Trends of wintering and breeding birds in the Oostvaardersplassen

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Introduction and Methods

This report presents an overview of recent trends in bird numbers in the Oostvaardersplassen and, for comparison, in The Netherlands. Brief descriptions of the findings and subsequent analyses are provided. Data on bird abundance in The Netherlands is collected from various sources by SOVON. See Hustings *et al.* (2009) for methodology of water bird counts and van Dijk *et al.* (2010) for details on breeding bird monitoring. Additional information was collected from de concept report of F. de Roder (Staatsbosbeheer, directie Oost), presenting data on bird numbers in the marsh area of the OVP. A large part of this report is based on data from aerial surveys collected by M. van Eerden of Rijkswaterstaat (Waterdienst, Lelystad). Recent data collected by de Roder in the dry area has not been made available yet. Also monitoring data from the marsh area for 2005 and later were collected by N. Beemster (Altenburg & Wymenga) are not yet made available. The report of R.G. Bijlsma (2008; Altenburg & Wymenga) provided some additional data for the dry area for the years 1997, 2002 and 2007.

Nature-2000 bird species in the N2000 designation for the OVP are shown in Table 1 and Table 2. These species are treated in this report unless data was not available. Data of some additional species is presented.

Table 1. Goals for breeding species in the Oostvaardersplassen.

Species and number in the Bird Directory	Preservation and quality of the living conditions with a carrying capacity for at least:	
A004 Little Grebe (*Thachybaptus ruficollis*)	140 pairs	Carrying capacity sufficient
A017 Cormorant (*Phalacrocorax carbo*)	8.000 pairs in the whole IJssel Lake area	Carrying capacity sufficient
A021 Bittern (*Botaurus stellarus*)	40 pairs	Carrying capacity sufficient
A022 Little Bittern (*Ixobrychus minutis*)	3 pairs	Carrying capacity sufficient
A026 Little Egret (*Egretta garzetta*)	20 pairs	Carrying capacity sufficient
A026 Great White Egret (*Casmerodius albus*)	40 pairs	Carrying capacity sufficient
A034 Spoonbill (*Platalea leucorodia*)	160 pairs	Carrying capacity sufficient
A082 Marsh Harrier (*Circus aeriginosus*)	40 pairs	Carrying capacity sufficient
A082 Hen Harrier (*Circus cyanus*)	4 pairs	Carrying capacity sufficient
A119 Spotted Crake (*Porzana porzana*)	40 pairs	Carrying capacity sufficient
A272 Bluethroat (*Luscinia svecica*)	190 pairs	Carrying capacity sufficient
A292 Savi's Warbler (*Locustella luscinoides*)	680 pairs	Carrying capacity sufficient
A295 Sedge Warbler (*Acrocephalus schoenobaenus*)	790 pairs	Carrying capacity sufficient
A298 Great Reed Warbler (*Acrocephalus arundinaceus*)	3 pairs	Carrying capacity sufficient

Table 2. Goals for non-breeding species in the Oostvaardersplassen as mentioned in the Designation

Species and number in the Bird Directory	Preservation and quality of the living conditions with a carrying capacity for a population of an average of (average per season):	
A027 Great White Egret (*Casmerodius albus*)	30 birds	Maintenance present numbers sufficient
A034 Spoonbill (*Platalea leucorodia*)	110 birds	Maintenance present numbers sufficient
A038 Whooper Swan (*Cygnus Cygnus*)	20 birds	Maintenance present numbers sufficient
A041 White-fronted Goose (*Anser albifrons*)	600	Maintenance present numbers sufficient
A043 Grey Lag Goose (*Anser anser*)	4.200	Maintenance present numbers sufficient
A045 Barnacle Goose (*Branta leucopsis*)	1.800	Maintenance present numbers sufficient
A048 Shelduck (*Tadorna tadorna*)	90	Maintenance present numbers sufficient
A050 Wigeon (*Mareca penelope*)	2.100	Maintenance present numbers sufficient
A051 Gadwall (*Mareca strepera*)	480	Maintenance present numbers sufficient
A052 Teal (*Anas crecca*)	1.300	Maintenance present numbers sufficient
A054 Pintail (*Anas acuta*)	80	Maintenance present numbers sufficient
A056 Shoveler (*Anas clypeata*)	1.900	Maintenance present numbers sufficient
A132 Avocet (*Recurvirostra avosetta*)	100	Maintenance present numbers sufficient
A156 Black-tailed Godwit (*Limosa limosa*)	90	Maintenance present numbers sufficient
A059 Pochard (*Aythya ferina*)	11.900	Maintenance present situation sufficient
A061 Tufted Duck (*Aythya fuligula*)	10.200	Maintenance present situation sufficient
A068 Smew (*Mergellus albellus*)	280	Maintenance present situation sufficient
A151 Ruff (*Philomachus pugnax*)	210	Maintenance present situation sufficient

Species and number in the Bird Directory	Preservation and quality of the living conditions):	
A075 White-tailed Eagle (*Haliaeetus albicilla*)A156	1-3 birds	Maintenance present numbers

Results

The trends of breeding and non-breeding birds in the OVP and, for comparison, in the entire country are grouped by habitat preferences, often coinciding with food preferences. These groups will by and large use either the marsh area or the dry area.

Colony breeders

Cormorant - Aalscholver

Cormorants are breeding in trees in the marsh area. For feeding they commute to deeper water outside of the OVP, mainly to Lake IJsselmeer and Lake Markermeer. Total numbers have slightly increased since 1997 but OVP-numbers have decreased since 2002 (Figure 1, Table 3). The cause of the decrease is thought to be the new usage of breeding areas in the IJsselmeer, and the decreasing food availability in Lake Markermeer (Cornelissen & Roos 2009). Outside of the breeding season Cormorants are present in low numbers.

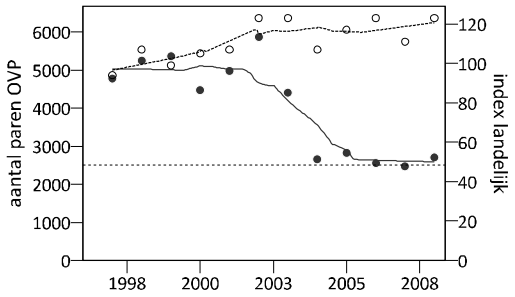

Figure 1. Number of breeding pairs of Cormorants in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 3. Results of GLM analysis of effects of time and area on Cormorant breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	158.320	24.0545	43.319	1	.000	5.724E68
[area=Country]	-178.091	24.5929	52.440	1	.000	.000
[area=OVP]	0	.	.	.	.	1
Year	-.075	.0120	38.870	1	.000	.928
[area=Country] * Year	.087	.0123	50.315	1	.000	1.091
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	144482.208	28611.7406				

Little Egret – Kleine Zilverreiger

Number of Little Egrets follow total numbers until 2005/06 but then fall steep when the national trend only shows a slight decrease (Figure 2). The pattern in the OVP follows that of the breeding pair numbers (Figure 3). The number of breeding birds in the OVP have decreased after 2006 probably as the result from local drought in the breeding area and disturbance by White-tailed Eagles and humans (Cornelissen & Roos 2009, van Dijk *et al.* 2010).

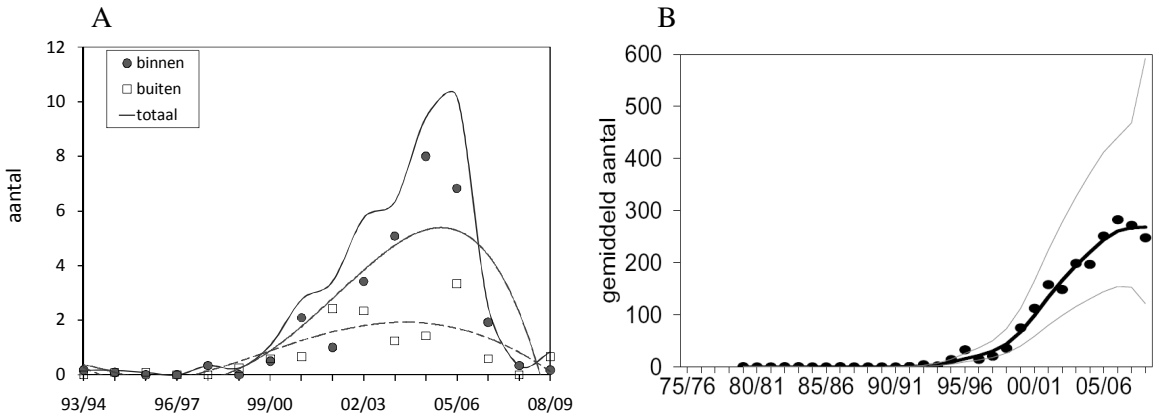

Figure 2. Average seasonal number of Little Egrets (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 4. Results of GLM analysis of effects of time and area on average seasonal Little Egret numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-287.150	34.2591	70.253	1	.000	.000
Marsh area	119.639	75.8972	2.485	1	.115	9.090E51
Dry area	140.721	71.0558	3.922	1	.048	1.301E61
Country	0	.	.	.	.	1
Year	.146	.0171	72.760	1	.000	1.157
Marsh area * Year	-.062	.0380	2.653	1	.103	.940
Dry area * Year	-.073	.0355	4.196	1	.041	.930
Country * Year	0	.	.	.	.	1
(Scale)	387.308	79.0589				

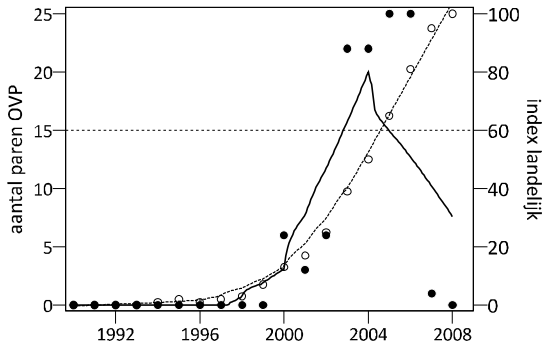

Figure 3. Number of breeding pairs of Little Egrets in the OVP (left axis: black dots) and national index (right axis: open dots). Lines are fitted to lead the eye.

Table 5. Results of GLM analysis of effects of time and area on Little Egret breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-176.547	55.5785	10.090	1	.001	.000
[area=Country]	-292.952	65.0787	20.264	1	.000	.000
[area=OVP]	0	.	.	.	.	1
Year	.089	.0278	10.262	1	.001	1.093
[area=Country] * Year	.147	.0325	20.408	1	.000	1.158
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	53.989[b]	12.2262				

Great White Egret – Grote Zilverreiger

The trend of non-breeding Great White Egrets in the OVP in general follow the national pattern (Figure 4). However the increase has been slower in the OVP, especially in the dry area (Table 7). The OVP contains the major part of the Dutch breeding population and the trend therefore almost equals the national trend (Figure 5). Numbers of breeding pairs have decreased in 2007 due to drought of surrounding marshes, making the nests vulnerable to predation.

