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Ducks on Åland and in the southwestern Finland

Inventory during the fall of 2007 – 2008

By Magnus Johansson 2010-01-29

Institution for Ecology and Evolution, Uppsala Universitet

Reviewed by Jacob Höglund and Björn Rogell

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Introduction

Hunting ducks and seals formerly formed a basis for life for the people living in the archipelago around Åland. Over the years the hunt has lost its importance and nowadays it is under EU regulation. The 1979's bird directive is a law that the members have to abide by. Seabirds are hunted during spring with shotguns and with the help of decoys made to resemble the bird of interest. These decoys, called "vette", are often placed in species specific groups and sometimes with more females than. These then lure ducks which are then shot by the hunter from a hideout.

The EU-court convicted Finland of not fulfilling its duty since they have not shown that a suitable alternative solution is present when it comes to the spring hunt of ducks on the mainland of Finland and on Åland. Considering this an inventory of seabirds was ordered and conducted during the fall of 2007 and 2008. The inventory shall form the foundation when answering the question whether the seven seabird species: long-tailed duck (*Clangula hyemalis*); eider (*Somateria mollissima*); common goldeneye (*Bucephala clangula*); red-breasted merganser (*Mergus serrator*); common merganser (*Mergus merganser*); velvet scoter (*Melanitta fusca*) and tufted duck (*Aythya fuligula*) are present on the mainland of Finland and on Åland during fall and in what numbers. For the velvet scoter and the eider, the species are analyzed looking at males, females and/or chicks and birds of unknown gender and age separately.

Method

Gathering data

During 1st of September – 31st of December 2007 and 2008 observational data for the following species was gathered: tufted duck; eider; velvet scoter; red-breasted merganser, common merganser, common goldeneye and long-tailed duck. The collection of data was done with the help of hunters during the time they were out hunting. All observations were noted on a sheet according to the distance from the hunter: visible and/or within 30 m (shooting range), binoculars were allowed. Regarding the species eider and velvet scoter they were divided further into the groups: male, female and/or chicks and birds of unknown gender and age. Only reliable observations were noted. Double counting of birds was minimized by following the bird's flight for as long as possible. The sheet was then sent to the section for hunting and wildlife management, Government of Åland, where it was compiled. A corresponding inventory was conducted on the mainland of Finland during the 1st of September – 31st of December 2008. This data has been analyzed separately from the data gathered on Åland. The method of gathering data has been developed in collaboration with lecturer Göran Hartman, institution for ecology, Swedish University of Agricultural Sciences.

Analyzing the data

The compiled dataset has been analyzed at the Department for Ecology and Evolution, Uppsala University. R 2.10.0 (R Development Core Team, 2009) has been used for all statistical analyses. To increase the accuracy of the analyses concerning Åland no consideration has been taken to which year the data was gathered, only to which month, i.e. the years are pooled. In order to investigate if the time spent on each occasion has any effect on how many birds are observed, the time each inventory occasion lasted was calculated and is a part of the variance analysis.

To answer the question whether the birds are present during the fall, so called Tukey “box-and-whisker” plots have been used. The box plots are built around the median, the value that represents the middle value or that 50% of the data points are under the median and 50% are over. The box around the median constitutes the second (lower) and third (upper) quartiles, quarters. Together they symbolize that 50% or half of all values are within the border of the box. In addition, the “whiskers” are sometimes visible and here they reach out a length of 1.5 IQR (inner quartile range). In other words they reach out 1.5 times the lower or upper quartile range, respectively. An observation outside the whiskers is considered as an extreme value (an outlier) and is marked with a circle. If only a line is visible in the plot it means that 50% of the values are no different from the median value.

The variation between months is analyzed with the aid of a generalized linear model (GLM). The following parameters are included in the model: month (Month); number of decoys of that species (e.g. VRedbreastedMerganser) and how long each occasion lasted (Total time). Since the data is count based, a Poisson distribution and in suitable cases (where the residual deviance is much larger than the degrees of freedom) a quasi-Poisson distribution was used. All GLMs were simplified based on the sequential removal of non-significant variables using Likelihood Ratio Tests (LRT). In cases where all variables have been removed the model was tested against the intercept. If a non-significant result is obtained one can say that the presence of birds is not different from what could be expected by chance. The variations among groups were analyzed using ANOVA and tables can be found in appendix 1 and 2 (Åland and Finland respectively).

Results

97 observations were noted on Åland during September to December 2007 and 2008. 18 of them during September, 40 during October, 29 during November and 10 during December. Regarding the Finnish mainland the following numbers were obtained. 66 observations in total distributed as follows: 21, 26, 15 and 4, respectively. Observations on the mainland were made during 2008 (Table 1).

Table 1. Compilation of the number of observation occasions in Finland and on Åland during the years 2008 (Finland) and 2007 – 2008 (Åland).

Month	Number of observation occasions	
	Finland	Åland
September	21	18
October	26	40
November	15	29
December	4	10
	$\Sigma=66$	$\Sigma=97$

Common goldeneye

Common goldeneye are present during all months both on the mainland and on Åland. The most observations on Åland happened during October while the most observations of goldeneye within range happened during November (Figure 9). On the mainland goldeneye are most numerous during October, both within and outside range (Figure 10).

