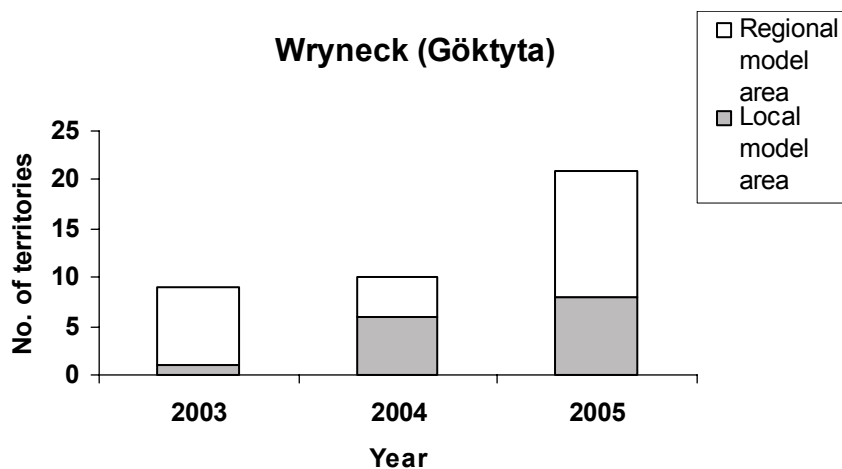


Figure 5-5. Number of recorded occupied territories of Wrynecks (Göktyta) in Simpevarp 2003–2005. Shaded parts show the number of territories within the local area.

The distribution of wrynecks over the regional model area is not even and most recorded territories are found in the southern and eastern coastal parts, extending a few km inland from the coast. Earlier speculation on the total number of territories in this area were based on an relatively even distribution /Green 2005/ which is apparently not the case. Hence, the a total population of 40–50 pairs /Green 2005/ is probably an over-estimate and it is more likely that the regional model area holds (in good years) around 30 pairs.

Interestingly, exactly the same pattern was registered in the Forsmark study area in 2005 and in a regional nest box project in the Oskarshamn area (Tommy Larsson, pers comm), and it seems as if wryneck numbers in 2005 were much higher than in the years just before at a large scale. The reason behind this increase remains unknown, but it may have been a very good breeding season in 2004, combined with beneficial conditions both during migration and wintering (the wrynecks spend the winter in tropical Africa) resulting the unexpected increase between 2004 and 2005.

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 2004, but the numbers have remained fairly stable during the last decade /Lindström and Svensson 2005/. 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/.

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

The lesser spotted woodpeckers has a population development in the Simpevarp area that is somewhat puzzling. At the larger scale, in the regional model area outside of the local area, the population trend is clearly positive. Numbers of recorded occupied territories increased from ten in 2004 to at least 18 in 2005 (a 80% increase!). These are minimum figures and true numbers can in fact be even higher. In the local area on the other hand, numbers decreased from six in 2004 to three in 2005 (a 50% decrease!). Taken together overall numbers hence increased from 16 in 2004 to 21 in 2005 (a 31% increase).

Further indications in the same direction are given by that out of seven known territories within the local area, used at least once during 2002–2004, only three (43%) were occupied in 2005. Corresponding figures from the regional model area outside of the local area were that out of twelve territories used at least once in 2002–2004, eleven (92%) were occupied also in 2005.

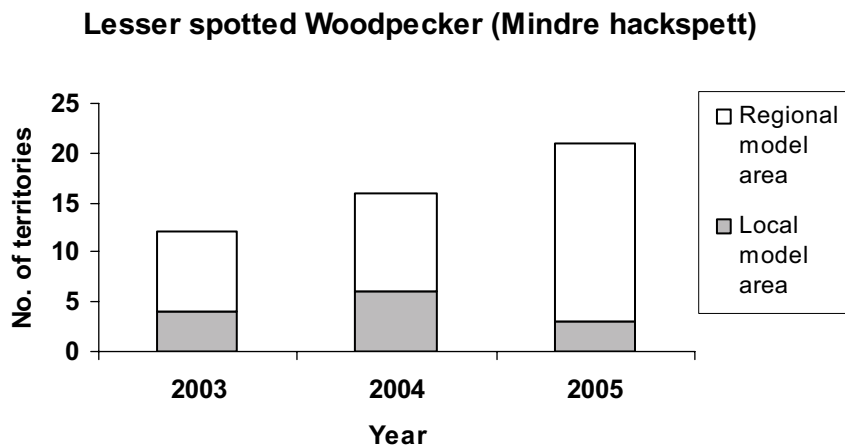


Figure 5-6. Number of occupied territories of Lesser spotted woodpecker (*Mindre hackspett*) in Simpevarp 2003–2005. Shaded parts show number of territories within the local area.