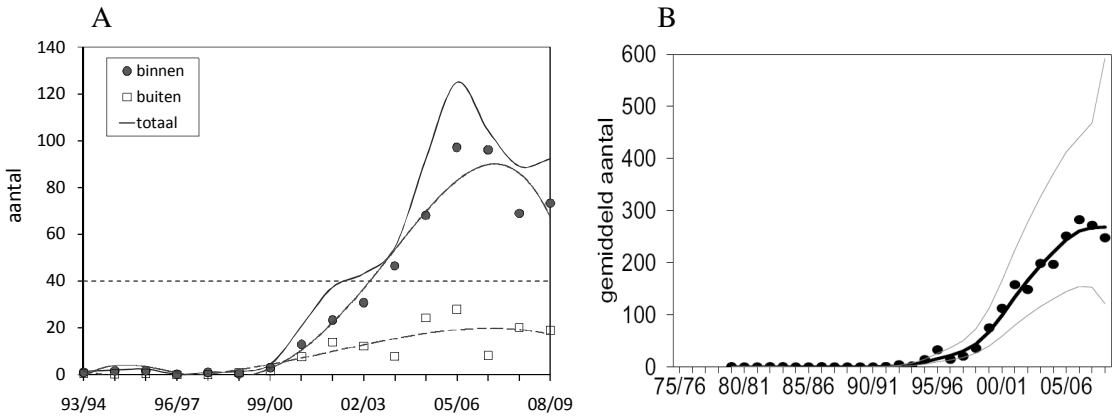

Figure 4. Average seasonal number of Great White Egrets (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 6. Results of GLM analysis of effects of time and area on average seasonal Great White Egrets numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

Parameter	B	Std. Error	Hypothesis Test			Exp(B)
			Wald Chi-Square	df	Sig.	
(Intercept)	-547.363	38.4052	203.129	1	.000	.000
Marsh area	187.641	62.1443	9.117	1	.003	3.100E81
Dry area	248.105	58.1700	18.192	1	.000	5.632E107
Country	0	.	.	.	.	1
Year	.276	.0192	207.101	1	.000	1.317
Marsh area * Year	-.094	.0310	9.234	1	.002	.910
Dry area * Year	-.125	.0290	18.586	1	.000	.882
Country * Year	0	.	.	.	.	1
(Scale)	306.766	62.6183				

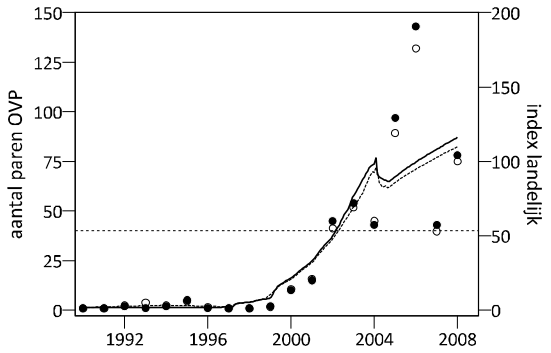

Figure 5. Number of breeding pairs of Great White Egrets in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 7. Results of GLM analysis of effects of time and area on Great White Egrets breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-331.561	36.1861	83.955	1	.000	.000
[area=Country]	-27.218	61.6538	.195	1	.659	.000
[area=OVP]	0	.	.	.	.	1
Year	.167	.0180	86.305	1	.000	1.182
[area=Country] * Year	.014	.0308	.199	1	.656	1.014
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	684.396	154.9853				

Great Grey Heron – Blauwe Reiger

Numbers of non-breeding Great Grey Herons are relatively low in the OVP and did not significantly differ from the national trend (Figure 6, Table 8). There are no breeding colonies of these birds in the OVP, due to the lack of suitable trees.

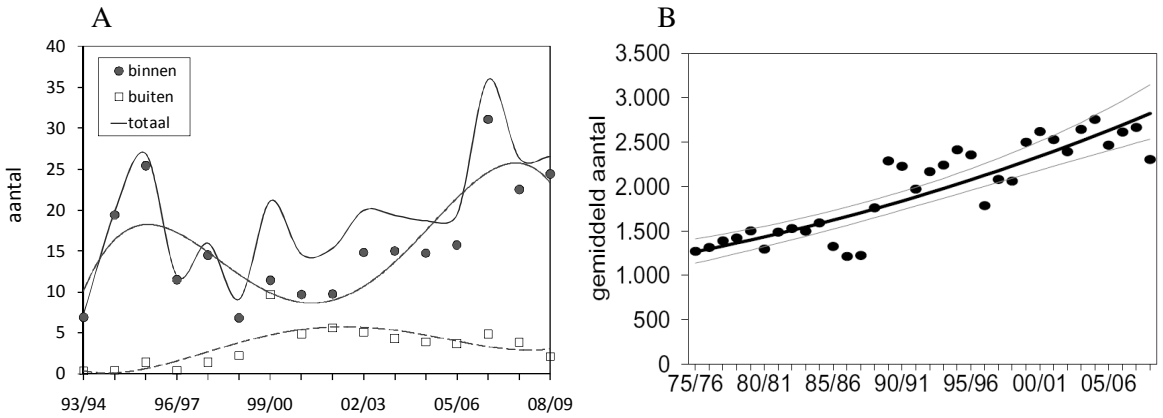

Figure 6. Average seasonal number of Great Grey Herons (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 8. Results of GLM analysis of effects of time and area on average seasonal Great Grey Heron numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-16.474	9.7974	2.827	1	.093	.000
Marsh area	-83.457	55.6236	2.251	1	.134	.000
Dry area	-77.594	50.8721	2.326	1	.127	.000
Country	0	.	.	.	.	1
Year	.012	.0049	6.134	1	.013	1.012
Marsh area * Year	.039	.0278	1.993	1	.158	1.040
Dry area * Year	.036	.0254	1.957	1	.162	1.036
Country * Year	0	.	.	.	.	1
(Scale)	14954.583[d]	3052.5914				

Spoonbill - Lepelaar

Numbers of Spoonbills increased steadily in The Netherlands while numbers in the OVP remained at a more or less equal level from 1993 (Figure 7, Table 9). The seasonal numbers probably mainly have bearing on breeding birds. Breeding pair numbers in the OVP fluctuated considerably, but tended to decrease during the last couple of years while the Dutch trend was still positive (Figure 8, Table 10). The ground-breeding Spoonbills are very sensitive to predation risks, which may be a factor limiting further population growth.

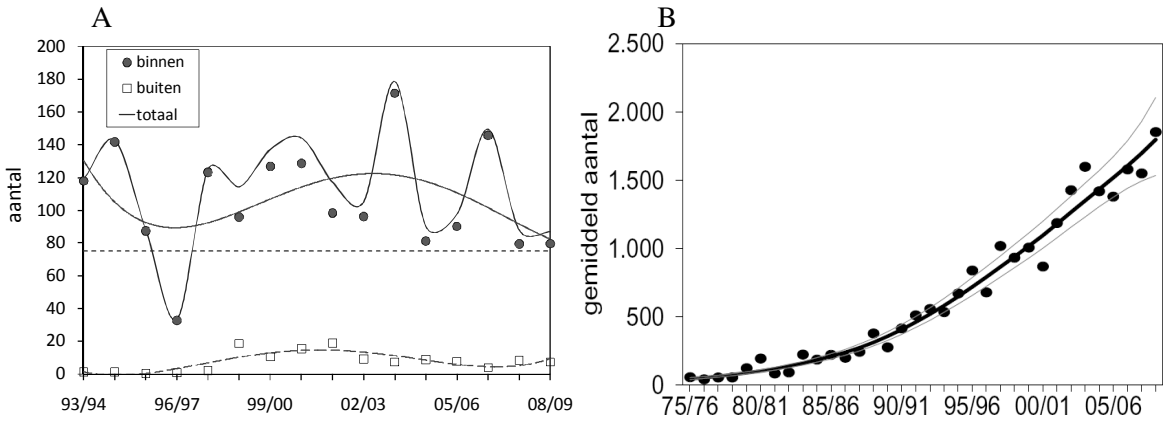

Figure 7. Average seasonal number of Spoonbills (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 9. Results of GLM analysis of effects of time and area on average seasonal Spoonbill numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-141.294	10.8374	169.981	1	.000	.000
Marsh area	153.051	32.6001	22.041	1	.000	2.945E66
Dry area	66.811	50.5997	1.743	1	.187	1.036E29
Country	0	.	.	.	.	1
Year	.074	.0054	187.787	1	.000	1.077
Marsh area * Year	-.078	.0163	22.706	1	.000	.925
Dry area * Year	-.036	.0252	2.019	1	.155	.965
Country * Year	0	.	.	.	.	1
(Scale)	5666.877	1156.7465				

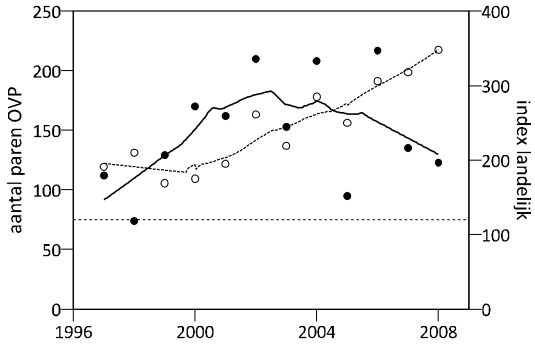

Figure 8. Number of breeding pairs of Spoonbills in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 10. Results of GLM analysis of effects of time and area on Spoonbills breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-15.032	33.9541	.196	1	.658	.000
[area=Country]	-121.177	34.5280	12.317	1	.000	.000
[area=OVP]	0	.	.	.	.	1
Year	.010	.0170	.348	1	.555	1.010
[area=Country] * Year	.061	.0172	12.422	1	.000	1.063
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	978.377	244.5943				

Waterbirds

The waterbird assembly contains the swans, geese, ducks and the Coot. These birds mainly use open water for foraging. Most of these birds do not breed in the OVP but are wintering or migrating in the area. Nevertheless, some species are breeding in the area in large numbers, in particular Greylag Geese, Mallard, Coot and Little Grebe.

Mute Swan - Knobbelzwaan

Seasonal numbers of Mute Swans in the OVP are relatively low (Figure 9).The increasing Dutch trend is not followed in the OVP (Table 11), but the cause of this difference is not known. The birds are feeding on short grass land and in pools and ditches.

