The recent decline in the population of Black-headed Gulls *Larus ridibundus* in Denmark and its plausible causes

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(Med et dansk resumé: Den nylige nedgang i bestanden af Hættemåge Larus ridibundus *i Danmark og mulige årsager hertil)*

Introduction

The population of Black-headed Gull *Larus ridibundus* increased markedly in most of western Europe in the 20th century due to climatic amelioration, reduced persecution and better food availability (Snow & Perrins 1998). The Danish Black-headed Gull population was estimated at 250000 pairs in the 1940s (Spärck 1942) and probably peaked with more than 300000 pairs in the 1950s (see Møller 1978). In 1974, however, the population was estimated at only 210000 by Møller (1978) who thought that the decrease was related to egg collecting, competition from Herring Gulls *L. argentatus*, increasing use of pesticides, predation by rats *Rattus norvegicus*, and hunting. The last published survey of breeding Black-headed Gulls in Denmark found 210000-230000 breeding pairs in 1988 (Christensen 1990). Declines are likewise indicated in the breeding populations of the neighbouring countries Sweden (Källander 1996b), Finland (Asbirk et al. 1997) and Latvia (Viksne et al. 1996), whereas the population is stable in Norway (Asbirk et al. 1997) and increases in the Wadden Sea (Fleet et al. 1994).

A further decrease in the Danish population has taken place since the mid-1980s (Grell 1998, this study) and the species is now considered to require special attention (Stoltze & Pihl 1998). However, an accurate estimate of the current population is lacking and the trends have not been described in detail since the account by Møller (1978). Here I present an overview of current status and trend of the Danish breeding population of Black-headed Gulls for the period 1977-1998. I examine possible patterns of similarities and dissimilarities between different regions and between coastal and inland colonies and discuss the possible causes of the general decline.

Methods

The study was based on available information on numbers of breeding Black-headed Gulls in all Danish colonies during 1977-1998, using the following sources: the Gull and Tern group of the Danish Ornithological Society (DOF) (J.O. Christensen unpubl.); DOF's recent Atlas survey *Fuglenes Danmark* (Grell 1998); the National Forest and Nature Agency, who manages most

nature reserves in Denmark; reports from counties and the National Environmental Research Institute; and bird reports from regional sections of DOF. In addition, people with knowledge of local and regional breeding numbers were contacted personally for information, and so were all regional sections of DOF. Requests for information were also published in the birding magazine *DOF-Nyt* of the Danish Ornithological Society.

Table 1. The change between 1988 and 1998 in numbers of breeding pairs of Black-headed Gulls in Denmark for each county. T total, I inland colonies, C coastal colonies. *Ændringen imellem 1988 og 1998 i antallet af ynglepar af Hættemåge i Danmark for hvert amt. T totalt, I indlandskolonier, C kystnære kolonier.*

County *Amt*		1988	1998	%
Nordjylland	T	66000	30900	-53
	I	1000	1000	0
	C	65000	29900	-54
Viborg	T	11100	7750	-30
	I	2000	2800	40
	C	9100	4950	-46
Ringkøbing	T	37500	10100	-73
	I	2550	1400	-45
	C	35000	8700	-75
Århus	T	9750	3850	-61
	I	6600	2500	-62
	C	3200	1350	-58
Vejle	T	7800	4600	-41
	I	1800	1350	-25
	C	6000	3250	-46
Ribe	T	4000	11000	175
	I	2000	500	-75
	C	2060	10500	410
Sønderjylland	T	4750	1700	-64
	I	1400	1000	-29
	C	3350	700	-79
Fyn	T	18700	9050	-52
	I	700	250	-64
	C	18000	8800	-51
Vestsjælland	T	9550	9400	-2
	I	4750	2000	-58
	C	4800	7400	54
Hovedstadsområdet	T	23550	12900	-45
	I	7950	3500	-56
	C	15600	9400	-40
Storstrøm	T	21750	9800	-55
	I	5350	5600	5
	C	16400	4200	-74
Bornholm	T	150	18	-88
	I	150	18	-88
	C	0	0	
Total	T	214600	110818	-48
	I	36250	21918	-40
	C	178510	88900	-50

Data were collected from all regularly counted localities and regions (10 inland and 33 coastal colonies). Also available were five estimates of the total number of pairs in certain fjords and bird sanctuaries) (Appendix 1). Interpolated values were used for sites and years where information was missing (15% of all entries) except that for 1978 and 1997 numbers from 1977 and 1998, respectively, were used instead. All counts and estimates from a year were summed and converted to an index so that 1988, when a detailed census (sum of mean of estimates for each county; J.O. Christensen unpubl.) resulted in an estimated 214600 breeding pairs, was given an index value of 100.

