

# False decline in bird populations due to bird counters' hearing loss?

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*(Med et dansk resumé: Fører høretab hos fugletællere til falske bestandstilbagegange?)*

**Abstract** The breeding bird population index calculated from the Danish Point Count Census data for the period 1975-2014 was analyzed in relation to visual versus auditory detection and bird sound pitch. A population decline of 0.9% per year was recorded for species with intermediate to high-pitched sounds that are mostly detected by hearing. The recorded population decline was only 0.2% per year for the species that are mostly recorded by sight. A 0.9% decline per year during 1975-2014 corresponds to a total decline of 40% over the 40 year period. In the 40 years, the Point Count Census has been running, the average age of participating bird counters is assumed to have risen from 35 years in 1975 to 65 years in 2015. The counters are primarily men. At an age of 65 years, most men have significant age-related hearing loss. A study shows that if they do not wear hearing aids, people with age-related hearing loss hear about 40% fewer individuals of species with intermediate to high-pitched sounds. Only a few of the bird counters are assumed to have used hearing aids. The Point Count Census results were compared with ringing results from Falsterbo Bird Observatory in southern Sweden, which are independent of the ability to hear the species. For four species with high-pitched sounds, the number of ringed birds by the standardized catch method from 1980 to 2014 did not show a significant decline comparable to that found in the Point Count Census. This suggests that age-related hearing loss of bird counters in the Danish Point Count Census has led to false population decline estimates for some species. With our current knowledge we cannot yet determine how large this effect has been for the population index of individual species.

## Introduction

Population indexes of breeding birds are used for many purposes. The population index from the Danish Point Count Census is used for example by the Danish government and the EU to document trends in biodiversity (Eurostat Statistics Explained 2016). Hence, it is important that the recorded population changes are reliable.

A Danish study indicates that age-related hearing loss in bird counters carrying out the census work may have led to gradually increasing underestimation of population size for some species with high-pitched sounds (Kayser 2013).

The purpose of this paper is to inspire researchers and authorities in Denmark, other European countries and elsewhere to conduct studies to quantify the magnitude of the problem for individual species and, if possible, to identify methods to adjust for such errors.

## Materials and methods

This paper is based on results of a study of the effects of the use of hearing aids on the recording efficiency of bird sounds (Kayser 2013). The results were used to compare the calculated breeding population index from the Danish Point Count Census (Nyegaard *et al.* 2015) and bird ringing totals from Falsterbo Bird Observatory in southern Sweden (Falsterbo Bird Observatory 2017).

Data from Appendix 1 in Nyegaard (2015) was used as a measure of the Danish population changes calculated from the Point Count Census. Values of percent change per year for breeding birds from the start of the census until 2014 were used.

The Swedish bird population changes were calculated based on the number of ringed birds at Falsterbo Bird Observatory (Falsterbo Bird Observatory 2017). The table 'One-species-All-years' from the website of Falsterbo Bird Observatory was used. The slope of the linear correlation trend-line was calculated and converted to percent per year from the number of ringed birds of each species each year.

Falsterbo Bird Observatory is situated at the southern tip of Sweden, very close to Denmark. But the monitoring conducted there does not cover Danish breeding populations, nor do changes in the numbers of ringed birds fully reflect population trends among Swedish breeding birds. However, when considered over 35 years (1980-2014), which is the timespan of this study, there was thought to be a sufficiently close relationship to be able to apply the ringing figures as a rough measure of the population trends in northern Europe, including Denmark.

In this paper, the species under consideration are grouped as either 'seen' or 'heard' species. This is based

on the experience of the author from many years of census work in several habitats (see Appendix 1). Some bird counters detect a greater proportion of bird individuals using hearing than others do. Nevertheless, this separation is still believed to provide a reasonable grouping of species that are mostly recorded by hearing compared to species that are mostly recorded by sight.

For each species, the general pitch level of bird sounds of the relevant species was obtained from sonograms given by Cramp *et al.* (1977-1994). If the main sound pressure was above 4 kHz, the bird sound was classified as high-pitched, if it was below 2 kHz, it was classified as low-pitched, and if it was between 2 and 4 kHz, it was classified as intermediate-pitched.

Age-related hearing loss commences at about 60 years of age, can often become severe with increasing age, and generally starts earlier for men than for women. More than half of the members of the Danish Ornithological Society (DOF) are now more than 60 years old (Tab. 1). This is also thought to apply to the people who perform the census work in the Point Count Census. In the 40 years over which the Point Count Census has been running, it is assumed that the average age of participants has risen from 35 years in 1975 to 65 years in 2015. The participants in the bird counts are primarily men.