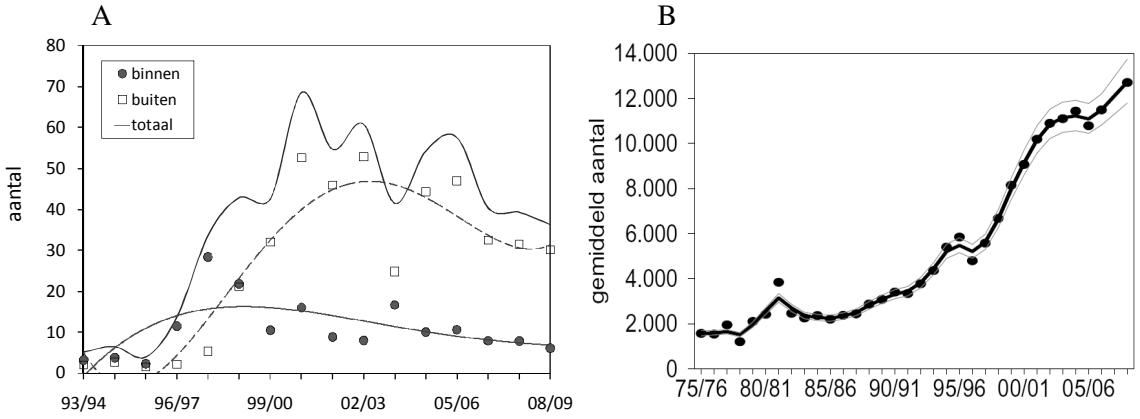

Figure 9. Average seasonal number of Mute Swans (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 11. Results of GLM analysis of effects of time and area on average seasonal Mute Swans numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-119.413	10.1258	139.075	1	.000	.000
Marsh area	125.803	50.4243	6.224	1	.013	4.321E54
Dry area	-29.262	44.1609	.439	1	.508	.000
Country	0	.	.	.	.	1
Year	.064	.0051	161.484	1	.000	1.066
Marsh area * Year	-.066	.0252	6.930	1	.008	.936
Dry area * Year	.012	.0220	.284	1	.594	1.012
Country * Year	0	.	.	.	.	1
(Scale)	290905.744	59380.8864				

Whooper Swan – Wilde Zwaan

Whooper Swans are wintering birds in The Netherlands. Their abundance is strongly dependent on the weather conditions, with higher numbers present during cold winters. The OVP is an area of minor importance for Whooper Swans and most birds are found in the northern part of the country where they feed in agricultural fields. The recent decrease in numbers in the marsh area of the OVP could be related to changes in water levels and predation risks.

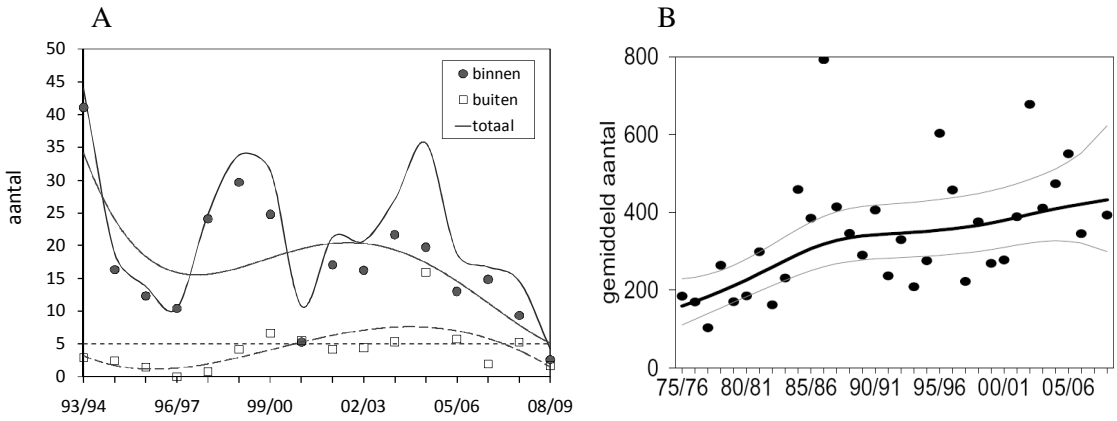

Figure 10. Average seasonal number of Whooper Swans (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 12. Results of GLM analysis of effects of time and area on average seasonal Whooper Swan numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-37.005	34.6057	1.143	1	.285	.000
Marsh area	156.998	67.0420	5.484	1	.019	1.526E68
Dry area	-56.494	63.8863	.782	1	.377	.000
Country	0	.	.	.	.	1
Year	.021	.0173	1.542	1	.214	1.022
Marsh area * Year	-.080	.0335	5.706	1	.017	.923
Dry area * Year	.026	.0319	.663	1	.416	1.026
Country * Year	0	.	.	.	.	1
(Scale)	5573.614	1137.7093				

White-fronted Goose – Kolgans

For White-fronted Geese the OVP is not an important wintering site. Numbers are low compared to the national total numbers (Figure 11). White-fronted Geese numbers have increased greatly during the last decades but they are almost exclusively found in agricultural areas. Apparently the area is not very suitable for roosting, which may be due to the distance from feeding areas, low water levels and to high predation risks (Table 13).

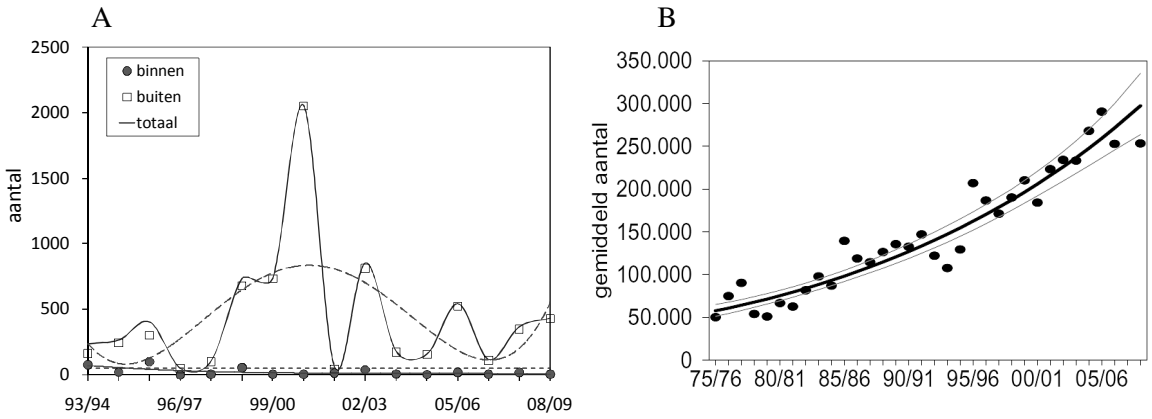

Figure 11. Average seasonal number of White-fronted Geese (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 13. Results of GLM analysis of effects of time and area on average seasonal White-fronted Geese numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-74.496	14.6815	25.747	1	.000	.000
Marsh area	466.290	158.9133	8.610	1	.003	3.214E202
Dry area	62.350	44.7349	1.943	1	.163	1.197E27
Country	0	.	.	.	.	1
Year	.043	.0073	34.978	1	.000	1.044
Marsh area * Year	-.238	.0797	8.917	1	.003	.788
Dry area * Year	-.034	.0223	2.358	1	.125	.966
Country * Year	0	.	.	.	.	1
(Scale)	1.880E8	3.8383E7				

Greylag Goose – Grauwe Gans

Greylag Geese use the OVP in large numbers to moult. However, more recent the number of breeding birds in The Netherlands has increased dramatically which is also reflected in the average seasonal national numbers (Figure 12). The nationwide increase has not been apparent in the average OVP numbers (Table 14, Figure 12). Large numbers of Greylag Geese use the reed area of the OVP to moult. Nowadays, these numbers amount to 20-30,000 birds, but up to 60,000 were counted in the early nineties (Cornelissen & Roos 2009). These numbers are affected by the availability of suitable habitat which strongly depends on the water level.
The number of breeding birds followed the positive national trend (Figure 13, Table 15), although, for unknown reasons, from 2004 to 2008 there has not been a further increase in the OVP. In 2009 the number of breeding pairs increased spectacularly to almost 1500 nests (not in the figure! ; de Roder, *in prep.*). The cause of this sudden increase is not yet understood.

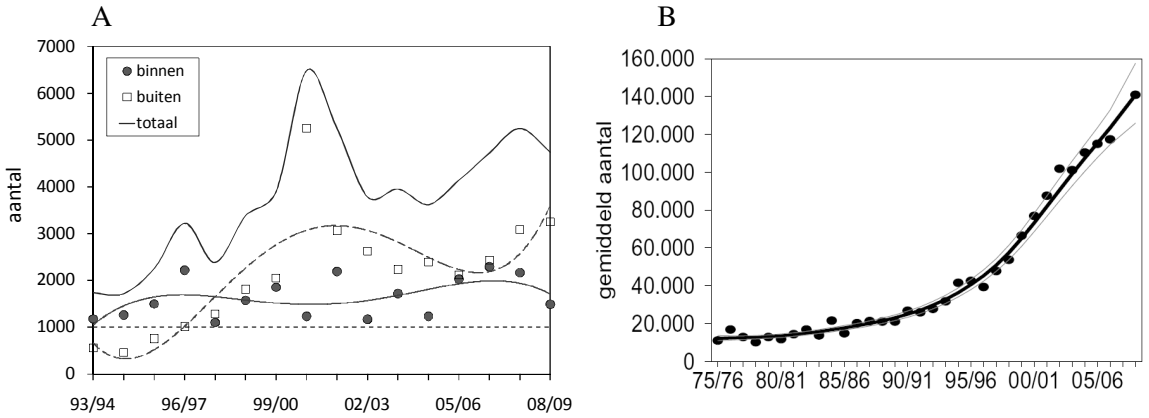

Figure 12. Average seasonal number of Greylag Geese (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 14. Results of GLM analysis of effects of time and area on average seasonal Greylag Geese numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-169.603	9.4791	320.132	1	.000	.000
Marsh area	134.386	25.3794	28.038	1	.000	2.308E58
Dry area	47.606	34.4208	1.913	1	.167	4.731E20
Country	0	.	.	.	.	1
Year	.090	.0047	365.118	1	.000	1.095
Marsh area * Year	-.069	.0127	29.666	1	.000	.933
Dry area * Year	-.026	.0171	2.222	1	.136	.975
Country * Year	0	.	.	.	.	1
(Scale)	1.871E7	3.8186E6				

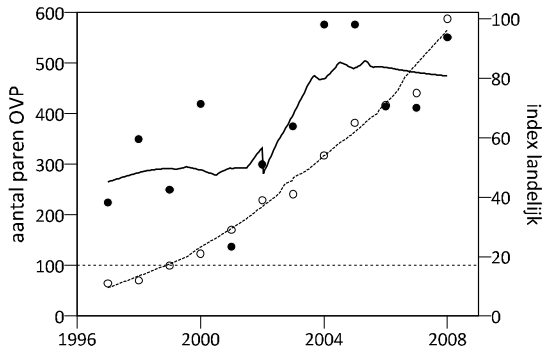

Figure 13. Number of breeding pairs of Greylag Geese in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye. In 2009 the number of breeding pairs increased to almost 1500 pairs.