The breeding population in 1998 was estimated as above but included additional colonies from where estimates were available. The latest estimate for each colony was used for colonies not counted in 1998. The sum of all estimates of coastal and inland colonies, respectively, is presented as a total for Denmark as well as for each county and compared with the corresponding 1988-estimates by the Gull and Tern Group (J.O. Christensen unpubl.).

The collected information is useful when describing the overall trend and the status of the population. The two national Atlas surveys on breeding birds, conducted in 1971-1974 (Dybbro 1976) and 1993-1996 (Grell 1998), were also included. I assume that these surveys covered all parts of Denmark well and therefore provide good data on the presence of breeding Black-headed Gulls in coastal and inland colonies, and in the different regions. The Atlas surveys recorded presence or absence of the species in 5×5 km squares, and in order to assign records to the coastal and inland categories, I considered all Atlas squares crossing a coastline as being coastal and all others as inland. The distance from the centre of each Atlas square to the nearest coastline was measured in order to see if there was any difference in the distance from the coast between squares with presence of Black-headed Gulls in the 1970s only, in the 1990s only, and in both periods, i.e., to see if there was any pattern in the areas recently occupied by Black-headed Gulls as opposed to areas deserted.

The difference between coast and inland in median proportional decrease in number and distribution per county was tested using the Mann-Whitney U-test (U), excluding the county of Bornholm due to the few colonies there. The trend in the 1977-1998 index was tested with Spearman Rank

Table 2. The 10 largest Black-headed Gull colonies in Denmark in 1988 (Christensen 1990) and 1998 (this study). (I) indicates inland colonies.
De 10 største kolonier af Hættemåge i Danmark i 1988 (Christensen 1990) og 1998 (denne undersøgelse). (I) indikerer indlandskolonier.

1988		1998	
Colony *Koloni*	Pairs *Par*	Colony *Koloni*	Pairs *Par*
Klosterholm	30000	Fruens Holm	12000
Hirsholmene	20000	Treskelbakkeholm	9392
Højsand	11-13000	Fjandø	8800
Sandøen	11400	Hirsholmene	6292
Fruens Holm	10000	Langli	6252
Vejlerne	6200	Ringøen	4750
Storeholm	6000	Vejlerne	3720
Utterslev Mose (I)	5-8000	Skalø/Vigelsø	3400
Ringøen	5000	Nielstrup Sø (I)	3000
Klægbanken	4700	Uttêrslev Mose (I)	2954
Sum	109300-114300	Sum	60560

test (r_S), and the cumulative frequency distribution on a distance gradient away from the coast was tested with Kolmogorov-Smirnov two-sample test (D) (Sokal & Rohlf 1995). All tests were two-tailed.

Results

The Danish breeding population of Black-headed Gulls increased slightly from 1977 to the mid-1980s and then decreased markedly, reaching a level of about 50% of the 1977 population in the mid-1990s (Fig.1, Appendix 1). Overall, the population decrease from 1977 to 1998 was significant (n=22; r_S=-0.67; p=0.0006).

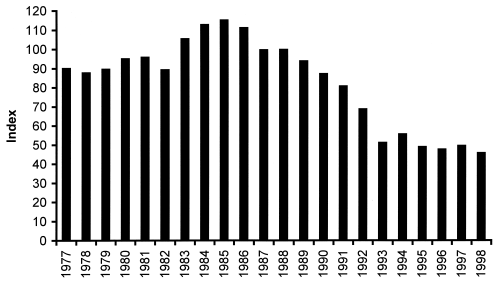

Fig. 1. Index for the Danish breeding population of Black-headed Gulls during 1977-1998 (1988 = 100). See also Appendix 1.
Indeks for den danske ynglebestand af Hættemåger i 1977-1998 (1988 = 100). Se også Appendix 1.