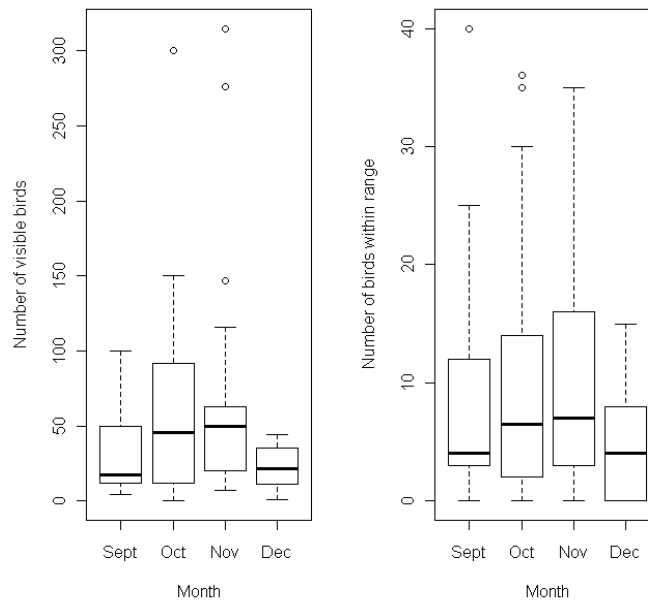


Figure 9. Tukey boxplot representing the number of visible common goldeneyes (left) and within range (right) on Åland.

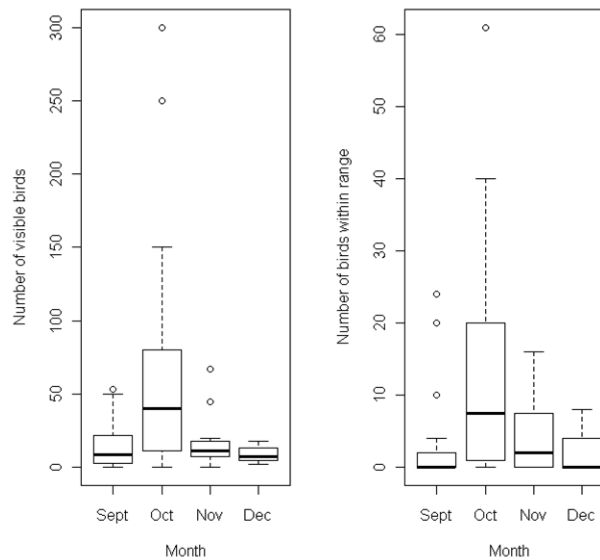


Figure 10. Tukey boxplot representing the number of visible common goldeneyes (left) and within range (right) in Finland.

Common merganser

The common merganser has been noted during all four months both on Åland and on the mainland (Figure 13 and 14).

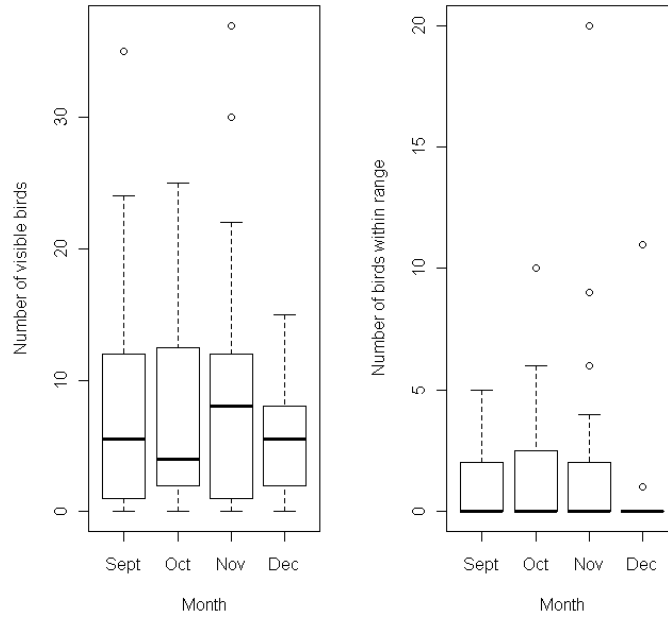


Figure 13. Tukey boxplot representing the number of visible common mergansers (left) and within range (right) on Åland.

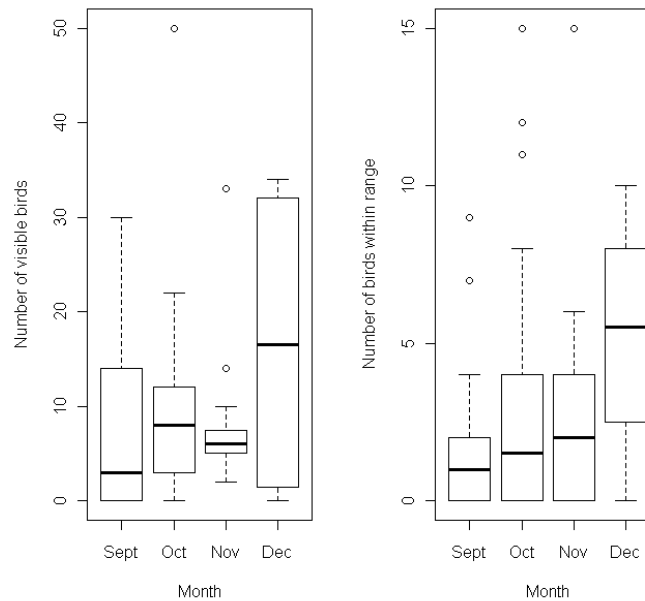


Figure 14. Tukey boxplot representing the number of visible common mergansers (left) and within range (right) in Finland.