Table 15. Results of GLM analysis of effects of time and area on Greylag Geese breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-328.869	154.9087	4.507	1	.034	.000
[area=Country]	-34.008	155.4140	.048	1	.827	.000
[area=OVP]	0	.	.	.	.	1
Year	.167	.0773	4.680	1	.031	1.182
[area=Country] * Year	.016	.0775	.042	1	.838	1.016
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	17926.739	4481.6847				

Barnacle Goose – Brandgans

Barnacle Geese are mostly wintering birds in The Netherlands, although breeding numbers are increasing. The birds are foraging on short grass in agricultural and natural (coastal) areas. The trend in numbers present in the dry area of the OVP are not significantly different from the national trend (Table 16), although stabilisation seems to have occurred in the OVP since 1999/2000 (Figure 14). Potential limiting factors in the OVP are surface area with short grass and nearby suitable roosting areas.

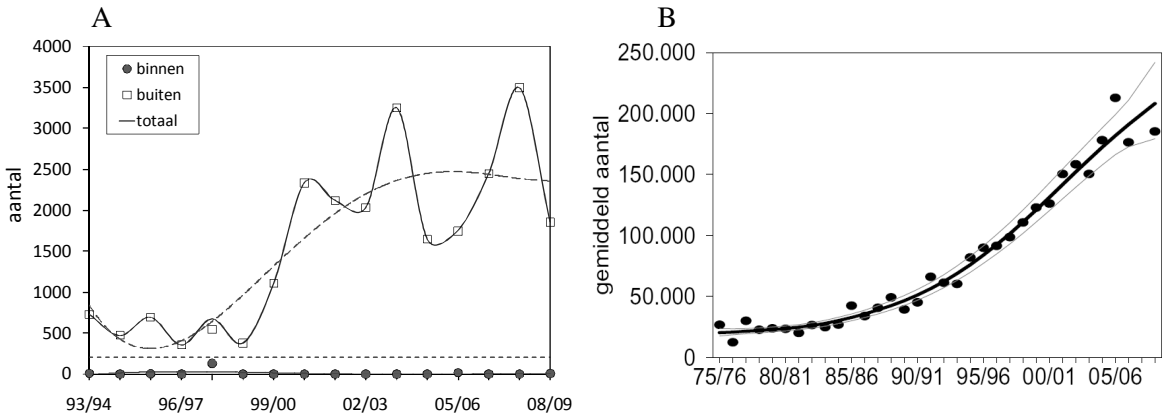

Figure 14. Average seasonal number of Barnacle Geese (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 16. Results of GLM analysis of effects of time and area on average seasonal Barnacle Goose numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-117.524	11.5851	102.908	1	.000	.000
Marsh area	300.123	70.0433	18.360	1	.000	2.196E130
Dry area	-61.383	45.1723	1.847	1	.174	.000
Country	0	.	.	.	.	1
Year	.065	.0058	124.499	1	.000	1.067
Marsh area * Year	-.155	.0350	19.566	1	.000	.857
Dry area * Year	.028	.0226	1.590	1	.207	1.029
Country * Year	0	.	.	.	.	1
(Scale)	5.645E7	1.1523E7				

Common Shelduck - Bergeend

Shelducks are present in low numbers in the OVP (Figure 15) and the trend stays behind with the positive Dutch trend (Table 17). This may be due to the disappearance of suitable habitat, in particular muddy areas and shallow water (de Roder, *in prep.*).

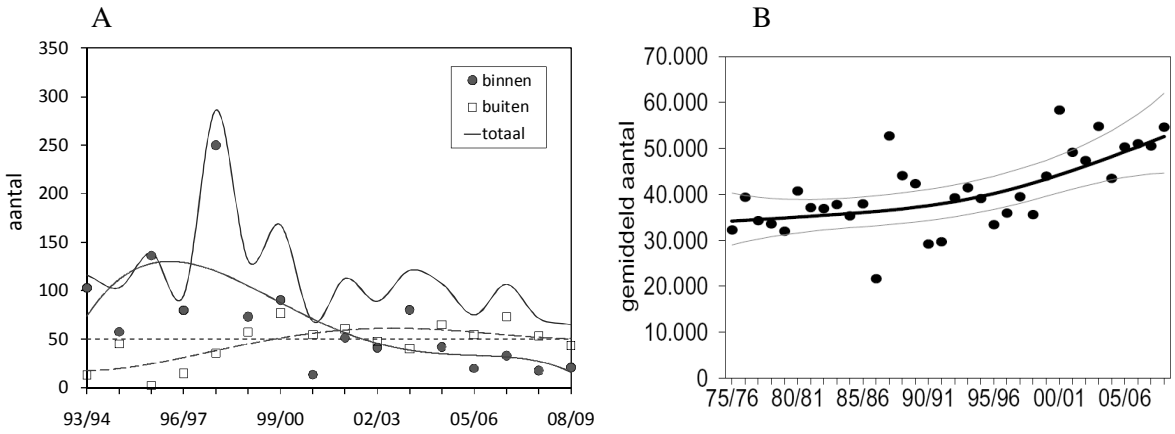

Figure 15. Average seasonal number of Shelducks (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 17. Results of GLM analysis of effects of time and area on average seasonal Shelduck numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			Exp(B)
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	
(Intercept)	-40.758	8.3691	23.717	1	.000	.000
Marsh area	227.423	39.3445	33.412	1	.000	5.871E98
Dry area	-49.772	39.7120	1.571	1	.210	.000
Country	0	.	.	.	.	1
Year	.026	.0042	37.986	1	.000	1.026
Marsh area * Year	-.117	.0197	35.348	1	.000	.890
Dry area * Year	.021	.0198	1.169	1	.280	1.022
Country * Year	0	.	.	.	.	1
(Scale)	8.704E6	1.7767E6				

Eurasian Widgeon – Smient

Widgeons appear in winter in large numbers. They forage almost exclusively on grassland and roost on open water. Numbers in the OVP are relatively low and the trend does not differ significantly from the national trend (Figure 16, Table 18).

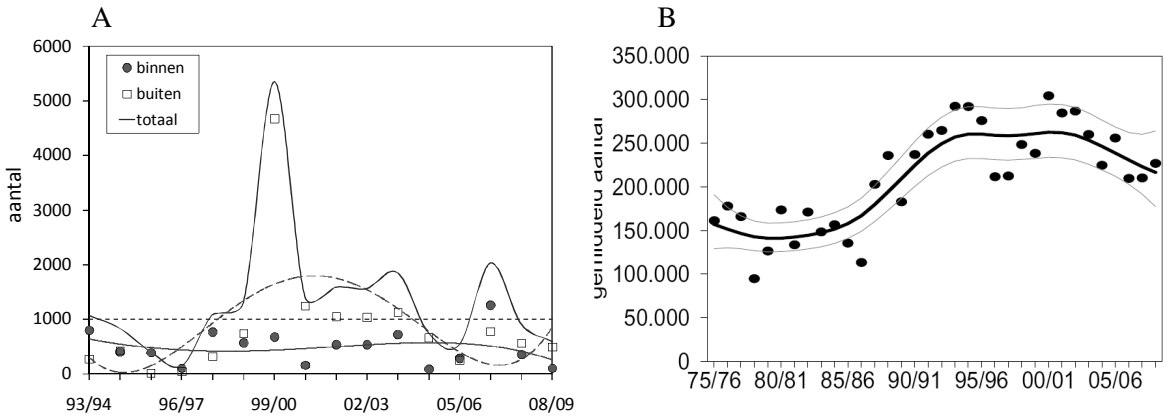

Figure 16. Average seasonal number of Widgeons (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 18. Results of GLM analysis of effects of time and area on average seasonal Widgeon numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	36.478	9.6505	14.288	1	.000	6.956E15
Marsh area	-7.320	76.2209	.009	1	.923	.001
Dry area	-49.293	55.3172	.794	1	.373	.000
Country	0	.	.	.	.	1
Year	-.012	.0048	6.215	1	.013	.988
Marsh area * Year	.001	.0381	.000	1	.989	1.001
Dry area * Year	.022	.0275	.626	1	.429	1.022
Country * Year	0	.	.	.	.	1
(Scale)	2.879E8	5.8762E7				

Gadwall – Krakeend

Gadwalls have been very successful during the last decades, with increasing winter numbers in The Netherlands (Figure 17) but also in Central and North-western Europe. This increase has not been apparent in the OVP (Table 19). This may have been caused by water levels being too high making it unsuitable for foraging.

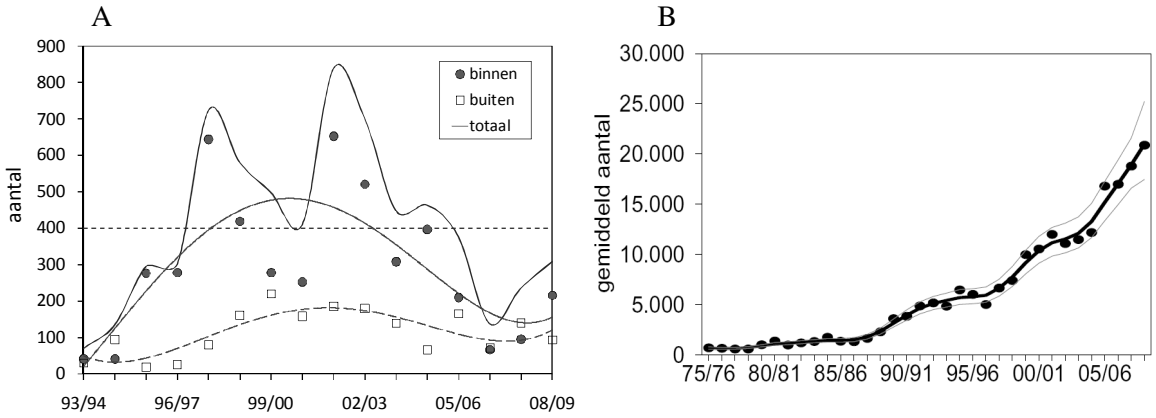

Figure 17. Average seasonal number of Gadwalls (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 19. Results of GLM analysis of effects of time and area on average seasonal Gadwall numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-192.770	9.5571	406.845	1	.000	.000
Marsh area	203.863	50.4473	16.331	1	.000	3.441E88
Dry area	135.276	40.7894	10.999	1	.001	5.619E58
Country	0	.	.	.	.	1
Year	.101	.0048	448.811	1	.000	1.106
Marsh area * Year	-.104	.0252	16.919	1	.000	.902
Dry area * Year	-.070	.0204	11.766	1	.001	.933
Country * Year	0	.	.	.	.	1
(Scale)	330746.726	67513.3926				

Common Teal - Wintertaling

Teals winter in and migrate through The Netherlands. They mainly eat seeds of water plants. Average numbers of Teals in the OVP fluctuate considerably, as are the Dutch numbers, and seasonal changes in the OVP seem to reflect the Dutch changes (Figure 18). Due to their diet and foraging mode the birds are sensitive to water level changes.