The 1998-population was also estimated by adding the estimated sum for each county (Table 1), which gave approximately 111000 breeding pairs, i.e., slightly more than the estimate from the index method (approximately 100000). Considering the difficulties in obtaining information on breeding numbers at an unknown number of small colonies, the Danish population in 1998 was estimated to be 110000-125000 breeding pairs.

The decrease from 1988 to 1998 occurred in all regions of Denmark (Table 1) with the exception of Ribe County. About 100000 pairs were lost from the population in the period. The proportion of the entire population breeding in coastal colonies was almost unchanged from 1988 (83%) to 1998 (80%). The proportional decrease within the counties was slightly but not significantly higher at coastal sites than inland (n=11; U=53; p=0.65).

The total number of breeding pairs in the 10 largest colonies, which are almost all at the coast, decreased by about 46% from 1988 (Christensen 1990) to 1998 (this study) (Table 2). Slightly more than half of the total population bred in the 10 largest colonies in both years.

The number of Atlas squares with Black-headed Gulls decreased from the early 1970s to the mid 1990s, except for the coastal parts of Ribe County (Table 3). Relatively, the decrease was stronger for inland squares than for coastal squares (n=11; U=29; p=0.04), but there was no significant difference in cumulative frequency distribution along a distance gradient away from the coast or between

any of the three combinations of squares with Black-headed Gulls present in 1971-1974 only (a), in 1993-1996 only (b), or in both Atlas surveys (c) ($D_{a,b}$=0.110<$D_{.05}$=0.195, n.s.; $D_{a,c}$=0.126<$D_{.05}$= 0.165, n.s.; $D_{b,c}$=0.041<$D_{.05}$=0.207, n.s.).

Table 3. The number of squares (5×5 km) with breeding Black-headed Gulls in two Danish Atlas surveys. From Grell (1998). T total, I inland colonies, C coastal colonies. *Antallet af kvadrater (5×5 km) med ynglende Hættemåger i to danske Atlas-undersøgelser. Fra Grell (1998). T totalt, I indlandskolonier, C kystnære kolonier.*

County *Amt*		1971-74	1993-96	%
Nordjylland	T	85	60	-29
	I	41	26	-37
	C	44	34	-23
Viborg	T	94	61	-35
	I	48	27	-44
	C	46	34	-26
Ringkøbing	T	68	32	-53
	I	40	15	-63
	C	28	17	-39
Århus	T	53	44	-17
	I	33	29	-12
	C	20	15	-25
Vejle	T	29	12	-59
	I	22	10	-55
	C	7	2	-71
Ribe	T	38	27	-29
	I	31	17	-45
	C	7	10	43
Sønderjylland	T	38	20	-47
	I	21	7	-67
	C	17	13	-24
Fyn	T	75	50	-33
	I	14	5	-64
	C	61	45	-26
Vestsjælland	T	59	34	-42
	I	28	15	-46
	C	31	19	-39
Hovedstadsområdet	T	38	40	5
	I	11	11	0
	C	27	29	7
Storstrøm	T	61	36	-41
	I	14	6	-57
	C	47	30	-36
Bornholm	T	2	2	0
	I	1	0	-100
	C	1	2	100
Total	T	640	418	-35
	I	304	170	-44
	C	336	248	-26

Discussion

The Danish breeding population of Black-headed Gulls decreased steadily from the mid 1980s to the mid 1990s with a mean annual decrease of about 6.6% (Fig. 1). The population peaked at about 250000 pairs in 1985 and reached an apparently stable level at about 100000 in the mid 1990s. The decrease seems to have occurred a decade later in Denmark than in Sweden (Källander 1996b) but concurrent with the decrease in Latvia (Viksne et al. 1996).

It is often difficult to estimate the number of pairs in a colony (Källander 1997), and the counts included in this study are of highly varying quality, ranging from rough estimates during single visits by inexperienced birdwatchers to careful counts by professionals. There is no indication, however, that the character and average quality of counts changed during the study period, so the estimates should still be comparable. The use of interpolated figures to fill gaps in the data probably smoothed the population curve artificially, so the annual fluctuations of the population probably are more pronounced than indicated. But the trend obtained from the resulting indices, covering 70% of all Danish breeding pairs in 1988, is probably fairly accurate.