Eider

Only one bird was observed on Åland and it was not seen within range (Figure 3). Two observations were made on the mainland, one during September and one during October (Figure 4).

Eider – male

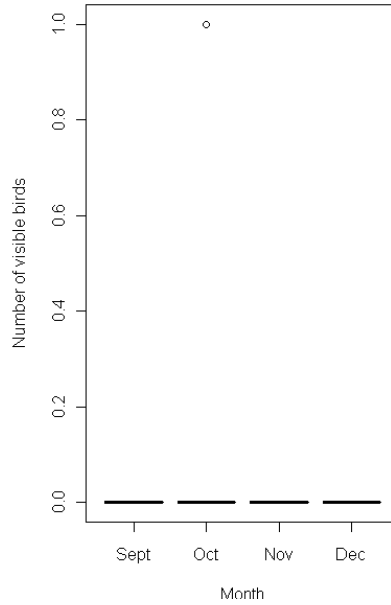


Figure 3. Tukey boxplot representing the number of visible male eiders on Åland.

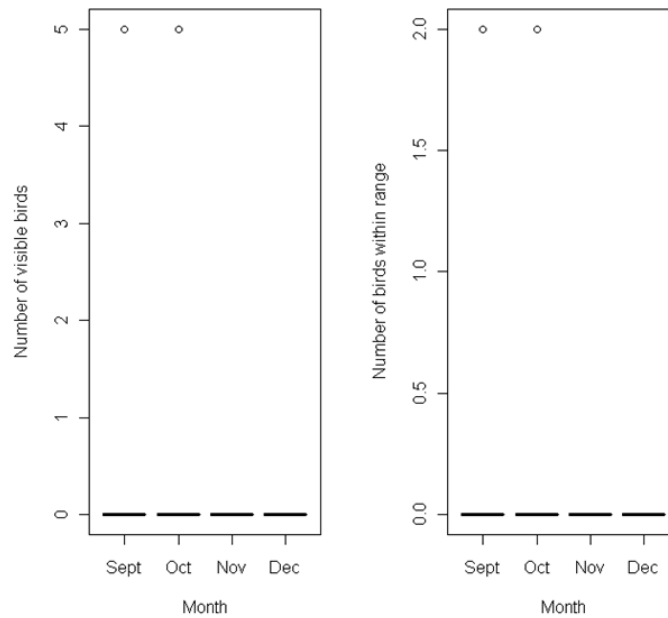


Figure 4. Tukey boxplot representing the number of visible male eiders (left) and within range (right) in Finland.

Eider – female and/or chick

Several observations of female and/or chicks were made on Åland but no appeared within range and none during December. At most 10 birds were seen at the same time (Figure 5). On the Finnish mainland more observations were made, although none during December and with the majority of observations occurring during September (Figure 6). September was also the month where the most eider females and chicks were observed within range.

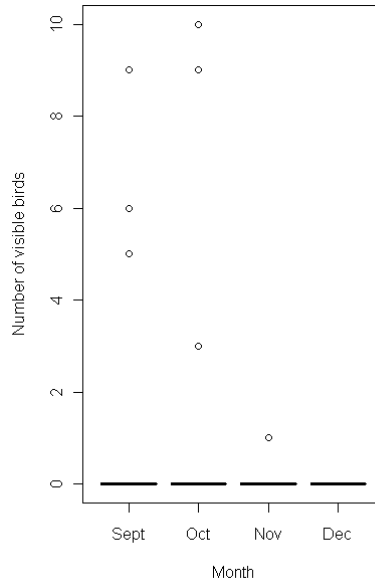


Figure 5. Tukey boxplot representing the number of visible female eiders and/or chicks on Åland.

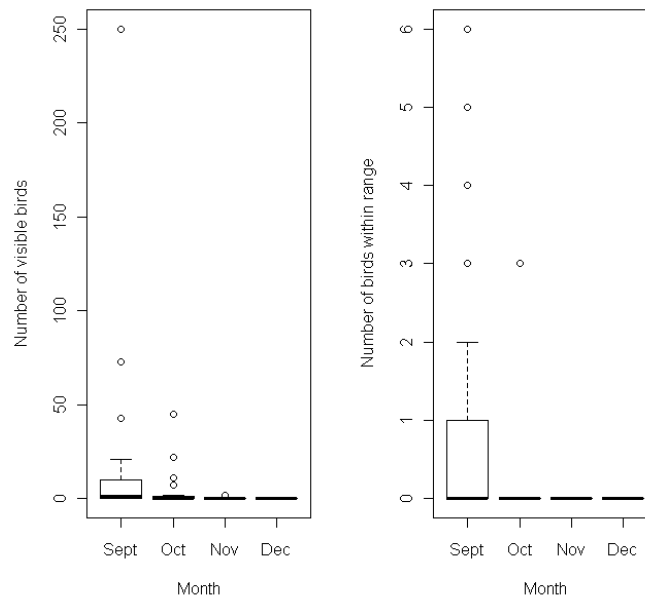


Figure 6. Tukey boxplot representing the number of visible female eiders and/or chicks (left) and within range (right) in Finland.