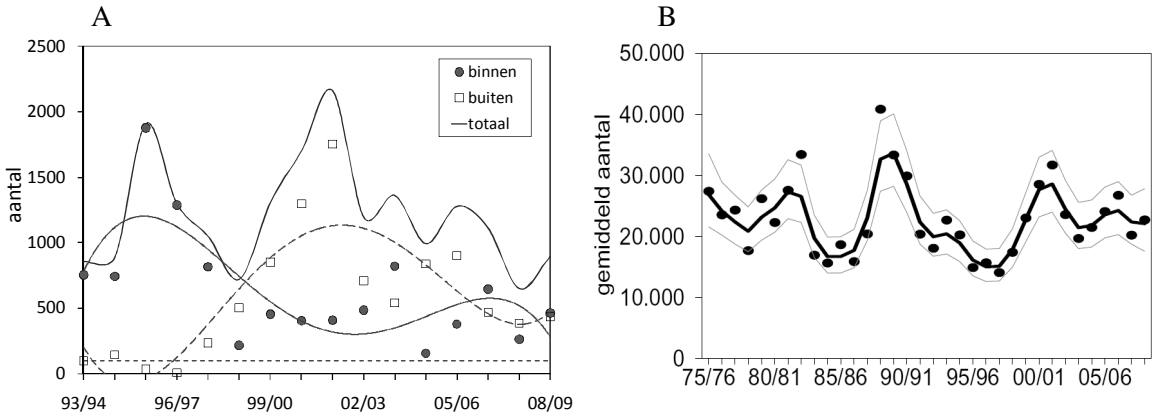

Figure 18. Average seasonal number of Teal (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 20. Results of GLM analysis of effects of time and area on average seasonal Teal numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-29.927	18.0841	2.739	1	.098	.000
Marsh area	204.690	62.3160	10.789	1	.001	7.866E88
Dry area	-52.079	49.1932	1.121	1	.290	.000
Country	0	.	.	.	.	1
Year	.020	.0090	4.870	1	.027	1.020
Marsh area * Year	-.104	.0311	11.168	1	.001	.901
Dry area * Year	.024	.0245	.976	1	.323	1.025
Country * Year	0	.	.	.	.	1
(Scale)	5.925E6	1.2095E6				

Mallard – Wilde Eend

Mallard numbers have decreased considerably in the OVP (Figure 19), and apparently numbers in the marsh area have decreased faster than the national number (Table 21). Causes of this decrease are unknown. Potentially climate change has resulted in a north-eastern shift of the European population (Hustings *et al.* 2009).

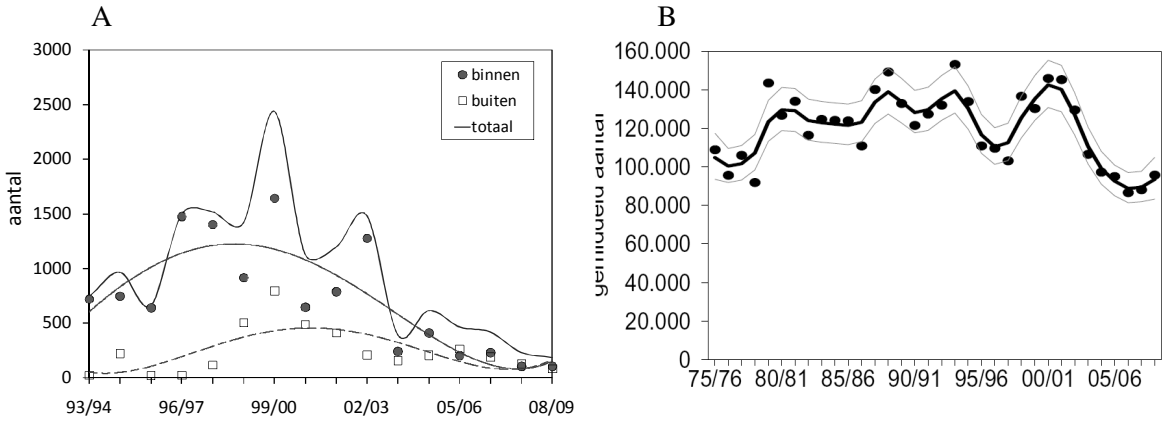

Figure 19. Average seasonal number of Mallards (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 21. Results of GLM analysis of effects of time and area on average seasonal Mallard numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	60.752	11.4280	28.261	1	.000	2.423E26
Marsh area	83.035	43.4037	3.660	1	.056	1.152E36
Dry area	-61.786	50.7417	1.483	1	.223	.000
Country	0	.	.	.	.	1
Year	-.025	.0057	18.467	1	.000	.976
Marsh area * Year	-.044	.0217	4.116	1	.042	.957
Dry area * Year	.028	.0253	1.206	1	.272	1.028
Country * Year	0	.	.	.	.	1
(Scale)	9.103E7	1.8582E7				

Pin-tailed Duck – Pijlstaart

Pin-tailed Ducks are wintering and migratory birds in fresh and salt water areas in The Netherlands. They forage on shallow open water. Numbers fluctuate partly due to winter weather. The increasing trend in the national numbers was not visible in the OVP (Figure 20, Table 22). Numbers in the OVP are likely to vary with water level and predation risks.

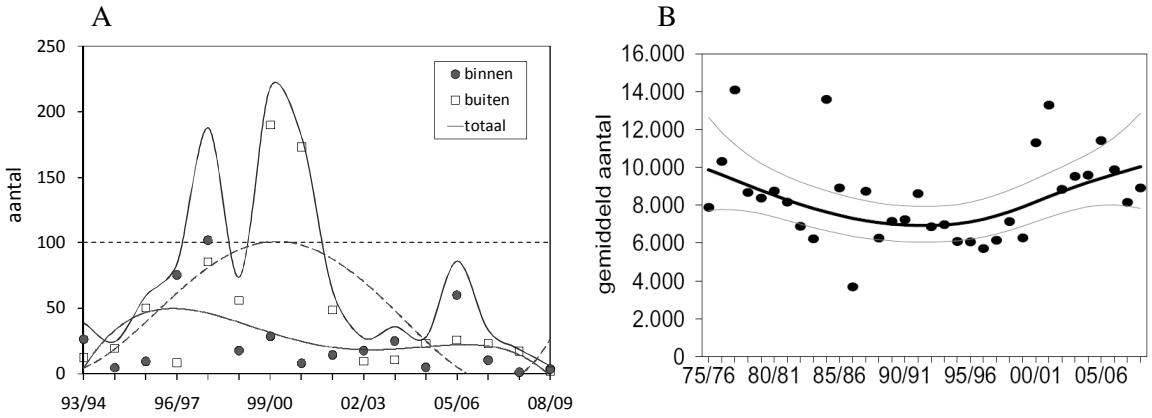

Figure 20. Average seasonal number of Pin-tailed Ducks (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 22. Results of GLM analysis of effects of time and area on average seasonal Pin-tailed Duck numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-55.454	16.4357	11.384	1	.001	.000
Marsh area	168.206	75.7785	4.927	1	.026	1.125E73
Dry area	125.384	50.9588	6.054	1	.014	2.842E54
Country	0	.	.	.	.	1
Year	.032	.0082	15.410	1	.000	1.033
Marsh area * Year	-.087	.0379	5.277	1	.022	.917
Dry area * Year	-.065	.0255	6.565	1	.010	.937
Country * Year	0	.	.	.	.	1
(Scale)	1.104E6	225433.8735				

Eurasian Shoveler – Slobeend

Shovelers are mainly migratory and wintering birds in The Netherlands. They forage in shallow water. A considerable number of Shovelers are found in the OVP (Figure 21), especially in August. There is also considerable yearly variation in their average numbers. No significant difference was found between trends in the different areas (Table 23).

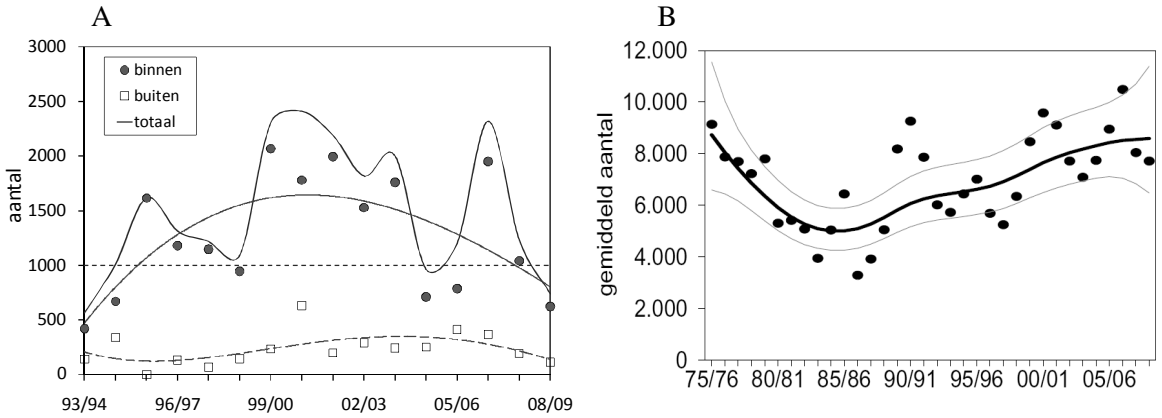

Figure 21. Average seasonal number of Shovelers (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 23. Results of GLM analysis of effects of time and area on average seasonal Shoveler numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-48.889	11.5200	18.010	1	.000	.000
Marsh area	41.641	40.6939	1.047	1	.306	1.215E18
Dry area	-6.101	53.7410	.013	1	.910	.002
Country	0	.	.	.	.	1
Year	.029	.0058	25.020	1	.000	1.029
Marsh area * Year	-.022	.0203	1.127	1	.288	.979
Dry area * Year	.001	.0268	.003	1	.958	1.001
Country * Year	0	.	.	.	.	1
(Scale)	293918.533	59995.8693				

Eurasian Coot – Meerkoet

Although Coots breed in our country, highest numbers are encountered in winter. Wintering Coots forage in ponds and lakes or on grassy shores or pastures near water. Average numbers in the OVP are low.