The conclusion from these figures is that something seems to be going on in the local area, that make the birds avoid this. This is a little bit surprising since lesser spotted woodpeckers are not known to be very sensitive to disturbances unless these are made at the very nest site. However, looking more in detail at which territories that have been abandoned since the start of the site investigations, one find that drilling activities have been conducted in all four of these. Hence, a possible negative impact from the site investigations can not be ruled out. Interestingly, something similar has been found in the Forsmark site investigation area, where numbers of this species has been stable or increasing slightly in the last years at large, but decreasing within the local area. In the Forsmark case however, there are no direct connections between possibly disturbing (drilling) activities and woodpecker territories. None of the territories there are in direct contact with any such sites.

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 are thought to have remained fairly stable during the last decade. The lesser-spotted woodpecker has been 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 is estimated to about 3,000 pairs /Artdatabanken 2005/, which means that the numbers in Simpevarp regional model area are not very far from being 1% of the national total!

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

Nightjar numbers remained at the high level recorded in 2004 also in 2005. A minor overall decrease from 71 occupied territories in 2004 to 66 in 2005 (a 7% decrease, well within the error margin of the used method) was recorded. There were some differences in the distribution of birds between the years with a higher proportion found in the central parts of the area in 2005. Still however, the absolute majority of the nightjars occur in the northern parts of the regional model area.

Within the local area, numbers have increased from five to seven occupied territories between 2003 and 2005. The patterns recorded last year /Green 2005/ with birds avoiding the parts with the most intensive parts of the site investigations were corroborated this year. No territories were found in the parts where drilling activities were conducted during the year. It will be very interesting to see if the nightjars will re-establish themselves in these parts after the drilling activities are finished!

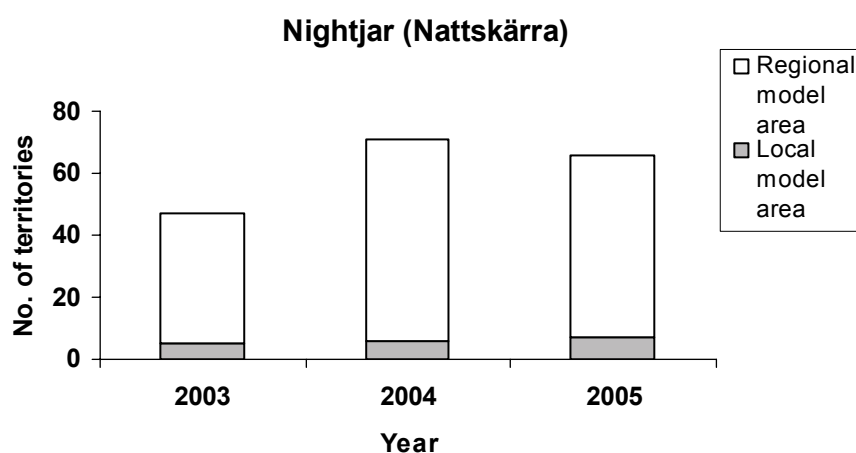


Figure 5-7. Number of occupied Nightjar (*Nattskärra*) territories in the regional model area of Simpevarp 2003–2005. Shaded parts show the number of pairs in the local area. Note that coverage of the area was not complete in 2003, probably making showed numbers in that year an underestimate of true numbers.

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 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 3% 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.

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

The wood lark was also among the listed species selected for monitoring in 2005, but due to lack of resources no monitoring was possible. Observations made during surveys for other species do however indicate that wood lark numbers were approximately at the same level in 2005 as in earlier years. In 2003–2004 about 30 occupied territories were registered in total, whereof about a third were found in the local area.

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

Red-backed shrike numbers decreased slightly between 2004 and 2005, both in the local area and in the regional model area. The population development of red-backed shrikes in Simpevarp is shown below in Figure 5-8. As areas covered during the site investigation period have differed between the years, at least outside the local area, the development is shown as an index instead of absolute numbers. Here I have used a chain 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 7% decrease in red-backed shrike numbers within the local area between 2003 and 2005 (index series 1 – 1.09 – 0.93), i.e. a very stable population size indeed. In the regional model area outside of the local area, numbers have increased with average 32%, although there was a decrease between the last two years (index series 1 – 1.46 – 1.32).