## Results

In the Point Count Census, a greater average decline was found for 'heard' species than for 'seen' species (Fig. 1). When the 'heard' species were split into species with low, intermediate and high-pitched sounds, the differences were even more significant. For the species with intermediate to high-pitched sounds detected by hearing, a population decline of 0.9% per year was recorded. For the 'seen' species, the recorded population decline was only 0.2% per year. A 0.9% decline per year over the period 1975-2014 corresponds to a recorded decline totaling about 40%.

Tab. 1. Age distribution of members of DOF in 2012 (T. Stampe pers. comm.).

*Aldersfordeling blandt DOFs medlemmer i 2012.*

Age (years) Alder (år)	2012 (%)
18-39	6
40-49	10
50-59	25
60-69	38
70+	21

Recording of birds in the Point Count Census depends on the ability of the counters to hear the birds. The numbers of birds caught in mist nets are independent of hearing ability. It was therefore appropriate to examine whether there were differences between the breeding population changes recorded in the Danish Point Count Census and the changes recorded from results of ringing of birds at Falsterbo Bird Observatory. For four species with high-pitched sounds, the numbers of ringed birds in the standardized catch from 1980 to 2014 were compared to the population index for the same period. See Materials and methods for method of comparison.

For Chiffchaff *Phylloscopus collybita* an increase of 80% per year was found for birds recorded by ringing compared to an increase of 16% per year for birds recorded in the Point Count Census (Fig. 2). For Lesser Whitethroat *Sylvia curruca* a decrease of 0.24% per year was found for birds recorded by ringing compared to a decrease of 1.30% per year for birds recorded in the Point Count Census (Fig. 3). For Goldcrest *Regulus regulus* an increase of 3.20% per year was found for birds recorded by ringing compared to a decrease of 1.20% per year by birds recorded in the Point Count Census (Fig. 4). For Dunnock *Prunella modularis* a decrease of 0.59% per year was found for birds recorded by ringing compared to a decrease of 1.6% per year by birds recorded in the Point Count Census (Fig. 5).

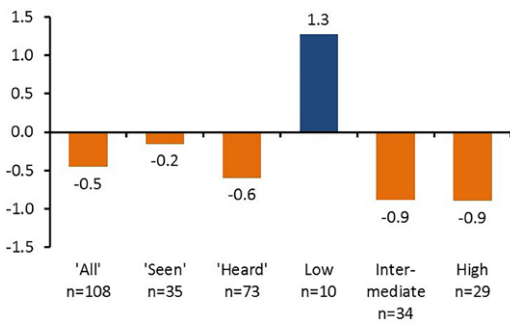


Fig. 1. Average annual change in the Point Count Index for different groups of bird species. 'All': All species. 'Seen': Species mostly recorded by seeing. 'Heard': Species mostly recorded by hearing. 'Low': Species with low-pitched sounds and mostly heard. 'Intermediate': Species with intermediate-pitched sounds and mostly heard. 'High': Species with high-pitched sounds and mostly heard.

Gennemsnitlig årlig procentvis ændring i punkttællingsindekset for forskellige grupper af fuglearter. 'All': Alle arter. 'Seen': Arter, som mest registreres ved at blive set. 'Heard': Arter, som mest registreres ved at blive hørt. 'Low': Arter med dybt stemmeleje, som mest høres. 'Intermediate': Arter med stemmeleje på mellem-niveau, som mest høres. 'High': Arter med højt stemmeleje, som mest høres.

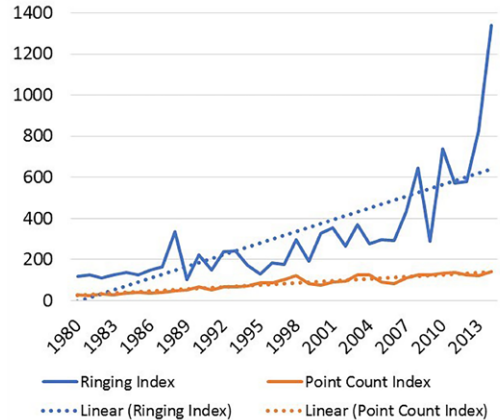


Fig. 2. Changes in the population index for Chiffchaff in the Danish Point Count Census compared to the total number of ringed birds each year at Falsterbo Bird Observatory. The Point Count Census index is multiplied by a factor of 0.2 to ensure approximately the same start point as for the number of ringed birds. The dotted lines are the linear trend lines.

Udvikling i bestandsindeks for Gransanger ved punkttællingsprogrammet i Danmark sammenlignet med årstotaler for ringmærkning ved Falsterbo Fuglestation. Indekstal er ganget med en faktor, så startniveauet svarer til ringmærkningstallet. For denne art er bestandsindekset fra punkttællingsprogrammet ganget med 0,2. De stiplede linjer er de lineære tendenslinjer.