The decrease from 1988 to 1998 was almost uniform throughout the country (Table 1). The one exception was Ribe County, showing a considerable increase from about 4000 to about 10500 breeding pairs, mainly due to the increase at one coastal breeding site, the island of Langli. This island was recolonised in the early 1990s, and the population growth since then was probably due to an absence of mammalian predators (Laursen 1999) and to an increase in the abundance of polychaetes in the Wadden Sea (Fleet et al. 1994).

The increases indicated at coastal sites in Vestsjælland County and inland sites in Viborg County (Table 1) were caused by the establishment of one and two new colonies, respectively.

The decrease in the number of Atlas squares with breeding Black-headed Gulls was larger inland than at the coast. This is in accordance with a reduction from 100000 breeding pairs at inland sites (48% of all pairs) in the 1970s (Møller 1978) to about 22000 (20%) in 1998 (this study). The coastal zone, the width of which was determined by the size of the Atlas squares, holds about 60% of all squares with Black-headed Gulls. A biological definition of the coastal zone would be preferable, but since the foraging range of Black-

Table 4. Overview of possible causes for the decrease of the Danish population of Black-headed Gulls. Assessment of the character of the influence (L local, G general) and whether recent changes in the parameter should increase (↑) or reduce (↓) the population. The last column summarises the author's opinion of the probability that each of the parameters caused the observed decrease. See text for discussion.
Oversigt over mulige forklaringer på nedgangen i den danske bestand af Hættemåge, med en vurdering af hvorvidt betydningen af parameteren er lokal (L) eller generel (G), og om nylige ændringer af parameteren skulle bevirke en fremgang (↑) eller en tilbagegang (↓) i bestanden. Sidste søjle sammenfatter forfatterens konklusion vedrørende sandsynligheden for, at den pågældende parameter har forårsaget den observerede nedgang.

Parameter *Parameter*		Area *Område*	Influence *Betydning*	Probability *Sandsynlighed*
Adult mortality	Food availability *Fødetilgængelighed*	G	↓	-
Voksendødelighed	Weather *Vejr*	G	?	?
	Pesticides *Gifte*	G	?	?
	Diseases *Sygdomme*	L	↓	-
	Hunting *Jagt*	G	↑	-
Immigration/emigration				
Ind- og udvandring		L	?	-
Breeding success	Food availability *Fødetilgængelighed*	G	↓	+
Ynglesucces	Reduction of wetlands *Færre vådområder*	G	↓	+
	Choice of crops *Afgrøder*	G	?	?
	Pesticides *Gifte*	G	?	?
	Weather *Vejr*	G	?	?
	Competition *Konkurrence*			
	Breeding site *Yngleplads*	G	↓	-
	Food *Føde*	G	↓	?
	Predation *Prædation*	L	↓	-
	Diseases *Sygdomme*	L	↓	-
	Egg collecting *Ægindsamling*	L	↑	-
	Protection of colonies *Kolonibeskyttelse*	G	↑	-

headed Gulls, although mostly within 12-15 km (Brandl & Gorke 1988), may exceed 70 km in extreme situations (Viksne et al. 1996), the entire country could be regarded as coastal.

The population decline remains unexplained

Detection of a population decrease leads to a search for causality. A decrease in a population can occur if the mortality of adult birds increases, if the breeding success decreases, if the immigration/emigration ratio decreases, or as a result of a combination of these factors (Table 4).

Given that Black-headed Gulls are generalist feeders (Snow & Perrins 1998) and forage at a large variety of habitats, it seems unlikely that the population decreased because adults were unable to find sufficient food to survive. Ryttman (1998) found no changes in the mortality of adult Black-headed Gulls in Sweden since the 1920s. And even though local populations of Black-headed Gulls are often characterised by tremendous fluctuations (Johst & Brandl 1997), a changed immigration/ emigration ratio is an improbable explanation of the country-wide population decrease, since that would imply that half of the Danish population had emigrated.

Källander (1996a) and Petersen & Jacobsen (1997) suggested that the population decrease of the Black-headed Gull was caused by a lower breeding success, a sensitive indicator of environmental change (Exo et al. 1996). A reduction of wetlands, or a change in the choice of crops or in the chemical and mechanical treatment of farmland, may reduce either the amount or the availability of food which, in turn, may impair fitness, breeding success and lifetime reproduction (Newton 1998). It has been suggested that the general change towards larger areas with winter crops has reduced the feeding possibilities of Black-headed Gulls in farmland (Petersen & Jacobsen 1997).