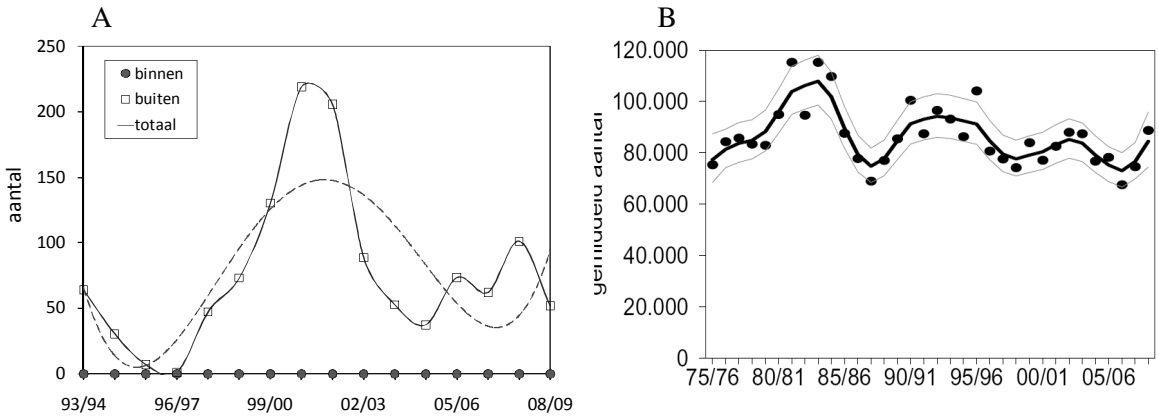

Figure 22. Average seasonal number of Coots (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 24. Results of GLM analysis of effects of time and area on average seasonal Coot numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	32.214	11.2855	8.148	1	.004	9.780E13
Marsh area	-18.749	.	.	.	.	.000
Dry area	-76.264	42.7710	3.179	1	.075	.000
Country	0	.	.	.	.	1
Year	-.010	.0056	3.428	1	.064	.990
Marsh area * Year	.000	.0001	.103	1	.748	1.000
Dry area * Year	.035	.0213	2.636	1	.104	1.035
Country * Year	0	.	.	.	.	1
(Scale)	1.904E7	3.8872E6				

Little Grebe – Dodaars

The Little Grebe is a breeding, wintering and migratory bird in The Netherlands. Numbers of Little Grebes have been increasing nationwide and in the OVP since the mid nineties (Figure 23), which probably is an effect of a series of mild winters. Average numbers seem to have increased steeper in the OVP than in the whole of the country (Table 25), but the reason for this is unclear.

Figure 23. Number of breeding pairs of Little Grebes in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 25. Results of GLM analysis of effects of time and area on Little Grebes breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-323.112	51.8326	38.860	1	.000	.000
[area=Country]	230.132	53.7151	18.355	1	.000	8.815E99
[area=OVP]	0	.	.	.	.	1
Year	.164	.0259	40.030	1	.000	1.178
[area=Country] * Year	-.115	.0268	18.332	1	.000	.891
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	1079.211	261.7472				

Waders

The waders are represented by the Avocet and the Black-tailed Godwit. Avocets use shallow water and mud to forage. Although Black-tailed Godwits breed in (agricultural) grasslands they use wetlands during migration and winter.

Avocet – Kluut

Avocets breed in bare sandy areas near water and feed on invertebrates in shallow water. National numbers have been fairly stable since the mid nineties and numbers in the OVP have been fluctuating greatly (Figure 24). On average the OVP-trend has been lower than the national trend (Table 26). This is the effect of some exceptional years with high numbers. Avocets profit from pioneer stages when bare surfaces are available for breeding. Water levels may be too high now to enable foraging. These factors also determine breeding numbers which have decreased steeply in the OVP (Figure 25, Table 27).

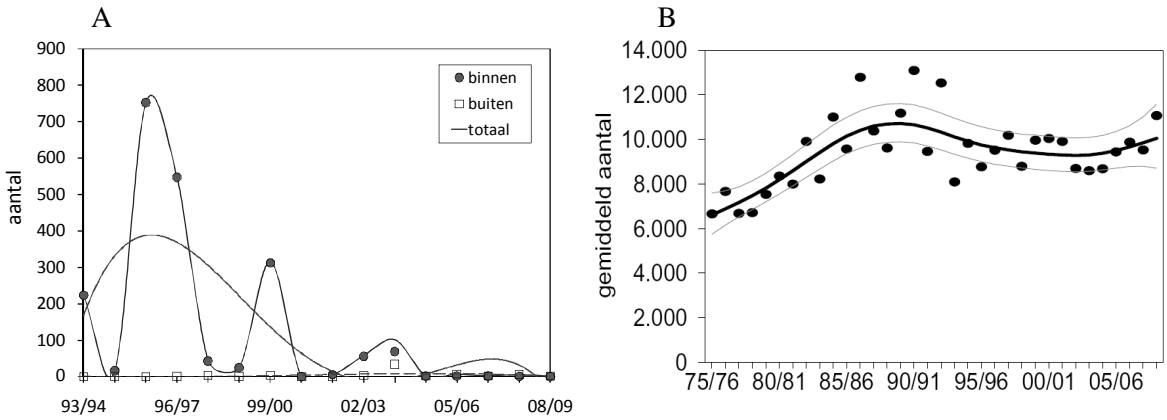

Figure 24. Average seasonal number of Avocets (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 26. Results of GLM analysis of effects of time and area on average seasonal Avocet numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

Parameter	B	Std. Error	Hypothesis Test			Exp(B)
			Wald Chi-Square	df	Sig.	
(Intercept)	-8.535	9.3894	.826	1	.363	.000
Marsh area	342.173	86.2327	15.745	1	.000	4.015E148
Dry area	-153.673	60.7490	6.399	1	.011	.000
Country	0[c]	.	.	.	.	1
Year	.009	.0047	3.546	1	.060	1.009
Marsh area * Year	-.173	.0431	16.139	1	.000	.841
Dry area * Year	.073	.0303	5.799	1	.016	1.076
Country * Year	0[c]	.	.	.	.	1
(Scale)	185230.486[d]	37810.0147				

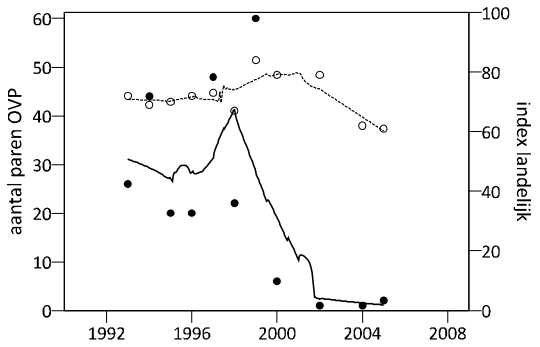

Figure 25. Number of breeding pairs of Avocets in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 27. Results of GLM analysis of effects of time and area on Avocet breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

Parameter	B	Std. Error	Hypothesis Test			Exp(B)
			Wald Chi-Square	df	Sig.	
(Intercept)	213.294	89.3756	5.695	1	.017	4.292E92
[area=Country]	-152.360	89.8660	2.874	1	.090	.000
[area=OVP]	0	.	.	.	.	1
Year	-.105	.0448	5.509	1	.019	.900
[area=Country] * Year	.077	.0451	2.908	1	.088	1.080
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	148.866	38.4371				

Black-tailed Godwit – Grutto

Migrating Black-tailed Godwits depend on shallow water or mud to feed. Average national numbers of non-breeding birds have been decreasing since the early nineties and a similar decrease has been visible in the OVP (Figure 26). Numbers in the OVP are very erratic and probably depend mainly on the water level.

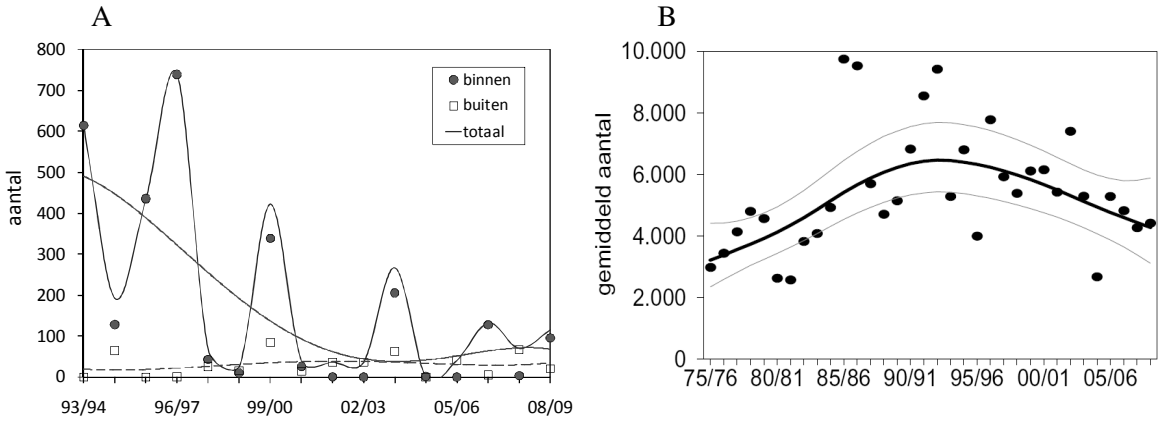

Figure 26. Average seasonal number of Black-tailed Godwits (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 28. Results of GLM analysis of effects of time and area on average seasonal Black-tailed Godwit numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	41.194	21.1777	3.784	1	.052	7.766E17
Marsh area	376.143	131.2652	8.211	1	.004	2.273E163
Dry area	-98.998	89.8881	1.213	1	.271	.000
Country	0	.	.	.	.	1
Year	-.016	.0106	2.376	1	.123	.984
Marsh area * Year	-.190	.0658	8.328	1	.004	.827
Dry area * Year	.047	.0449	1.091	1	.296	1.048
Country * Year	0	.	.	.	.	1
(Scale)	434778.144	88748.7170				

Grassland foragers

The category of grassland foragers contains birds feeding on invertebrates in grassy areas. When not feeding they may revert to different habitats, such as shallow water.

Eurasian Golden Plover – Goudplevier

Golden Plovers are wintering and migratory birds in The Netherlands. Outside of the breeding season they feed on buried invertebrates in grasslands. Numbers in the OVP have increased steeper than the national trend (Figure 27, Table 29). This species likely profits from the increased grazing intensity in the dry area, increasing the area of suitable feeding habitat.