## Discussion

A study by Kayser (2013) showed that people with age-related hearing loss recorded significantly fewer individuals of 'heard' species if hearing aids were not used. The decline in the number of birds detected by a counter without hearing aids compared to a counter with

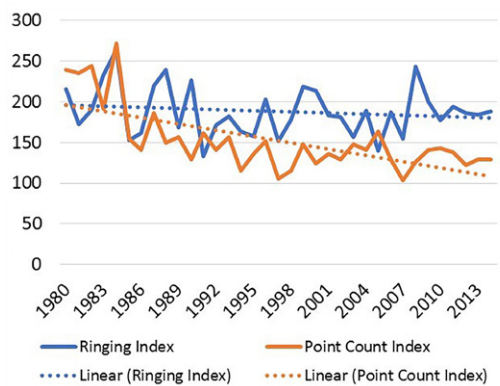


Fig. 3. Lesser Whitethroat. For description see Fig. 2. For this species, the Point Count Index was multiplied by 2.3. Gærdesanger. For beskrivelse, se Fig. 2. For denne art er bestandsindekset fra punkttællingsprogrammet ganget med 2,3.

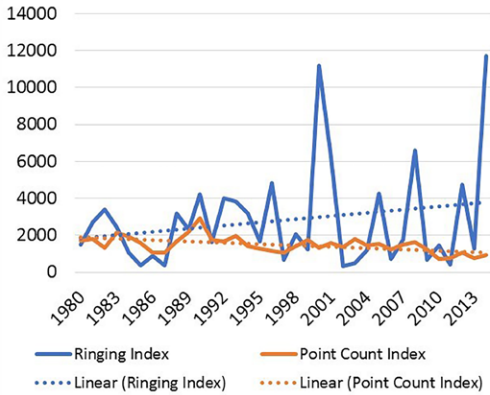


Fig. 4. Goldcrest. For description see Fig. 2. For this species, the Point Count Index was multiplied by 25.

*Fuglekonge. For beskrivelse, se Fig. 2. For denne art er bestandsindekset fra punktællingsprogrammet ganget med 25.*

hearing aids was 23% for low pitched species, 39% for intermediate pitched species, and 42% for high pitched species. This means that for species with intermediate to high-pitched sounds, around 40% fewer birds will be heard without hearing aids than with hearing aids. This corresponds to the recorded decline in the Danish Point Count Census for the same species group over the past 40 years.

Against this background, our discussion focuses on two questions: 1) Why has a much larger population decline been recorded for 'heard' species than for 'seen' species in the Danish Point Count Census? 2) Why is the decline even larger for species with high-pitched sounds?

In the Point Count Census, an annual population decline of 0.9% has been recorded over the last 40 years for species categorized as 'heard' species with intermediate or high-pitched sounds. This result corresponds to a decline of around 40% over the entire period. This 40% decline corresponds to Kayser's (2013) finding that persons with age-related hearing loss recorded 40% fewer birds. A smaller or larger part of the population decline reflected in the Point Count Census for species with intermediate to high-pitched sounds recorded by hearing could therefore have been caused by gradually reduced ability of census participants to hear high-pitched bird sounds.

A comparison between the population index from the Danish Point Count Census and the bird ringing data from Falsterbo Bird Observatory (which are independent of the ability to hear) showed that the significant population decline indicated by the Point Count Census for Lesser Whitethroat, Goldcrest and Dunnock was

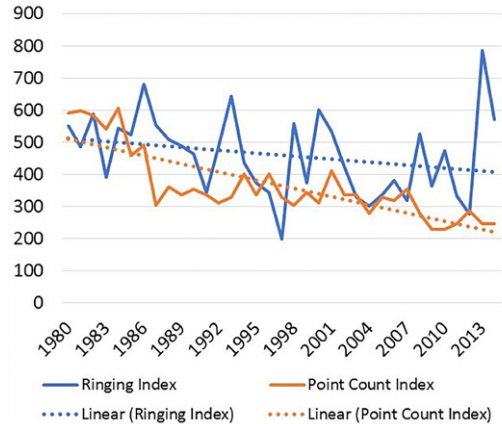


Fig. 5. Dunnock. For description see Fig. 2. For this species, the Point Count Index was multiplied by 8.2.

*Jernspurv. For beskrivelse, se Fig. 2. For denne art er bestandsindekset fra punktællingsprogrammet ganget med 8,2.*

not reflected by the ringing results from Falsterbo. For Chiffchaff, where a large and significant increase was recorded in the Point Count Census, a much larger and significant increase was recorded in the ringing figures.