Eider – unknown

Only one bird was noted as "Eider – unknown" and that was during October (Figure 7). On the Finnish mainland several observations were made, all during September and October (Figure 8).

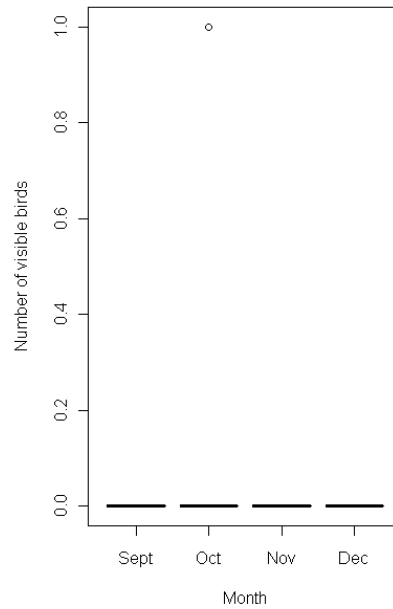


Figure 7. Tukey boxplot representing the number of visible unknown eiders on Åland.

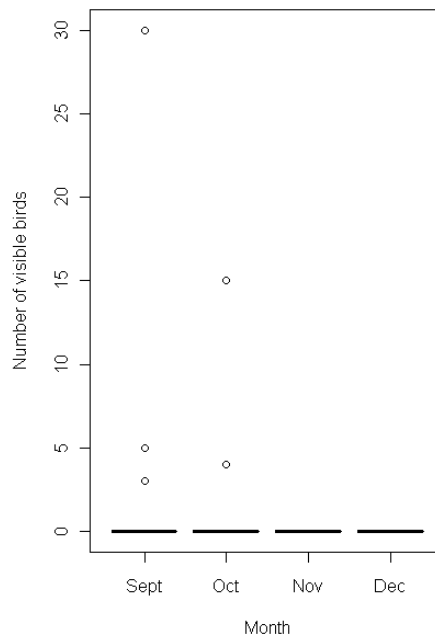


Figure 8. Tukey boxplot representing the number of visible unknown eiders in Finland.

Long-tailed duck

A few observations of long-tailed ducks were made both in Finland and on Åland. No observations were made during September and December (Figure 1) and in Finland observations were made only during October (Figure 2).

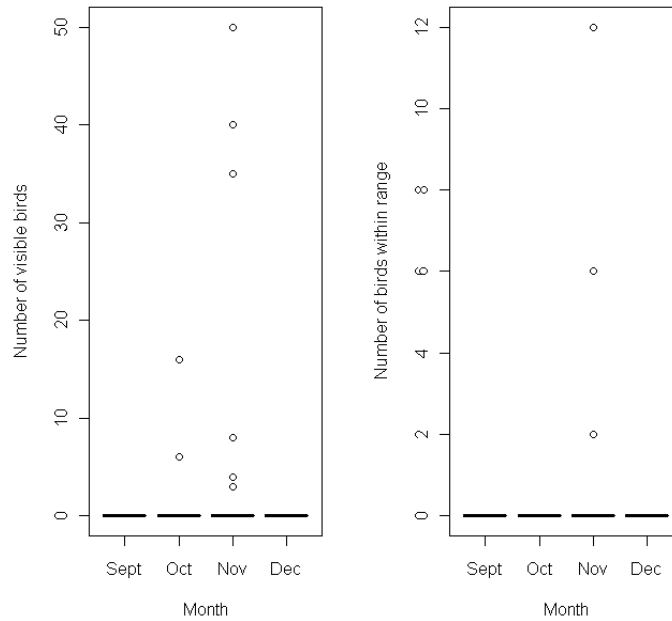


Figure 1. Tukey boxplot representing the number of visible long-tailed ducks (left) and within range (right) on Åland.

