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WeBS Alerts 1999/2000: Changes in Numbers of Wintering Waterbirds in the United Kingdom at National, Country and SSSI Scales

Interim Report

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1. INTRODUCTION

1.1 Introduction

Wetland sites support the vast majority of the internationally important bird populations that occur in Britain and Ireland and, as such, are one of the most important habitats for birds in an international context. Since the winter of 1966/67 the majority of the nationally and internationally important sites in England, Scotland and Wales have been counted for wildfowl, extending to waders in 1969/70, Coot and Great Crested Grebe in 1983/83, Little Grebe in 1985/86 and Cormorant in 1986/87. Sites in Northern Ireland were counted for waders from 1970/71 and other waterbirds were added in the winter of 1986/87.

These counts are routinely reported on under the Wetland Bird Survey (WeBS) monitoring scheme (e.g. Cranswick *et al.* 1999). The annual WeBS reports provide wader and wildfowl indices for Britain and Ireland combined (waders) or separately (wildfowl & other waterbirds) but do not specifically assess population change either at a national or country level. To effectively monitor population change of important bird populations, data need to be readily available at different scales to examine changes at an individual country, region or site level.

This requirement led to the development of an 'alert' system for waterbirds (Atkinson & Rehfisch 2000; Underhill 2000) through which population change can be assessed across a range of spatial scales and for a variety of species. The aim of the system is to take data from the monthly waterbird counts and remove the year-to-year variation in the counts by smoothing the data to reveal the underlying trend in that species' population. The smoothed index is used to calculate population changes over 5, 10 and 25 year periods and also over the entire time period that the species was counted for. Species which have undergone major population changes are flagged by issuing an Alert if the population has changed (either increased or decreased) by more than 25% and a higher level of Alert if the population has changed by over 50%. This method allows interpretation of the annual indices in terms of short-, medium- and long-term change in the population.

This system was tested and applied to waterbird data in a previous report (Atkinson *et al.* 2000) and full details of the rationale behind Alerts are contained there. The first full implementation of the method to waterfowl data took place using WeBS data up to the 1998/99. Alerts were calculated at national and country scales as well as for Special Protection Areas for which there were suitable WeBS data. In that report two methods were used (the Underhill method and the General Additive Model method) but in this report we use General Additive Models as they are preferable from a statistical point of view (Pettifor 1997).

This report presents the second implementation of the WeBS Alert system and presents population change at a national level, a country level (England, Northern Ireland, Scotland and Wales) and also a SSSI level.

1.2 The Wetland Bird Survey (WeBS)

The Wetland Bird Survey (WeBS) aims to monitor non-breeding waterbirds in the UK and is a joint scheme of the British Trust for Ornithology (BTO), The Wildfowl and Wetlands Trust (WWT), the Royal Society for the Protection of Birds (RSPB), and the Joint Nature Conservation Committee (JNCC - on behalf of the Countryside Council for Wales, English

Nature, the Environment and Heritage Service in Northern Ireland and Scottish Natural Heritage). WeBS is an amalgamation of two previous long running monitoring schemes, the Birds of Estuaries Enquiry (BoEE) and the National Waterfowl Counts (NWC).

The principal aims of WeBS are to identify important sites and to determine changes in the numbers and distribution of divers, grebes, Cormorant, herons, wildfowl, rails, waders, gulls, terns and Kingfisher in the United Kingdom. Core Counts are made at around 2,000 wetland sites of all habitats although estuaries and large still waters predominate. Volunteers carry out monthly co-ordinated counts, principally from September to March with fewer observations in the summer months. Approximately 250,000 records are collected annually.

Only a small proportion of those species recorded as part of the Wetland Bird Survey are regularly indexed. Of the 125 species recorded in the 1996-97 WeBS report (Waters *et al.* 1998), only 12 waders and 29 wildfowl species or populations are either sufficiently common or have a sufficiently large proportion of their populations on WeBS sites to be indexed (Table 1.1). Currently the normal method of indexing these species is by the method described by Underhill & Prys-Jones (1994) which uses a log-linear Poisson generalised linear model as its base. The counts are modelled as a function of site, year and month factors and the year factor is used as a base for the index which is scaled to a value of 100 in either the first or last year. For each species certain months are used to index the population. These are chosen to be the months in which the population of that species is most stable. For waders this is December through to February but varies with different species of wildfowl (Table 1.2).