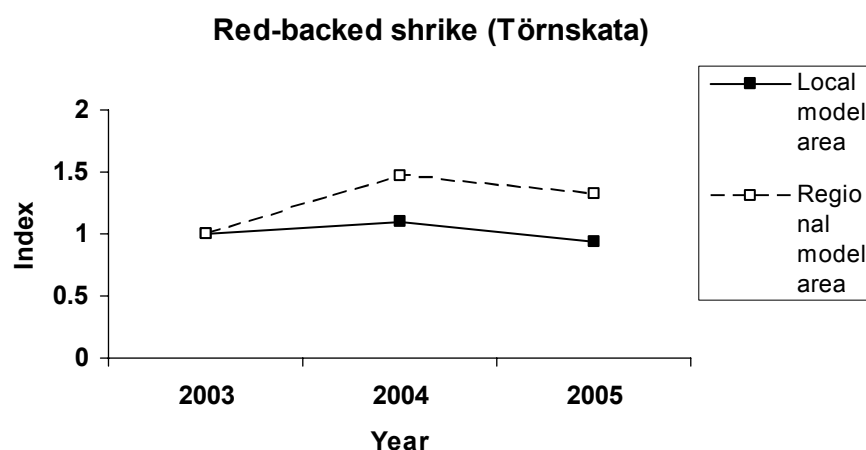


Figure 5-8. Population development of red-backed shrikes in Simpevarp 2003–2005 shown as a chain index. Index for year 2003 is set to 1. See text for further explanations.

The conclusion from these figures is that the shrikes in Simpevarp are doing fine in general. The stable numbers in the local area indicate that there is no negative impact on the shrikes from the site investigations. Through the years 2002–2005 135 shrike territories have been recorded in the whole area. The majority of these have been found under electrical power wires (66%) and in clear-cuts (15%). The decrease in numbers between 2004 and 2005 may at least partly depend on areas under power wires being less suitable for shrikes this year compared to the year before. These areas are managed every eighth year in order to keep vegetation low. This means that there is a succession of mainly shoots from deciduous trees that after a few years make the areas unsuitable for shrikes, preferring open areas with thorny bushes, until these are cut again. The general impression from 2005 was that a larger part of these areas were less suitable for shrikes compared to earlier years.

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 2005/ 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. National population size of red-backed shrikes is estimated to be about 23,000 pairs /Artdatabanken 2005/.

Table 5-5. Population changes of selected listed species in Simpevarp between 2004 and 2005. 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	0		0
Osprey	0	0	0
Eagle Owl	0	0	0
Wryneck	+	+	+
Lesser Spotted Woodpecker	+	–	+
Nightjar	–	0/+	–
Woodlark	0?	0?	0?
Red-backed shrike	–	–	–

6 Discussion

This report is the third in line trying to evaluate any effects from the site investigations on the breeding bird fauna in the Simpevarp area, and it might be a good time to make some conclusions from the results gathered so far. In the four seasons since the start of the site investigations in 2002, the general bird fauna has been monitored in three different ways: i) by large-scale line transects in 2002–2004, ii) by large-scale point counts in 2002–2004 and iii) by territory mapping in smaller areas around selected drilling sites (two sites in 2003–2004, one site in 2004–2005) /Green 2003, 2004, 2005 and the present report/. In all cases the setup has been aiming at a ‘before- and after approach’, meaning that results from monitoring before any possibly disturbing activities has been compared with results gathered in the same way after the start of such activities. All results from all the three methods indicate the same thing – the bird fauna in general do not show any tendencies of being negatively affected in any way by the activities within the site investigations. Number of territories/individuals, number of present species or the distribution of these did not change in directions expected if the birds should avoid the area(s), neither at a large regional scale or at the very local scale around drilling sites. This is perfectly in line with expectations since most ‘common birds’ are quite tolerant to disturbances as long as habitats are not altered completely.

The results gathered during these studies can only tell us about short-time effects in the form of direct avoidance of an area. Any possible effects on breeding output, would not show up in form of lower bird densities (which is what we monitor!) yet, as the investigations so far have only covered one-two generations. Effects of a lower breeding output is always lagging behind and will not show up until the following generations are getting ready for reproduction. Hence, if we want to be completely sure about that there are no negative effects from the site investigations on the general bird fauna, some kind of follow up of these results are necessary. Still, nothing indicates that there should be any such effect on the breeding birds in Simpevarp in general.