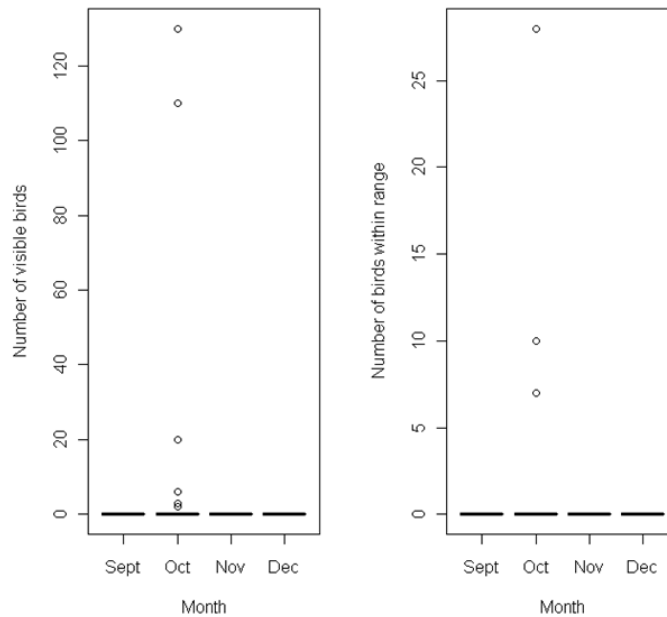


Figure 2. Tukey boxplot representing the number of visible long-tailed ducks (left) and within range (right) in Finland.

Red-breasted merganser

Red-breasted merganser was seen on Åland during all months. Though only two observations were made in December (Figure 11). Only a few observations were made during September and October on the mainland, and no birds were noted during the last two months (Figure 12).

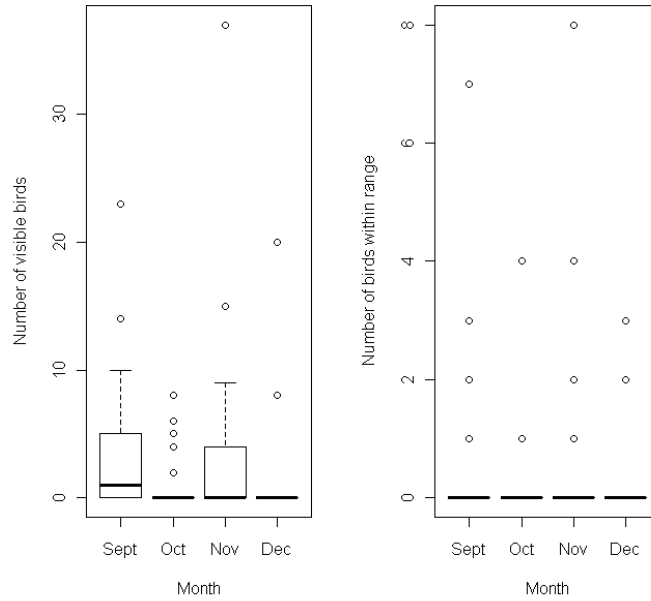


Figure 11. Tukey boxplot representing the number of visible red-breasted mergansers (left) and within range (right) on Åland.

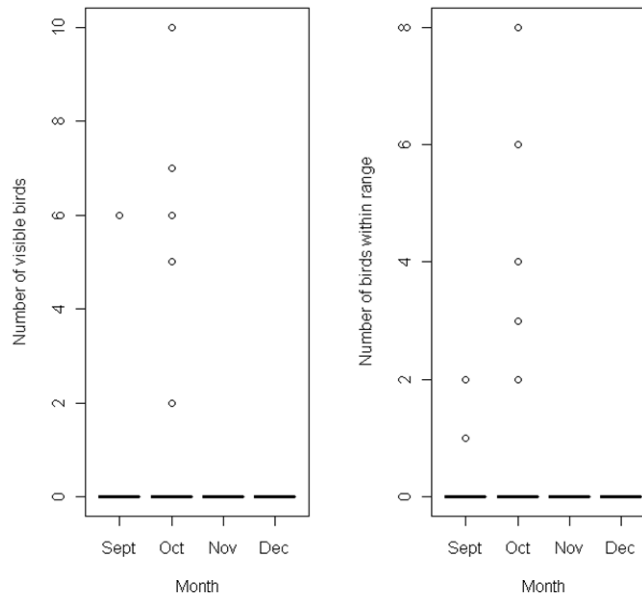


Figure 12. Tukey boxplot representing the number of visible red-breasted mergansers (left) and within range (right) in Finland.

Tufted duck

The tufted duck is present during all months and on both the mainland and on Åland (Figure 19 and 20). On one occasion (September 2008) 998 tufted ducks were observed on Åland. This sighting has been removed from the box plot to increase resolution but is included in the analysis.

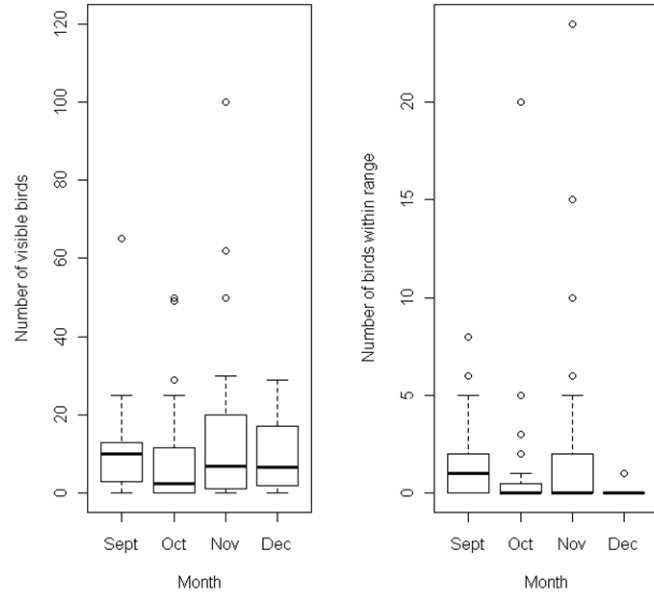


Figure 19. Tukey boxplot representing the number of visible tufted ducks (left) and within range (right) on Åland.