1.3 The Alert Process

The overall aim of the WeBS Alert system is to devise a method whereby it is possible to flag up large changes in waterbird abundance at national, regional and site level. The coverage of the WeBS survey is an important consideration when assessing population change. For these changes to be relied on, it is essential that the survey covers a representative sample of sites. For strictly estuarine species, this can be accepted as a valid assumption because over 95% of estuaries in Great Britain are counted annually. However, for some of the more widespread wildfowl such as Mallard, much of the population occurs inland. The counting of inland sites follows no formal sampling pattern and therefore it is unclear as to whether these are a representative sample. For these species, it is important that a stratified sample of estuaries, lakes and rivers of varying sizes is used for indexing. This is something that needs to be addressed in the future but, for the purposes of this report, all core WeBS sites are used for waterbirds other than waders. For waders, the traditional set of estuaries that are used to produce annual indices are used.

The UK holds internationally important populations of waterbirds and there is a statutory duty on government to monitor these populations. National and regional indexing using the Underhill method allows inter-annual variation in counts to be described but, due to sampling error and natural annual fluctuations, there can be a great deal of variation between counts. For statutory monitoring it is therefore essential to differentiate between these natural population fluctuations and medium to long-term population changes. For this, the Alert system uses a method of calculating indices which smoothes the annual fluctuations to remove unwanted variation. Population change over various time periods can then be calculated and trends identified.

The Alert system provides a framework in which population changes in waterbird populations can be evaluated at different time scales. If population change over a given time period exceeds a certain limit, then an alert is issued which acts as a warning as to the possibility of large changes in that population. These alerts would then be issued to WeBS partners and the wider conservation community. Alerts can be set both for populations that are increasing or declining. Predetermined limits need to be set initially but would have to come under review as the scheme progresses. For waterbirds, the suggested time periods over which change could be calculated are 5, 10 and 25 year periods. Alerts would be raised if population change exceeded 25% (a 25% Alert or 'Medium Alert') or 50% (a 50% Alert or 'High Alert') over each given time period. For site-based Alerts, variation in the numbers of waterbirds is often more extreme that at a larger scale and so only changes of 50% trigger an Alert at the site level. In this analysis, we only report on the negative Alerts (i.e. declines) in any detail.

Species that show large year to year fluctuations will be more likely to trigger alerts. A high degree of smoothing applied to the indices will remove much of these fluctuations but it is likely that highly variable species will trigger a series of five year Alerts, either positive or negative. Alerts should therefore be advisory and the particular species ecology and population dynamics are extremely important in interpreting the alerts once they have been triggered. This is likely to be more of a problem for passerine species such as Wren *Troglodytes troglodytes*, which show annual fluctuation orders of magnitude higher than most wader and wildfowl species.

1.4 Methods

1.4.1 Coverage of species and sites

The WeBS Alert system is suitable for most species whose populations are regularly indexed by WeBS, given the caveat about coverage discussed previously. Thirty-six such common waterbird species were run through the process. Species such as Pink-footed Goose, Barnacle Goose, Icelandic Greylag Goose and Greenland White-fronted Goose are not fully covered by WeBS and numbers are regularly censused using co-ordinated goose counts, rather than regular WeBS counts. It may be possible to incorporate these data into an Alert system in future. Of the waders, Lapwing, Golden Plover and Purple Sandpiper are common species but not regularly indexed, as WeBS covers only a small part of their population. Most Lapwing and Golden Plover occur inland and are poorly covered by WeBS although data from some sites of international importance are collected, and could be included in the future. Purple Sandpiper tend to occur on rocky rather than estuarine shores and, again, the numbers sampled through WeBS are not representative of the whole population. Although these data were not available for this report, they could be included in any future waterbird alert system if the data could be made readily available.