Changes in weather patterns can influence birds either immediately or indirectly by affecting their habitats and food supplies (Newton 1998). However, although the trend in numbers of foraging Black-headed Gulls in farmland was best correlated with variation in spring precipitation in a study of farmland birds during the breeding season, reduced rainfall can not be responsible for the actual population decline (Petersen & Jacobsen 1997).

Black-headed Gulls are subdominant in competition with Herring Gulls for food (Källander 1996a) and breeding sites (e.g. Møller 1978, Meltofte & Fjeldså 1989), but an effect at the level of the entire Danish population appears highly unlikely. Predators, both avian and mammalian, may seriously affect egg and chick survival (Bensch et al. 1996a, Bensch et al. 1996b, Cramp & Simmons 1983, Viksne et al. 1996, Nielsen & Drachmann 1999), but any impact on Black-headed Gull populations would be local, not countrywide. The same argument applies to egg collecting (Dybbro 1972), disease (Ellemann 1959, Nielsen 1960, Gophen et al. 1991), and decreasing numbers of mink farms and open rubbish dumps (see Christensen 1990).

Egg collecting (until 1982; L.R. Nielsen in litt.) and hunting (until 1993; Clausager 1995) of Black-headed Gulls are now legally prohibited, and the protection of the breeding sites is probably better than ever before. Changes in these factors, hence, should have led to an increase, not a decrease, of the population.

All in all, an obvious explanation for the recent decline is lacking, and most of the mentioned hypotheses are somewhat speculative. The general decrease calls for a general explanation; it is highly unlikely that local incidents should have occurred simultaneously a vast number of times across the entire country. An improved insight in the mechanisms regulating Black-headed Gull numbers requires that studies and data collecting are designed so that each hypothesis can be verified or rejected. The effort should probably be centred on studies of breeding success and food availability.

Acknowledgments

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Resumé

Den nylige nedgang i bestanden af Hættemåge *Larus ridibundus* i Danmark og mulige årsager hertil

Efter en generel bestandsfremgang hos Hættemåge *Larus ridibundus* i Nordvesteuropa i dette århundrede, er tendensen i flere af Danmarks nabolande ændret til en tilbagegang i de sidste 10-20 år. En tilsvarende tilbagegang er også kendt i Danmark, men der har ikke været foretaget en grundig undersøgelse af den danske bestands status og udvikling siden 1970erne.

Materialet til denne undersøgelse er indsamlet fra diverse rapporter og bøger såvel som ved direkte henvendelse til DOFs lokalafdelinger og en række personer med kendskab til ynglefugle generelt og Hættemåge specifikt.

Undersøgelsen viser udviklingen af den danske bestand fra 1977 til 1998 i form af et indeks (Fig. 1, Appendiks 1). Indeks 100 er valgt for 1988, hvor Måge- og Ternegruppen foretog et nøje bestandsestimat (ca 214600 ynglepar). Bestanden steg langsomt fra slutningen af 1970erne til midten af 1980erne, hvor den toppede med cirka 250000 ynglepar. Herefter aftog den jævnt med cirka 6,6% om året indtil midten af 1990erne. Siden har bestanden ligget næsten konstant på omkring 100000 ynglepar. Opgjort som summen af totalerne for hvert amt er den samlede bestand beregnet til 111000 ynglepar i 1998. På baggrund af de to estimater, og idet der tages højde for, at der mangler oplysninger fra mange smålokaliteter, skønnes den danske bestand i 1998 at have været 110000-125000 ynglepar.

Totalerne for de enkelte amter både for kysten og indlandet (Tabel 1) viser, at bestandsnedgangen har været generel for hele landet på nær Ribe Amt (fortrinsvis pga. en meget stor fremgang på Langli). De to atlasundersøgelser i 1971-74 og 1993-96 viser i overensstemmelse hermed, at Hættemågen er forsvundet fra 35% af alle kvadrater (Tabel 3), og at alle amter undtagen kystområderne i Ribe Amt udviser en nedgang i antallet af kvadrater med ynglende Hættemåger. Den relative nedgang er signifikant større i indlandet end i kystområderne.