These findings suggest that age-related hearing loss among the bird counters in the Danish Point Count Census can contribute to false population decline estimates for some species. However, with our current knowledge we cannot yet determine how large an effect loss of hearing ability has on the population index of the individual species. To calculate the size of the effect of bird counter hearing loss, it would be relevant to study the difference between how efficiently a 35-year-old man and a 65-year-old man with and without hearing aids record bird species having different sound pressures.

There are some uncertainties in the assumptions in this article. First, it is assumed that the trends in population changes are the same in the ringing data at Falsterbo and in the Danish Point Count Census. Second, it is assumed that the average age of participants in the Danish Point Count Census increased by 35 years between 1975 and 2014. Third, it is assumed that only a few participants in the Point Count Census used hearing aids. However, it is believed that these uncertainties do not change the general conclusions of this paper but they may affect the size of the effect.

## Acknowledgements

I am grateful to and would like to thank Henning Heldbjerg, Bo Svenning Petersen and Ole Thorup, who contributed with criticism and suggestions for improvements to this paper, and Nick Quist Nathaniels for checking the English.

Gærdesangeren er en art med højfrekvent sang, der er gået væsentligt mere tilbage i punkttællingerne end i fangsttallene ved Falsterbo. Foto: John Larsen.



## Resumé

### Fører høretab hos fugletællere til falske bestandstilbagegange?

Bestandsindeks for fugle anvendes til mange formål. Fx anvender forvaltningen i både Danmark og EU resultaterne fra det danske punkttællingsprogram til at følge udviklingen i biodiversiteten. Det er derfor vigtigt, at de registrerede bestandsindekser afspejler de faktiske bestandsændringer.

I artiklen sammenlignes udviklingen i ynglebestandsindeks beregnet i punkttællingsprogrammet med bestandsindeks beregnet ud fra antallet af ringmærkede træfugle ved Falsterbo Fuglestation. Arterne er grupperet efter, om de især registreres ved at blive set (se-arter) eller hørt (høre-arter). Høre-arterne er desuden delt op efter, om deres stemmeleje er dybt, mellemhøjt eller højt. Disse analyser er sammenholdt med en undersøgelse af, om personer med aldersbetinget høretab registrerer flere fugle, når de bruger høreapparat, end når de ikke gør (Kayser 2013).

Det viser sig, at der ved punkttællingerne er registreret en betydeligt større bestandstilbagegang for høre-arter med mellemhøjt og højt stemmeleje end for se-arter (Fig. 1). En tilsvarende tilbagegang er ikke registreret for ringmærkningstallene fra Falsterbo Fuglestation.

Hvorfor er der så registreret en meget større bestandstilbagegang for høre-arter end for se-arter i det danske punkttællingsprogram? Og hvorfor er denne forskel endnu større for arter med mellem- og højt stemmeleje?

Det er påfaldende, at der i punkttællingsprogrammet er registreret en årlig tilbagegang på 0,9 % for gruppen af arter med mellemhøjt og højt stemmeleje. Det svarer til en tilbagegang på omkring 40 % i løbet af de 40 år, punkttællingsprogrammet har kørt. Og denne 40 % tilbagegang svarede helt til de 40 % færre fugle, som bliver registreret af tællere med aldersbetinget høretab (Kayser 2013).

Har der været registreret en tilsvarende bestandstilbagegang, når der anvendes metoder som fx ringmærkning, som ikke er påvirket af deltagernes evne til at høre? En sammenligning af ringmærkningstallene fra Falsterbo Fuglestation for nogle arter med højt stemmeleje med Punkttællingsindeks viser, at der ikke har været registreret en tilsvarende tilbagegang

for ringmærkningstallene (Gærdesanger (Fig. 3), Fuglekonge (Fig. 4) og Jernspurv (Fig. 5)). Og for en art som Gransanger (Fig. 2), der har vist fremgang i punkttællingsindekset, har der været registreret en meget større bestandsfremgang for ringmærkningstallene.

Der synes således ikke at være tvivl om, at der i det danske punkttællingsprogram er registreret nogle bestandstilbagegange, som ikke skyldes reelle tilbagegange, men i stedet kan være forårsaget af en gradvist nedsat hørelse hos optællerne.

Der er derfor behov for mere præcis viden om, hvor meget den nedsatte hørelse hos optællerne påvirker den enkelte arts bestandsindeks. En undersøgelse af, hvor mange fugle 35-årige mænd registrerer i forhold til 65-årige mænd med og uden høreapparater, kunne være med til at belyse dette spørgsmål.

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Appendix 1: <http://dof.dk/doft/2017/2.appendiks1>