The coverage of counts also varies between countries (Table 1.3). The main difference is that although for waders UK indices can be calculated, wildfowl counts only started in 1986 in Northern Ireland. For the purposes of this report, therefore, when we refer to the UK for wildfowl this includes just England, Scotland and Wales. Northern Ireland is treated separately.

Over 90% of estuaries are counted each month and for strictly estuarine species one can expect a near 100% coverage. For species which also occur on non-estuarine coasts, such as Turnstone, Ringed Plover, Sanderling and Curlew the coverage will be lower and the alerts

generated should be thought of as an alert for the proportion that use WeBS sites rather than for the population as a whole.

1.4.2 Calculation of Underhill indices

In this report, the smoothed data and the traditional Underhill indices are presented. For each species, there are a recommended series of months which are traditionally used to index that population (Cranswick *et al.* 1998). These are December, January and February for waders but different months are used for wildfowl, ranging between one to seven months for each species (Table 1.2). Indices are calculated by summing the number of 'bird months' and scaling the last year to 100. Missing counts are inevitable with this kind of data and these are estimated using the Underhill method (Underhill & Prys-Jones 1994). At the base of this method is a General Linear Model (GLM) with a Poisson error distribution and log link function, which fits a model with site, year and months factors. Where missing counts occur, they are estimated using the parameters calculated in the GLM. The Underhill method and GAMs have one major difference. Poor quality or missing counts are estimated using GAMs whereas the Underhill method estimates poor quality counts and only includes that count if it is greater then the poor count. At the site level it may be more appropriate to use different periods of months but due to difficulties of extracting data, standard Underhill months have been used.

1.4.3 Smoothing indices using GAMs

The monthly counts are smoothed using General Additive Models rather than other methods which use a running mean (Gregory et al. 2000). Data were extracted from the WeBS database and the Fortran program GAIM used to smooth the count data. The amount of smoothing is determined by the number of degrees of freedom associated with the year parameter. A model with minimum degrees of freedom constrains the fit to a linear line and maximum (number of years minus 1) fits an unconstrained model similar to a log-linear Poisson regression which is the basis of the Underhill method. For the purposes of WeBS data, a moderate degree of smoothing of 0.3 times the number of years was tested and found to provide an acceptable degree of smoothing (Atkinson & Rehfisch 2000).

1.4.4 Assessment of change and calculation of Alerts

Alerts are generated by assessing the percentage change in the population over several different time periods. In this report we calculate change over 5, 10 & 25 year periods. We also calculate change over the entire time period for which data are available. Alerts are triggered if the change exceeds 25% (a positive or negative Medium Alert) or 50% (a positive or negative High Alert). It is important to note both large increases (positive Alerts) as well as large decreases (negative Alerts) but in this report we only report in any detail on declining species. Using GAMs, the percentage change in the smoothed population trend is simply the change in the smoothed index between years; see worked example in Box 1.1.

For this report we present Alerts calculated using only the GAM method and the Underhill method used last year is not currently used.

The term 5-year change can be misleading. In this report we define this as the change over five separate time periods, e.g. the change from the index for the winter of 1994/95 to the winter of 1999/2000. This includes six winters worth of data but five separate time periods.

For country and national alerts, bootstrapped confidence intervals can be calculated. To obtain 95% confidence intervals the program GAIM bootstraps the count data to produce many different smoothed trajectories. Confidence intervals can then be placed around the smoothed trajectory. Five, ten and 25 year changes and associated confidence intervals are calculated from these. For an Alert to be significant, the upper 95% CI would have to be below zero indicating a significant negative change over that time period.