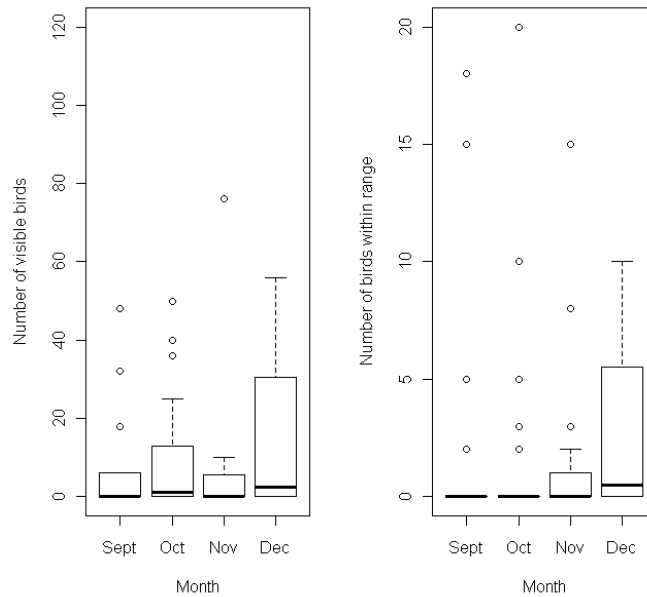


Figure 20. Tukey boxplot representing the number of visible tufted ducks (left) and within range (right) in Finland.

Velvet scoter

Velvet scoter – male

Male velvet scoters were not found either on Åland or on the mainland.

Velvet scoter – female and/or chick

Only a few observations of female velvet scoter and/or chicks were made in both areas. On Åland only one bird was seen within 30m (Figure 15) and no birds were seen within range on the mainland (Figure 16).

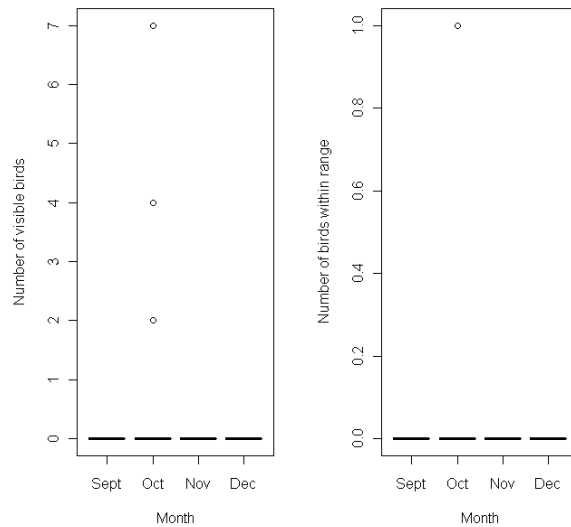


Figure 15. Tukey boxplot representing the number of visible female velvet scoters and/or chicks (left) and within range (right) on Åland.

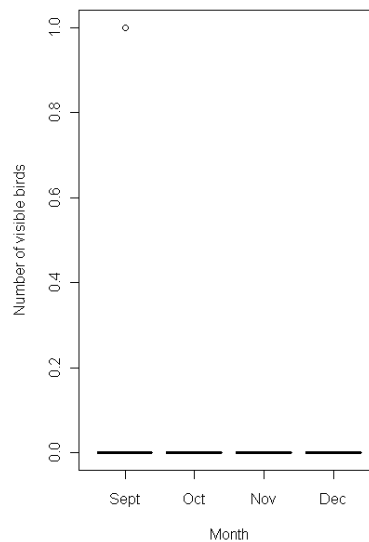


Figure 16. Tukey boxplot representing the number of visible female velvet scoters and/or chicks in Finland.

Velvet scoter – unknown

None of the observations of unknown velvet scoters were made within 30m. September and October were the only months where observations were made on Åland (Figure 17). On the Finnish mainland observations were only made during September (Figure 18).

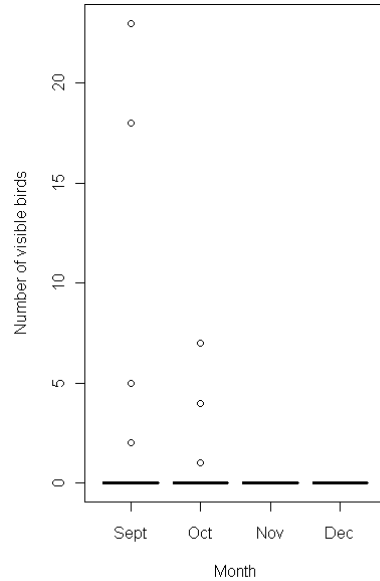


Figure 17. Tukey boxplot representing the number of visible unknown velvet scoters on Åland.