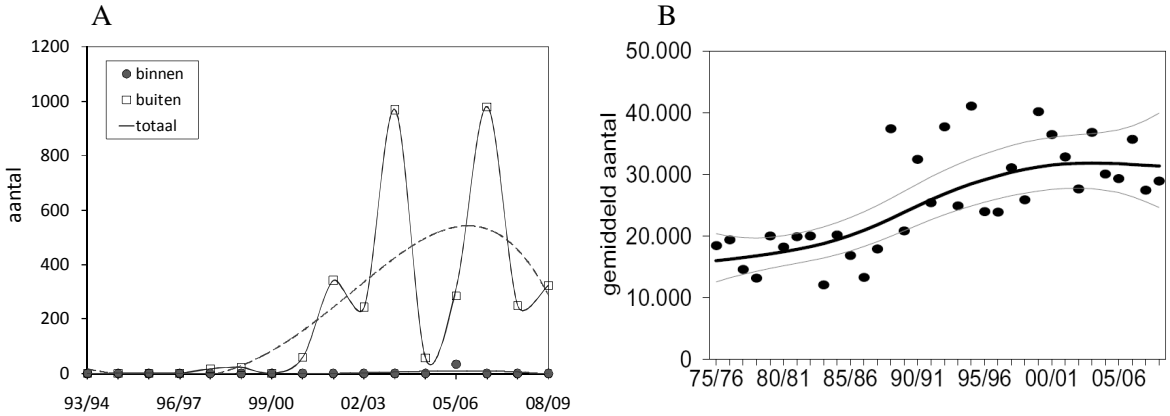

Figure 27. Average seasonal number of Golden Plovers (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 29. Results of GLM analysis of effects of time and area on average seasonal Golden Plover numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	6.253	19.0084	.108	1	.742	519.660
Marsh area	-276.701	91.3237	9.180	1	.002	.000
Dry area	-278.661	78.0537	12.746	1	.000	.000
Country	0	.	.	.	.	1
Year	.002	.0095	.046	1	.830	1.002
Marsh area * Year	.133	.0457	8.543	1	.003	1.143
Dry area * Year	.137	.0389	12.333	1	.000	1.147
Country * Year	0	.	.	.	.	1
(Scale)	9.513E6	1.9418E6				

Lapwing – Kievit

Lapwings are breeding, wintering and migratory birds in The Netherlands. Lapwings feed on invertebrates in short grasslands and usually roost in or near shallow water. The trend in the dry area of the OVP is more positive than the national trend which may be due to the increased grazing intensity and the subsequent increase of suitable short grass feeding habitat.

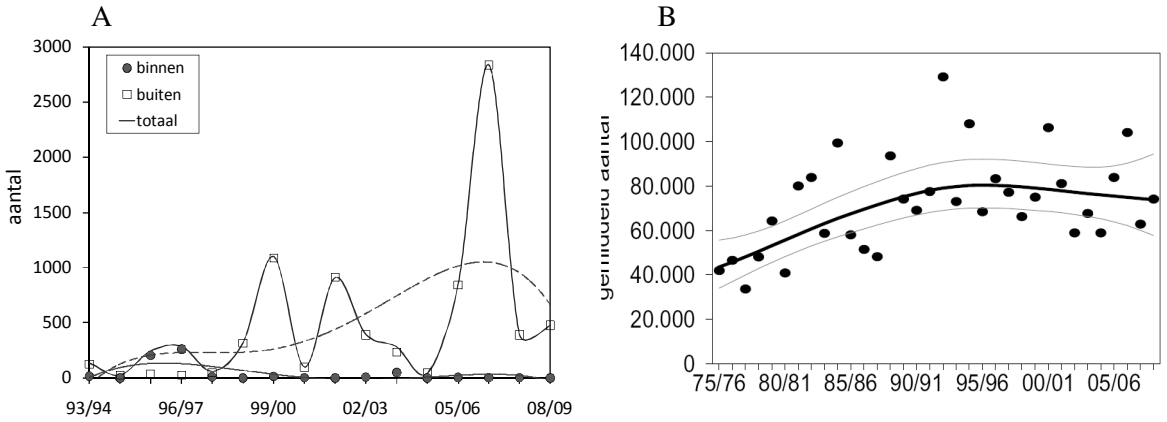

Figure 28. Average seasonal number of Lapwings (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 30. Results of GLM analysis of effects of time and area on average seasonal Lapwing numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	26.999	21.0597	1.644	1	.200	5.314E11
Marsh area	265.220	105.4177	6.330	1	.012	1.525E115
Dry area	-260.015	101.8339	6.519	1	.011	.000
Country	0	.	.	.	.	1
Year	-.008	.0105	.558	1	.455	.992
Marsh area * Year	-.136	.0527	6.711	1	.010	.872
Dry area * Year	.127	.0509	6.259	1	.012	1.136
Country * Year	0	.	.	.	.	1
(Scale)	7.489E7	1.5287E7				

Ruff – Kemphaan

Ruffs use our country during migration. Breeding birds have virtually disappeared, but staging numbers show a steep decline as well (Figure 29). Ruffs appear only in small and also decreasing numbers in the OVP.

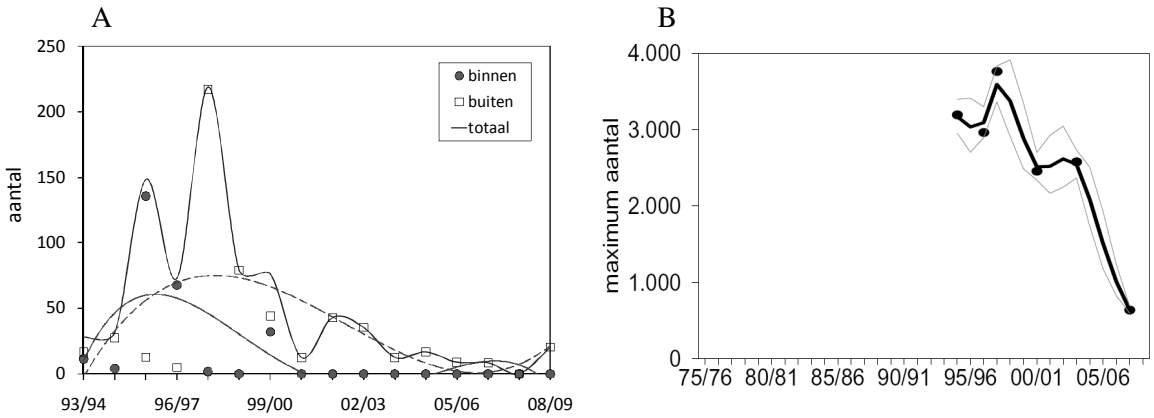

Figure 29. Average seasonal number of Ruffs (July-June) in **A)** OVP and **B)** Netherlands (with 95% confidence interval). OVP-numbers are shown separately for dry ('buitenkaads') area and marsh area ('binnenkaads). Total number is depicted by the red line. Where appropriate the lower permissible threshold is shown by a red broken line.

Table 31. Results of GLM analysis of effects of time and area on average seasonal Ruff assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	123.392	57.9243	4.538	1	.033	3.877E53
Marsh area	221.970	119.5804	3.446	1	.063	2.514E96
Dry area	0	.	.	.	.	1
Year	-.060	.0289	4.309	1	.038	.942
Marsh area * Year	-.111	.0597	3.482	1	.062	.895
Dry area * Year	0	.	.	.	.	1
(Scale)	1731.817	432.9542				

Winchat – Paapje

Winchats breed in areas with shrub vegetation. They have almost disappeared from the OVP (2 in 2007, Bijlsma 2008). In that, they follow the national trend.

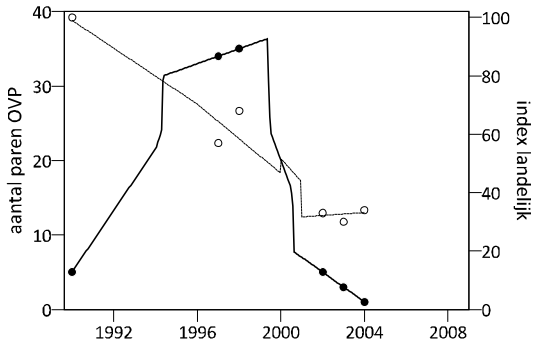

Figure 30. Number of breeding pairs of Whinchats in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 32. Results of GLM analysis of effects of time and area on average seasonal Whinchat numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	66.646	75.6601	.776	1	.378	8.791E28
[area=Country]	71.180	76.6766	.862	1	.353	8.188E30
[area=OVP]	0	.	.	.	.	1
Year	-.032	.0378	.716	1	.397	.968
[area=Country] * Year	-.035	.0383	.830	1	.362	.966
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	84.569	23.9198				

Reed birds

The reed birds are categorised by their breeding habitat.

Hen Harrier – Blauwe Kiekendief

Hen Harriers are breeding and wintering birds in The Netherlands. Breeding numbers have been decreasing the last two decades both nationwide as well as in the OVP (Figure 31). The decrease is steeper in the OVP than the national trend, but this is probably not the case when analysed for the period from 1995 (Table 33). The Wadden Islands used to be the stronghold for Hen Harriers but also there numbers have declined greatly. The decline is probably related to habitat changes such as new growth of shrubs and bushes due to succession.

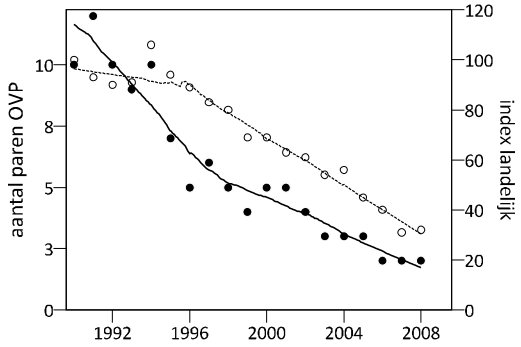

Figure 31. Number of breeding pairs of Hen Harriers in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 33. Results of GLM analysis of effects of time and area on Hen Harrier breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	194.483	15.5514	156.396	1	.000	2.903E84
[area=Country]	-85.030	18.3894	21.380	1	.000	.000
[area=OVP]	0	.	.	.	.	1
Year	-.096	.0078	153.593	1	.000	.908
[area=Country] * Year	.044	.0092	22.687	1	.000	1.045
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	33.769	7.6471				

Marsh Harrier – Bruine Kiekendief

Marsh Harriers are breeding birds in our region. In winter they migrate to southern Europe and Africa. The species breeds in reed beds and feeds on young and adult birds and other vertebrate prey. The trend of breeding pairs in the OVP follows the national trend (Figure 32, Table 34). Also the recent decline in national numbers is tracked by the OVP-birds.