However, for WeBS data, it is unclear as to exactly what the intervals relating to the smoothed trajectory relate to. If the sample of WeBS sites was a truly random sample then these intervals would indeed indicate the confidence limits around the changes in the population.. However, as in the case of strictly estuarine waders, the WeBS counts do not represent a random sample, rather an almost-complete census. In this case, the 95% intervals represent 'Consistency Intervals' (Underhill & Prys Jones 1994). These indicate how patchily distributed the population is. For example, if the same numbers of birds were recorded at each site at the start of the time period, and they varied from year to year in the same way, the consistency interval would be zero indicating that the population was evenly spread, and changed at the same rate across all sites. If, however the bulk of the population occurred on a small number of sites and the majority of sites held zero or low numbers of birds then the consistency interval would be high. These intervals would not tell you anything about the confidence in population trajectory itself as, with 100% coverage in your survey, you have sampled the entire population and any changes calculated would be absolute. To understand the confidence in the counts then some attempt to estimate error in counting (e.g. observer or site specific errors) would have to be made.

Inevitably, WeBS counts fall somewhere in the middle. For estuarine species, a near 100% coverage is achieved but for rocky shore species this will be less. For inland species we have little idea as to how representative WeBS is, but most of the major sites of importance are covered.

In this report, we have bootstrapped change measures using 199 bootstraps. For each of the country chapters we note where these confidence/consistency intervals indicate that the change is not significantly below zero; for others assume it is significant. However, for countries with relatively few WeBS sites, such as Northern Ireland and Wales, these 95% intervals may, especially for highly variable species, be large and not significantly below zero. This may not invalidate the Alerts, is as discussed above if the majority of important sites for that species are covered. Therefore intervals should be advisory and interpreted with knowledge of the species and sites concerned. They should not necessarily be taken to mean that the Alert is not significant.

1.4.5 SSSI Site Alerts – species and site coverage

In this report we assess population change and raise alerts for species which occur in nationally or internationally important numbers on SSSIs in each country. The list of SSSIs was supplied by the country agencies via JNCC. For each country, each SSSI had a list of species associated with the site or an assemblage.

Inevitably the coverage of SSSIs is poorer than the coverage of SPAs and an attempt has been made to match up boundaries of WeBS sites and SSSIs as closely as possible.

The list of species for which Alerts were requested included non-WeBS species as well as sites which are not covered by the WeBS scheme. Where possible, data for each site were

extracted, smoothed using the GAM method and population and Alerts calculated in the usual manner. No bootstrapping is possible in this case.

Many of the SSSIs have been classified as important due to their assemblage of waterfowl rather than individual species. For these a new method of Alerting has had to be developed. In these cases, the Underhill method was used to impute missing counts. Two methods of assessing assemblage alerts will be presented in the final report. These will involve assessing change in numerical terms and also in terms of population size. Further details will appear in the final report.

The sites used in these analyses are those that are currently used to calculate the national waterbird indices. These 'core' sites are those which have been counted on more then 50% of available occasions. If a site was not counted on more than 50% of occasions we did not perform any analysis because of the amount of time needed to extract the data from the WeBS database. This may be remedied in the future with the new database, and sites which have been counted on less than 50% of occasions can be included.

Several caveats need to be borne in mind when interpreting these analyses. WeBS sites tend to be made up from counts taken from a number of sectors which are amalgamated to form a total count for that site. For this analysis we did not have access to the site boundaries for the SSSIs and so had to make a 'best guess' attempt to match up SSSIs and WeBS sites. As far as we know, this worked reasonably well for most sites but there are a few known problems:

- There may be no WeBS data for a particular SPA
- WeBS sites may not match up exactly with SPA boundaries.
- Birds which use SPAs may roost outside the SPA boundaries where they are counted by WeBS. For example, on the Wash many waders roost in fields behind the sea-wall which are not part of the SPA. Most of the WeBS counts therefore technically include birds not in the SPA, but which obviously made use of it at low tide
- Some WeBS sites may cover more than one SPA, e.g. the Wash WeBS area covers both the Wash and Gibraltar Point SPAs and with the current amalgamation of data can not be separated.

The full extent of the coverage of sites and species in each country are given in the relevant country chapters. Matching WeBS sites to SSSI boundaries and providing a definitive list must be seen as a priority.

1.5 Interpretation of Numbers and Alerts

1.5.1 Units of abundance

Two units of abundance are used in the WeBS scheme and it is important to distinguish between them. In the WeBS reports, indices are traditionally calculated by totalling up the number of 'bird months' and scaling the resulting data so that the first or last year is equal to 100. This is termed the *index of abundance*.