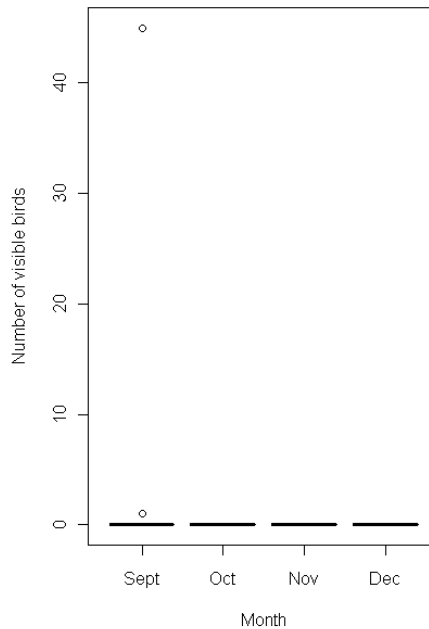


Figure 18. Tukey boxplot representing the number of visible unknown velvet scoters in Finland.

Discussion

The two species eider and velvet scoter were only observed a few times while the common goldeneye and the tufted duck were observed each month and on one occasion almost 300 common goldeneyes were seen (Figure 9). In addition more tufted ducks are seen later during the year in Finland while observations on Åland are evenly spread over the months. Red-breasted and the common merganser were seen in far less number than the common goldeneye and the tufted duck. The presence of red-breasted merganser also shows a clear difference in the number of observed birds on Åland and in Finland (Figure 11 and 12). The analysis of the difference in observed number of birds in the different groups (visible and within 30m) can be found in appendix 1 and 2. In general one can say that the variations in the number of observed birds are due to which month and how long you hunt during each occasion. The latter is not that surprising since one should see more birds the longer one wait, assuming that the species is present in the area. The variation in the number of seen birds is rarely a consequence of the number of decoys.

Statistical tests are constructed in such a way that they compare the data to a null hypothesis, e.g. “there are no birds on Åland”. If the data is significantly separate from the null hypothesis one can draw the conclusion that there are birds on Åland. One can make two types of mistakes here, type I and type II. Type I occurs when you reject the null hypothesis when, in fact, it is true. Type II is when you accept the null hypothesis when it is false. The probability that the conclusion is correct is based on the test’s statistical power. The power of the test is due to several things, among those the level of significance you have chosen (*i.e.* 5%), the size of the data set and the accuracy of the measurements.

One limitation with this data set is that the collection of data was conducted during only two years on Åland and during one in Finland. This means that each month only have two or one measuring point, respectively. The number of observation occasions during each month varies between 4 – 26 for Finland and 10 – 40 for Åland (table 1). For several of the species (foremost eider and velvet scoter) that was inventoried, a majority of the observations are nulls, *i.e.* no individuals were seen. From a statistical point of view it is difficult to draw reliable conclusions. In such a case an analysis of the variation between months becomes pointless, which is the reason that eider (male and unknown) and velvet scoter are not present in the appendices.

Due to the short duration of the inventory and the presence of many null observations, the analyses therefore have low statistical power. One could say that the possibility of drawing the wrong conclusion is large concerning some species. For example: red-breasted merganser occurs in low numbers and I have interpreted that as a species not suitable for hunting. Although it can not be excluded that occasional individuals can be shot during the fall. To increase the power of the analysis the inventory should be conducted over several years. The results are however not confusing from a biological point of view and from what is expected with the knowledge of the species’ biology. Ornithologists have known that long-tailed duck, eider, red-breasted merganser and velvet scoter do not occur, or in very low numbers, around Åland and in the southwestern part of Finland during September to December. This is due to the fact that these species migrate during the winter and return later during the spring. Common goldeneye,

common merganser and tufted duck, on the other hand, spend the winters in this area and are present in a higher extent. To sum up one can make the conclusion that common merganser and tufted duck are present on Åland but are necessarily not suitable for hunting since the number of birds within 30m is not significantly different from random chance in either case. This is not so for Finland where both species were found within hunting distance. The common goldeneye is huntable both on Åland and in Finland. The other species inventoried are present only in very small numbers, both in Finland and on Åland.

Reference:

R Development Core Team (2009). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org>.

Appendix 1. ANOVA tables for Åland

The ANOVA tables below are compiled from simplified models, including only significant effects. No tables are done for eider (male and unknown) and the velvet scoter due to lack of data.