De 10 største kolonier i 1988 og 1998 rummede begge år godt halvdelen af alle danske ynglepar (Tabel 2). Flere af de store kolonier er forsvundet eller reduceret mellem de to estimater.

Årsagerne til nedgangen i bestandene er ukendt, men kan teoretisk tænkes relateret til en højere adult dødelighed, en ringere ynglesucces, en ændring i forholdet mellem udvandrende og indvandrende ynglepar eller eventuelt en kombination af flere af disse faktorer (Tabel 4). Ændringen af forholdet mellem ind- og udvandring kan udelukkes, idet halvdelen af den danske bestand

The Danish population of Black-headed Gulls decreased from about 250 000 pairs to roughly 100 000 pairs between the mid-1980s and mid-1990s. Photo: Erik Thomsen.
Den danske Hættemåge-bestand er faldet fra ca 250 000 par til godt 100 000 par siden midten af 1980erne.

skulle være udvandret for at forklare nedgangen i de sidste årtier. Vedrørende både den adulte dødelighed og ynglesuccesen er der mange ubesvarede spørgsmål, men noget tyder på, at tilgængeligheden af føde har haft en vis betydning for nedgangen. Men kun målrettede og veldesignede undersøgelser vil kunne be- eller afkræfte de forskellige hypoteser, der er fremsat.

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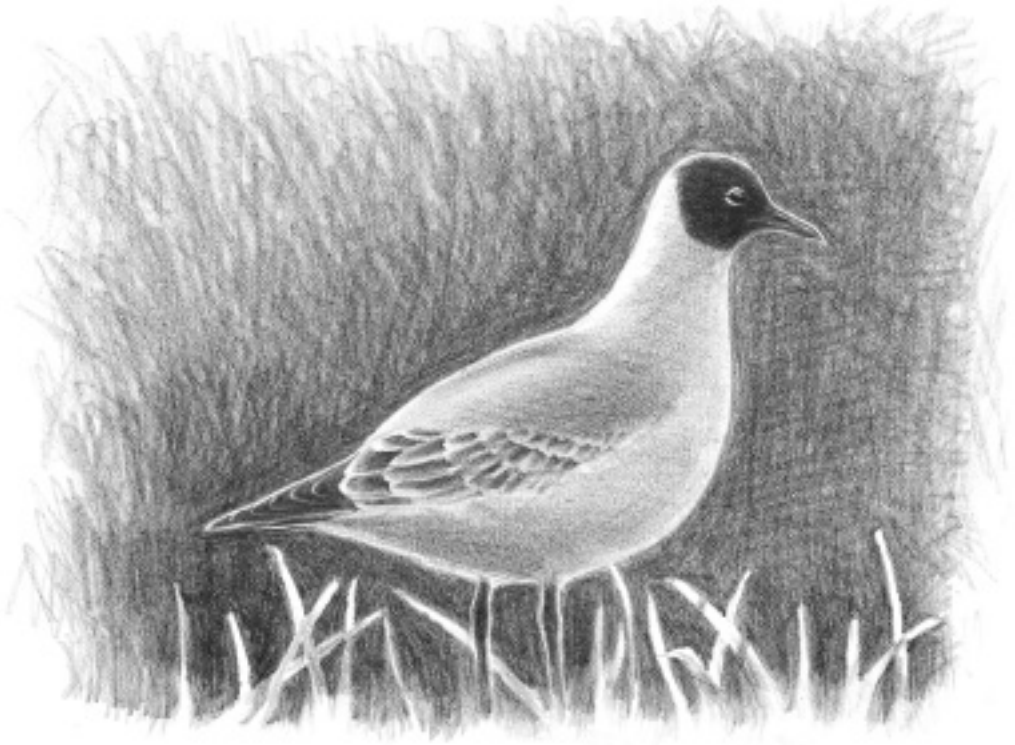

Appendix 1. Number of breeding pairs of Black-headed Gulls in different colonies in 1977-1998 and the resulting indices. (I) indicates inland colony. Estimated figures are shown in italics. See text for calculations of estimates.

Antallet af ynglepar af Hættemåge på forskellige lokaliteter i 1977-1998 og det resulterende index. (I) indikerer indlandskoloni. Estimater er kursiveret.