When considering whether a site is nationally or internationally important or not for a particular species, yearly maxima are traditionally presented in the WeBS report for all sites where the 5-yearly mean of the maxima exceeds the relevant national or international total.

In this report we do not use changes in count maxima to evaluate site, country or national Alerts, rather we use the *average number of birds recorded per month*. This is calculated in a similar way to the Underhill index but instead of scaling the total number of bird months so that either the first or last year equals 100, this figure is divided through by the number of months over which the species is traditionally recorded.

Example 1: Calculating the average number of birds per month

Coot are traditionally indexed over 7 months in NI – September to March

	Sep	Oct	Nov	Dec	Feb	Mar	April	TOTAL
Actual	1,800	4,950	3,450	-	550	343	103	
Imputed				1,250				12,446

The example above shows a series of counts of Coot at a site. The December count is missing and so the count is imputed using the standard Underhill method.

The total number of bird months is the sum of all counts for that year. These are added together for all sites and this, when scaled so that the last year equals 100, is used as the basis of the national index. This value equals 12,446 so the average number of birds per month is this figure divided by 7 (the number of months). This equals 1,778 birds. It is this figure, rather than the maximum of 4,950 birds in October, that is used when considering changes in the population and raising alerts for the site.

Clearly, this may lead to some apparent discrepancy between SPA/SSSI citations which are based on maxima and the average number of birds present per month. If a species occurs in large numbers on a site for one month only, the average of the five yearly maxima, which are used to determine national or international site importance, may indicate a site is important whereas the average numbers of birds per month may be very small. This is especially true for species such as Bewick's and Whooper Swan which can appear in large numbers on some sites (e.g. the Wash) for one or two months in a five-year period. This has resulted in them being cited for this SPA/SSSI even though the site does not hold a regular wintering population of any importance. The Alert system is not suitable for this situation.

1.5.2 Interpretation of Alerts

Alerts are raised when the percentage change in a population exceeds certain limits. Here we use 25 and 50% changes over 5, 10, 25 and all years for which counts are available. This allows change in the population to be classified according to the criteria in the table below. Thus a change of –34% over a 10 year period would be classed as a moderate decline over the medium term etc. These terms are used throughout this report.

Type of Alert	50%	25%	25%	50%
When used	Decline greater than 50%	Decline between 25% and 50%	Increase of between 25 and 50%	Increase of greater than 50%
Direction	Negative	Negative	Positive	Positive
Code used in this report	--	-	+	++
Description of change	large decline or HIGH ALERT	moderate decline or MEDIUM ALERT	moderate increase	large increase

Time Period	5 year	10 year	25 year	All years
Description	short-term	medium-term	long-term	all years

The Alerts are presented in a similar manner to the example for Little Grebe below. Data are presented from left to right starting with the codes for the 5,10, 25 and all year Alerts. The figures following are the actual percentage change in the population over similar time periods. The next two figures are presented for site alerts only and correspond to the first and last years that counts took place. For national and country alerts these are stated in Table 1.3. The species name and site then follow.

5-yr	10-yr	25-yr	All	5-yr	10-yr	25-yr	All	Start	End	Species
++	++	N/A	++	155	381	N/A	294	85	97	Little Grebe

In some cases, the Alert over all years should also be treated with caution as count quality and coverage may have been poor in the early years of the precursors to WeBS.

Two codes are used in the Alert tables:

n/a this refers to Alerts where data are not available for a particular year and so it is not possible to calculate that Alert. In the example above, Little Grebe were not counted until 1985/96 in Great Britain and so a 25 year Alert is not possible.

>1000 this refers to percentage changes that were calculated to be over 1,000%. This is a result of either an infinite change (i.e. a change from zero birds to at least 1 bird) or a very large change which is generated by the GAIM or Underhill programs allocating a very small value (e.g. 0.00001) to a zero value. If the number of birds were to increase from this value then the apparent change would be very large. In most cases this does not make sense and so all changes greater than this have been coded '>1000'.