Table 1. ANOVA table of the significant effects of the number of decoys and month on the number of seen Long-tailed ducks, a) Visible and b) Within 30m (shooting range) on Åland. Df is the number of degrees of freedom, Dev the deviation, Resid Df is the number of degrees of freedom of the residual, Resid Dev is the residual deviation and Sign is the significance level (* = weakly significant, ** = significant, *** = very significant). VLongTailedDuck is the number of decoys used.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
VLongTailedDuck	1	390.3	95	539.9	***
Month	3	158.3	92	381.5	***

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
VLongTailedDuck	1	82.5	95	91.4	***
Month	3	40.0	92	51.4	***

Table 2. ANOVA table of the significant effects of the number of decoys, month and the total observational time, with interactions, on the number of seen female eiders and/or chicks, a) Visible and b) Within 30m (shooting range) on Åland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
VEider	1	12.2	90	222.6	***
Month	3	37.6	87	184.9	***
Total time	1	18.6	86	166.3	***
VEider×Total time	1	12.5	85	153.8	***
Month×Total time	3	26.7	82	127.0	***

Table 3. ANOVA table of the significant effects of the number of decoys and month on the number of seen common goldeneyes, a) Visible and b) Within 30m (shooting range) on Åland. Abbreviations as in table 1.

a) Visible	Df	Df	Dev	Resid Df	Resid Dev
VGoldeneye	1	683.6	95	3802.7	***
Month	3	459	92	3343.7	*

b) Within 30m	Df	Df	Dev	Resid Df	Resid Dev
VGoldeneye	1	40.0	95	906.8	*

Table 4. ANOVA table of effects of the number of decoys, month and the total observational time on the number of seen red-breasted mergansers, a) Visible and b) Within 30m (shooting range) on Åland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
Month	3	95.8	88	586.0	**
Total time	1	80.0	87	506	**

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
VRedBreastedMerganser	1	0.247	90	175.4	
Month	3	18.3	87	157.1	
Total time	1	18.9	86	138.2	*

Table 5. ANOVA table of the significance of the intercept the number of seen common mergansers, a) Visible and b) Within 30m (shooting range) on Åland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
Intercept	97	2792,1	-1	-1936,2	***

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
Intercept	97	407,9	-1	-23,1	

Table 6. ANOVA table of the significant effects of the month, the total observational time and intercept on the number of seen tufted ducks, a) Visible and b) Within 30m (shooting range) on Åland. Abbreviations as in table 1.

	Df	Dev	Resid Df	Resid Dev	Sign
a) Visible					
Month	3	1648.9	88	6143.7	**
Total time	1	753.3	87	5390.4	**

	Df	Dev	Resid Df	Resid Dev	Sign
b) Within 30m					
Intercept	97	499.2	-1	-21.4	

Appendix 2. ANOVA tables for Finland

The ANOVA tables below are compiled from the simplified models. No tables are done for eider (male and unknown) and the velvet scoter due to lack of data.

Table 1. ANOVA table of the significant effects of the number of decoys, month and the total observational time on the number of seen Long-tailed ducks, a) Visible and b) Within 30m (shooting range) in Finland. Df is the number of degrees of freedom, Dev. the deviation, Resid Df is the number of degrees of freedom of the residual, Resid Dev is the residual deviation and Sign is the significance level (* = weakly significant, ** = significant, *** = very significant). VLongTailedDuck is the number of decoys used.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
VLongTailedDuck	1	1183.3	64	501.5	***
Month	3	203.5	61	298.1	***
Total time	1	86.6	60	211.4	***

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
VLongTailedDuck	1	251.7	64	42.6	***
Month	3	19.1	61	23.6	***
Total time	1	14.0	60	9.6	***

Table 2. ANOVA table of the significant effects of the number of decoys and month on the number of seen female eiders and/or chicks, a) Visible and b) Within 30m (shooting range) in Finland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
Month	3	650.6	62	1770.3	*

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
VEider	1	17.8	64	101.7	***
Month	3	18.3	61	83.3	***

Table 3. ANOVA table of the significant effects of the number of decoys, month and the total observational time on the number of seen goldeneyes, a) Visible and b) Within 30m (shooting range) in Finland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
VGoldeneye	1	1057.6	64	3103.5	***
Month	3	714.7	61	2388.8	**

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
VGoldeneye	1	297.5	64	596.8	***

Table 4. ANOVA table of the significant effects of month and the total observational time on the number of seen red-breasted mergansers, a) Visible and b) Within 30m (shooting range) in Finland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
Month	3	52.6	62	161.8	**

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
Month	3	31.1	62	95.3	***
Total time	1	23.4	61	71.9	***

Table 5. ANOVA table of the effects of the number of decoys, month and the total observational time, with interactions between month and time, on the number of seen common mergansers, a) Visible and b) Within 30m (shooting range) in Finland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
VCommonMerganser	1	10.7	64	610.7	
Month	3	36.9	61	573.8	
Total time	1	0.2	60	573.6	
Month×Total time	3	97.0	57	476.7	*

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
Intercept	66	454.1	-1	-158.1	***

Table 6 ANOVA table of the effects of the number of decoys, month and the total observational time on the number of seen tufted ducks, a) Visible and b) Within 30m (shooting range) in Finland. Abbreviations as in table 1.

a) Visible	Df	Dev	Resid Df	Resid Dev	Sign
VTuftedDuck	1	6.5	64	4688.3	
Month	3	626.2	61	4062.1	
Total time	1	28.7	60	4033.4	
Month×Total time	3	700.0	57	3333.9	*

b) Within 30m	Df	Dev	Resid Df	Resid Dev	Sign
Total_Tid	1	65.4	64	391.5	*