Colony	County	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Troldholmene	Nordjylland	800	900	400	650	600	800	700	600	750	900	600	300	180	80	25	675	0	0	0	0	1	0
Hirshalmene	Nordjylland	10000	12500	15000	18000	18000	20000	23000	26000	26000	26000	25100	23000	20000	15000	13973	12945	11918	10890	9050	10720	6292	6250
Nordre Rønner	Nordjylland	15	0	0	0	7	0	25	2	1	0	18	52	93	11	4	24	18	12	6	0	0	0
Klosterholm og Startarter	Nordjylland	12000	10000	15000	16000	5000	14000	16500	29250	43000	35650	31700	30000	31900	30000	20000	12500	5000	3050	800	1175	913	102
Vilr Holme & Kye Holm	Nordjylland	2500	1300	1100	1400	5	10	5	0	45	65	225	1500	285	1165	4300	0	30	122	333	488	725	10
Rønholm	Nordjylland	1200	900	35	5	0	15	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hornsgård Holm	Nordjylland	75	175	50	300	200	0	3	5	3	4	0	150	255	5	75	5	0	0	0	0	0	0
Tresteltbakkeholm	Nordjylland	550	15	25	25	35	700	425	425	425	425	150	900	2500	2500	5400	6700	8000	8150	8380	8570	8150	9302
Vejlerne	Viborg	4320	4320	4241	4736	5835	4121	4205	4150	4485	6755	6155	6510	8655	5013	4659	6114	5248	4382	4400	2657	5082	3720
Store & Lille Rotholm	Viborg	1300	650	800	550	550	300	250	250	133	15	57	100	30	0	0	0	0	1	1	0	1	1
Tipperne	Ringkøbing	0	8	3	95	1100	350	220	35	31	105	300	500	770	600	449	80	56	32	6	0	0	0
Poldene, Nymindestrømmen	Ringkøbing	4520	4995	4588	4180	1800	1600	2250	2000	2050	900	700	500	700	1195	1121	1172	*814*	455	450	307	164	*164*
Høje Sand	Ringkøbing	9000	6500	6750	7000	6000	6200	11200	11000	6450	12000	4631	9095	3939	1725	509	577	263	0	0	0	0	0
Klægbanken	Ringkøbing	11500	11500	11500	11500	11500	6600	4450	8300	6000	4300	3938	4232	4529	3522	5782	4824	7662	10500	9500	7050	5300	0
Fjande	Ringkøbing	2000	9500	6000	6000	10000	11000	11000	8250	6500	4050	3100	4400	300	600	500	200	800	500	600	1500	8800	6600
Sandaen, Felsted kog	Ringkøbing	2500	3500	3500	4000	4857	5333	6000	8600	7400	6900	6600	11400	13000	13000	12000	12000	10000	7700	6000	7000	2000	0
Seby Rev	Århus	2	61	0	0	5	1	4	21	59	43	0	0	1	0	0	3	5	1	0	0	0	0
Alrø Poller	Århus	25	22	488	157	125	83	0	1	16	9	25	54	242	27	3	27	51	96	65	65	0	0
Mørke Kær (I)	Århus	740	740	740	740	740	745	750	825	500	580	680	535	623	710	442	426	235	150	270	180	25	75
Brabrand Sø (I)	Århus	3400	3400	3800	3800	4750	3500	2900	4200	3800	4300	3870	3440	3190	3190	2200	1611	1580	1586	1592	1469	1346	1223
Hjarnø	Vejle	2250	3237	4223	5210	5685	6387	5050	4700	5725	4504	4380	4350	3680	2715	4405	4085	4200	3400	1200	2545	2307	1983
Langli	Ribe	62	62	62	62	42	23	4	20	11	2	5	39	45	4	55	609	1997	2251	2170	2926	4813	6252
Lindenum	Sønderjylland	53	53	61	70	200	100	0	0	25	265	375	218	3	263	0	0	67	88	15	0	0	0
Hedersley Dam (I)	Sønderjylland	1500	1500	1500	1500	*1180*	975	*562*	250	475	700	1000	1100	950	1500	1600	1300	1000	1000	850	900	900	900