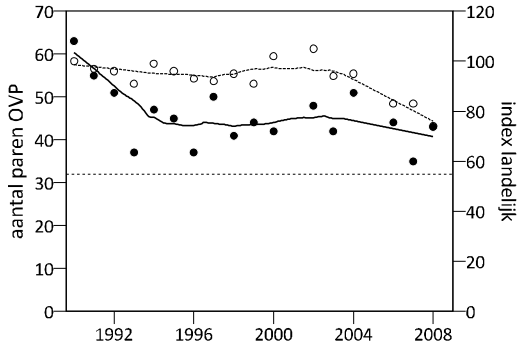

Figure 32. Number of breeding pairs of Marsh Harriers in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 34. Results of GLM analysis of effects of time and area on Marsh Harrier breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	25.226	12.9551	3.792	1	.052	9.025E10
[area=Country]	-5.482	14.1062	.151	1	.698	.004
[area=OVP]	0	.	.	.	.	1
Year	-.011	.0065	2.734	1	.098	.989
[area=Country] * Year	.003	.0071	.193	1	.660	1.003
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	39.312	9.1399				

Bearded Tit – Baardman

Bearded Tits breed and winter in reed beds in The Netherlands. They feed on seeds in winter and on invertebrate prey during the rest of the year. They have decreased in number since 1992 (Figure 33, Table 35). Recent numbers are not (yet) available. The OVP is the most important area for this species nationally and a national trend cannot be calculated without figures from the OVP. Data from several other areas are also incomplete (van Dijk *et al.* 2010). Their abundance depends on the available area of reed beds. They have a preference for a mixture of young and old reed beds.

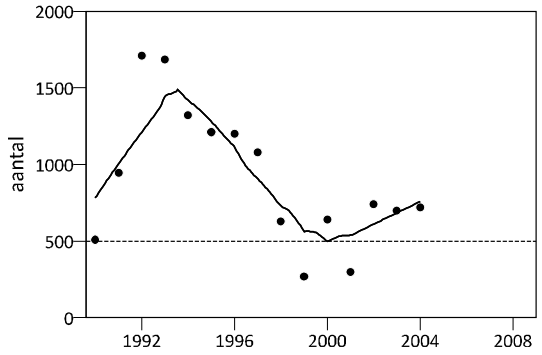

Figure 33. Number of breeding pairs of Bearded Tits in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 35. Results of GLM analysis of effects of time and area on Bearded Tit breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	111.814	50.9641	4.814	1	.028	3.631E48
[area=OVP]	0	.	.	.	.	1
Year	-.053	.0255	4.251	1	.039	.949
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	139922.405	51092.4384				

Bluethroat – Blauwborst

The Bluethroat is a migratory bird breeding in bushy and reed habitat in the OVP. Recent numbers of breeding pairs in The Netherlands and the OVP are not yet available. The trend until 2004 was negative in the OVP and positive nationwide (Figure 34, Table 36). The decline in numbers may be an effect of grazing and trampling by large grazers through which reed beds in the dry area have become fragmented, or may be due to the disappearance of bushy areas and drying out of wet areas (Bijlsma 2008).

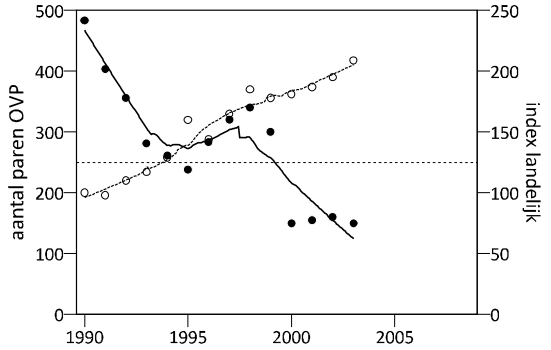

Figure 34. Number of breeding pairs of Bluethroats in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 36. Results of GLM analysis of effects of time and area on Bluethroat breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	64.807	30.2029	4.604	1	.032	1.398E28
[area=Country]	-135.509	32.1162	17.803	1	.000	.000
[area=OVP]	0	.	.	.	.	1
Year	-.030	.0151	3.847	1	.050	.971
[area=Country] * Year	.068	.0161	17.661	1	.000	1.070
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	3330.066	784.9040				

Spotted Crake – Porseleinhoen

For the Spotted Crake no national trend is available. The species is notoriously difficult to monitor, and recent numbers from the OVP are not yet made available (Figure 35). The birds depend on reed habitat with shallow water. Spotted Crakes have disappeared as breeding bird from the dry area (Bijlsma 2008).

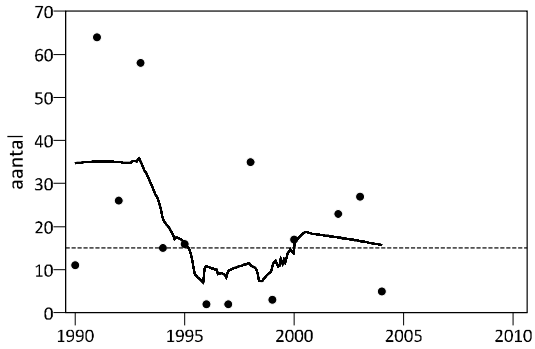

Figure 35. Number of breeding pairs of Spotted Crakes in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Sedge Warbler – Rietzanger

Sedge Warblers breed in the OVP and migrate to Africa to winter. The national trend for Sedge Warblers has been positive until 2004. In the OVP there has been a decline in numbers during 2002-04 (Figure 36, Table 37). Its abundance is dependent on the availability of reed beds with or without bushes. Numbers may also be affected by weather conditions and habitat availability in the African winter quarters.

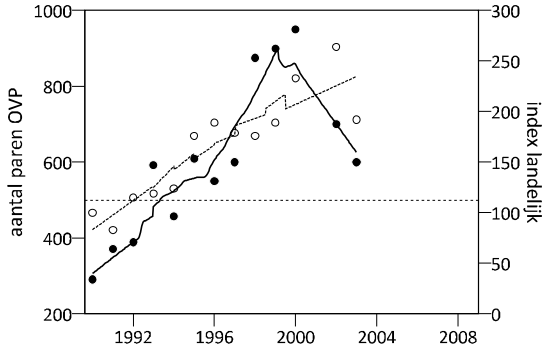

Figure 36. Number of breeding pairs of Sedge Warblers in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 37. Results of GLM analysis of effects of time and area on Sedge Warbler breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-84.442	29.8798	7.987	1	.005	.000
[area=Country]	-.675	31.5769	.000	1	.983	.509
[area=OVP]	0	.	.	.	.	1
Year	.045	.0150	9.180	1	.002	1.047
[area=Country] * Year	.000	.0158	.000	1	.986	1.000
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	18354.916	4326.2951				

Savi's Warbler – Snor

Savi's Warbler is a migratory breeding bird. It breeds in mainly old marsh vegetation. The trend in breeding numbers in the OVP follows that of the country (Figure 37, Table 38). Recent numbers are not yet available.

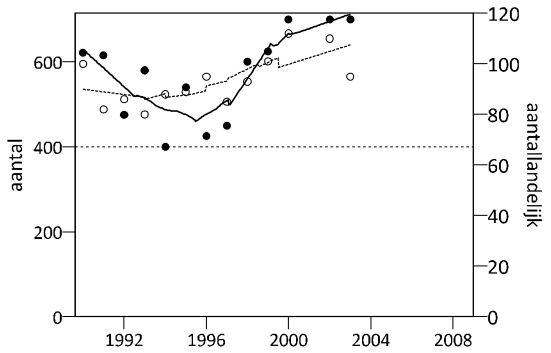

Figure 37. Number of breeding pairs of Savi's Warblers in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 38. Results of GLM analysis of effects of time and area on Savi's Warbler breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-38.588	11.4648	11.328	1	.001	.000
[area=Country]	18.834	13.0774	2.074	1	.150	1.512E8
[area=OVP]	0	.	.	.	.	1
Year	.023	.0057	15.372	1	.000	1.023
[area=Country] * Year	-.010	.0065	2.495	1	.114	.990
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	2960.163	707.6142				

Great Bittern – Roerdomp

Great Bitterns are year-round present. They breed and feed in reed beds. No national trend is available for this species. Numbers are affected by the available area with reeds and also by cold spells during winter. Numbers in the OVP have been declining from 2003.

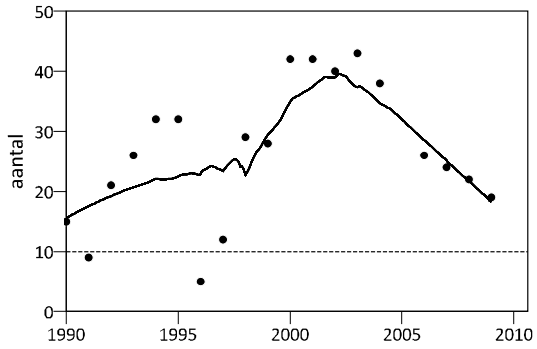

Figure 38. Number of breeding pairs of Bitterns in the OVP. Lines are fitted to lead the eye.

Little Bittern – Woudaap

Little Bitterns are summer visitors, wintering in sub-Saharan Africa. Numbers in the OVP are small, as are numbers in the whole country – 16 territories in 2008. Numbers are affected by availability of suitable habitat and amount of precipitation in the Sahel zone. Recent numbers are not yet available.

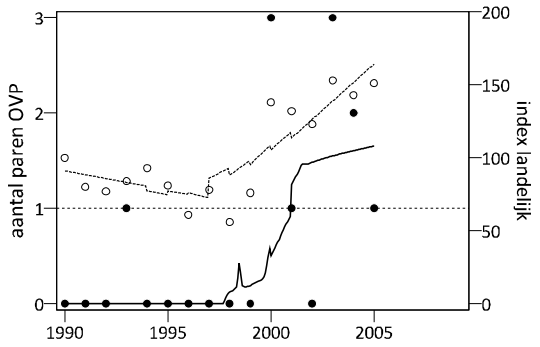

Figure 39. Number of breeding pairs of Little Bitterns in the OVP (left axis: black dots) and nationwide index (right axis: open dots). Lines are fitted to lead the eye.

Table 39. Results of GLM analysis of effects of time and area on Little Bittern breeding pair numbers assuming normally distributed residuals and a log-link. B is the coefficient estimate; Exp(B) equals e^B. When Exp(B) is lower or higher than 1, population growth rate is, respectively, negative or positive. B equals 0 for factor values serving as reference.

			Hypothesis Test			
Parameter	B	Std. Error	Wald Chi-Square	df	Sig.	Exp(B)
(Intercept)	-346.730	117.8953	8.649	1	.003	.000
[area=Country]	236.841	119.3595	3.937	1	.047	7.224E102
[area=OVP]	0	.	.	.	.	1
Year	.173	.0589	8.655	1	.003	1.189
[area=Country] * Year	-.116	.0596	3.786	1	.052	.891
[area=OVP] * Year	0	.	.	.	.	1
(Scale)	241.865	57.8167				

Acknowledgements

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