If we turn to the listed species selected for monitoring we now start to get time series that are approaching a length which possible to analyse statistically. A minimum period of five years is a sensible requirement for such tests, which means that for most species we need another two years of data. The results gathered so far are in line with general results discussed above. Also among listed species, few possibly negative effects have been recorded. Some negative impacts are indicated though. Nightjars and lesser spotted woodpeckers seem to avoid areas with a high levels of human activities, even though this seems more to affect the distribution of birds within the regional model area than numbers (population size) as such. It will be of large interest to follow these patterns, ideally also after the site investigations are finished, to evaluate whether these species re-establish themselves in the areas they seem to avoid now.

Breeding success of ospreys and eagle owls was low in 2005 in Simpevarp which may, or may not have anything to do with the site investigations. For these, and a few other species of high conservation concern such as honey buzzard and white-tailed eagle, it is of high interest to keep on trying to avoid activities close to known breeding sites during critical periods of the breeding cycle.

The main conclusion from the bird monitoring so far is however that the way SKB are conducting the site investigations there are very few negative effects on the local breeding bird fauna. Hence it seems as if the aim ‘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)’ is fulfilled.

7 References

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Appendix

Table A-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 2002–2005. Since the Swedish Red List was updated in 2005, a few species being red-listed before, but not after, 2005 are included as well. These species are shown in parenthesis. Otherwise 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
(Gadwall)	(Snatterand)	(<i>Anas strepera</i>)	(SRL)	1
Shoveler	Skedand	<i>Anas clypeata</i>	SRL	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
Black-throated Diver	Storlom	<i>Gavia arctica</i>	EU	2
Honey Buzzard	Bivråk	<i>Pernis apivorus</i>	SRL, EU	10
White-tailed Eagle	Havsörn	<i>Haliaeetus albicilla</i>	SRL, EU	2
Marsh Harrier	Brun kärrhök	<i>Circus aeruginosus</i>	EU	1
Osprey	Fiskgjuse	<i>Pandion haliaetus</i>	EU	4–6
Crane	Trana	<i>Grus grus</i>	EU	30
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	4
Nightjar	Nattskärja	<i>Caprimulgus europaeus</i>	SRL, EU	65
Wryneck	Göktyta	<i>Jynx torquilla</i>	SRL	30
Black woodpecker	Spillkråka	<i>Dryocopus martius</i>	EU	25
Lesser Spotted Woodpecker	Mindre hackspett	<i>Dendrocopus minor</i>	SRL	25
Wood Lark	Trädgårdslärka	<i>Lullula arborea</i>	EU	31
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	500
Red-backed Shrike	Törnskata	<i>Lanius collurio</i>	SRL, EU	150
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

Table A-2. Number of territories per bird species in the territory mapping at Sandö in 2004 and 2005. English and Swedish names are shown. Listed species in bold text.

Species	No. of territories 2004	No. of territories 2005	Change 2004–2005
Chaffinch, Bofink	26	33	7
Willow warbler, Lövsångare	25	32	7
Robin, Rödhake	11	13	2
Goldcrest, Kungsfågel	11	12	1
Song thrush, Taltrast	7	9	2
Blackbird, Koltrast	7	8	1
Tree pipit, Trädpiplärka	9	7	-2
Spotted flycatcher, Grå flugsnappare	6	6	0
Great tit, Talgoxe	3	6	3
Blackcap, Svarthätta	3	5	2
Coal tit, Svartmes	4	5	1
Greenfinch, Grönfink	3	4	1
Yellowhammer, Gulsparv	3	4	1
Wood pigeon, Ringduva	4	4	0
Crested tit, Tofsmes	3	3	0
Blue tit, Blåmes	2	2	0
Cuckoo, Gök	2	2	0
Siskin, Grönsiska	3	2	-1
Jay, Nötskrika	1	2	1
Pied flycatcher, Svartvit flugsnappare	0	2	2
Garden warbler, Trädgårdssångare	1	2	1
Treecreeper, Trädkrypare	3	2	-1
Lesser whitethroat, Ärtsångare	0	1	1
Marsh tit, Entita	2	1	-1
Wren, Gärdsmyg	2	1	-1
Wryneck, Göktyta	0	1	1
Wood warbler, Grönsångare	1	1	0
Dunnock, Järnsparv	2	1	-1
Raven, Korp	0	1	1
Nutcracker, Nötkråka	0	1	1
Nuthatch, Nötväcka	0	1	1
Buzzard, Ormvråk	1	1	0
Great spotted woodpecker, Större hackspett	2	1	-1
Willow tit, Talltita	2	1	-1
Red-backed shrike, Törnskata	1	1	0
Wood lark, Trädlärka	1	1	0
Crane, Trana	0	1	1
Mallard, Gräsand	1	0	-1
Black woodpecker, Spillkråka	1	0	-1
Total no. of territories	153	180	27