Margrethe-Kog	Sønderjylland	3045	3045	4161	4161	3033	172	130	133	304	401	820	1037	610	717	446	509	547	94	60	101	4	0
Hjelmshoved	Fyn	0	25	0	10	15	9	125	250	1	5	0	0	85	225	5	20	0	8	30	0	0	0
Store Svelmø	Fyn	20	30	30	30	95	160	200	180	150	8	25	100	150	350	362	362	375	550	425	300	200	350
Halmø	Fyn	315	175	235	290	380	170	150	40	75	200	80	185	175	400	90	0	0	0	0	0	0	0
Eskildsø	Fyn	750	775	800	900	1000	125	500	550	400	800	850	1000	1000	900	1100	1000	1000	1000	1025	1050	1100	1150
Odense Fjord	Fyn	13520	11726	14235	11525	11990	10225	11220	11305	7102	6215	6749	7900	8450	9101	8332	7562	6792	6023	5254	4484	3715	5300
Kvanløseby Mose (I)	Vestsjælland	92	103	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	110	51	0	3
Bromeby Mose (I)	Vestsjælland	770	770	770	770	1100	1000	375	100	0	15	45	0	25	45	225	300	350	287	243	190	137	83
Kidholm Skelskør	Vestsjælland	25	25	20	50	220	20	300	25	125	25	50	70	65	65	50	50	75	75	75	75	75	75
Agersø (total)	Vestsjælland	2410	2400	2500	2100	4800	2100	4000	1250	4500	1435	1725	1820	2005	5195	3645	4775	2560	2400	1400	650	450	1075
Vesterfed, Glænø	Vestsjælland	150	75	100	2500	2000	1200	600	400	350	250	200	145	75	0	0	0	15	*12*	8	4	0	0
Østerfed, Glænø	Vestsjælland	500	350	250	300	250	250	250	300	325	350	450	700	700	800	800	800	800	733	667	600	533	467
Isefjord	Vestsj./Roskil.	4300	4300	4300	4325	3513	2700	5665	4365	6081	6790	5115	3493	3352	3400	4750	5001	4280	2305	2220	2725	5000	3089
Roskilde Fjord	Roskilde	7941	7941	7086	7180	10003	10517	14767	13662	14857	16544	15203	13896	7767	6906	5991	5885	6589	7762	6945	7042	6857	6857
Snoldelev - Gl. Havdrup Mose (I)	Roskilde	400	400	400	400	535	525	550	525	500	1000	750	1000	1000	2000	2010	2150	300	300	100	90	90	90
Ulterslev Mose (I)	København	13969	13420	8871	11931	10772	9815	12737	*11190*	9942	8095	6547	5000	5000	6500	4000	4350	4040	3023	3023	3023	3023	2664
Damhussøen & engen (I)	København	150	250	300	300	150	200	200	200	200	200	200	200	200	3	0	5	27	50	37	24	10	92
Saltholm	København	39	86	34	279	506	400	1368	2153	3304	926	962	1622	1637	1614	1315	156	294	935	495	185	196	424
Hyllekrog	Storstrøm	400	500	600	700	700	800	600	400	0	0	3	0	0	0	0	0	1	3	1	1	0	0
Holmegårds Mose (I)	Storstrøm	1800	1800	1100	1500	2600	2550	2500	2500	3100	3600	3350	3100	3250	2700	3250	3600	2100	2500	2000	2300	2600	2600
Nyord	Storstrøm	28	28	230	250	48	245	302	380	130	280	150	500	390	75	0	0	0	0	4	8	0	1400
Storeholm	Storstrøm	4500	4500	4500	4500	4500	4250	4000	5000	6000	6000	6000	6000	5500	5000	5000	3500	2000	2500	275	450	70	10
Lilleholm	Storstrøm	1500	1500	1500	1500	1500	1750	2000	1050	100	0	0	0	0	0	10	5	5	0	0	0	0	0
Nielstrup Sø (I)	Storstrøm	6000	2000	300	3000	4000	3000	3500	3000	3000	3500	3000	2000	2500	1500	2000	1800	1800	2000	1800	2500	2800	3000
Index		88.8	86.5	88.5	93.9	95.6	89.8	105.6	112.4	114.8	110.8	99.0	100.0	94.0	87.3	80.8	68.6	58.9	55.4	48.7	47.3	49.2	46.5