Table 1.1 Wader and wildfowl species or populations which are regularly indexed as part of the Wetland Bird Survey and to which an alert system can be applied. Countries refer to the countries for which data are available. E = England, S= Scotland, W= Wales, NI= Northern Ireland. Species which have no country code allocated are those which are regularly indexed, but using co-ordinated goose counts rather than regular WeBS counts. These currently fall outside the Alert system.

Species		Countries
Little Grebe	*Tachybaptus ruficollis*	E,S,W,NI
Great Crested Grebe	*Podiceps cristatus*	E,S,W,NI
Cormorant	*Phalacrocorax carbo*	E,S,W,NI
Mute Swan	*Cygnus olor*	E,S,W,NI
Bewick's Swan	*Cygnus columbianus*	E,S,W,NI
Whooper Swan	*Cygnus cygnus*	E,S,W,NI
Pink-footed Goose	*Anser brachyrhynchus*	
European White-fronted Goose	*Anser albifrons albifrons*	E,S,W
Greenland White-fronted Goose	*Anser albifrons flavirostris*	
Greylag Goose - Icelandic	*Anser anser*	
Greylag Goose - naturalised	*Anser anser*	E,S,W
Canada Goose	*Branta canadensis*	E,S,W
Barnacle Goose - Svalbard	*Branta leucopsis*	
Dark-bellied Brent Goose	*Branta bernicla bernicla*	E,S,W,NI
Light-bellied Brent Goose - Canadian	*Branta bernicla hrota*	NI
Shelduck	*Tadorna tadorna*	E,S,W,NI
Wigeon	*Anas penelope*	E,S,W,NI
Gadwall	*Anas strepera*	E,S,W,NI
Teal	*Anas crecca*	E,S,W,NI
Mallard	*Anas platyrhynchos*	E,S,W,NI
Pintail	*Anas acuta*	E,S,W,NI
Shoveler	*Anas clypeata*	E,S,W,NI
Pochard	*Aythya ferina*	E,S,W,NI
Tufted Duck	*Aythya fuligula*	E,S,W,NI
Goldeneye	*Bucephala clangula*	E,S,W,NI
Red-breasted Merganser	*Mergus serrator*	E,S,W,NI
Goosander	*Mergus merganser*	E,S,W
Ruddy Duck	*Oxyura jamaicensis*	E,S,W
Coot	*Fulica atra*	E,S,W,NI
Oystercatcher	*Haematopus ostralegus*	E,S,W,NI
Avocet	*Recurvirostra avosetta*	E,S,W,NI
Ringed Plover	*Charadrius hiaticula*	E,S,W,NI
Grey Plover	*Pluvialis squatarola*	E,S,W,NI
Knot	*Calidris canutus*	E,S,W,NI
Sanderling	*Calidris alba*	E,S,W,NI
Dunlin	*Calidris alpina*	E,S,W,NI
Black-tailed Godwit	*Limosa limosa*	E,S,W,NI
Bar-tailed Godwit	*Limosa lapponica*	E,S,W,NI
Curlew	*Numenius arquata*	E,S,W,NI
Redshank	*Tringa totanus*	E,S,W,NI
Turnstone	*Arenaria interpres*	E,S,W,NI

Table 1.2 Species to which the WeBS Alert system has been applied to and the months used in calculating indices for wildfowl species in Great Britain and Northern Ireland (indicated using the first letters of the months September to March).

Species	GB	NI
Little Grebe	SO	SON
Great Crested Grebe	SON	SONDJFM
Cormorant	SONDJFM	SOND
Mute Swan	SONDJFM	SONDJ
Bewick`s Swan	JF	NDJF
Whooper Swan	ND	ONDJFM
European White-fronted Goose	JF	
Feral Greylag Goose	S	
Canada Goose	S	
Dark-bellied Brent Goose	DJF	
Light-bellied Brent Goose		SONDJFM
Shelduck	JF	DJFM
Wigeon	J	SONDJFM
Gadwall	SONDJFM	SONDJ
Teal	DJF	DJ
Mallard	DJF	SO
Pintail	ONDJ	ONDJFM
Shoveler	SO	SONDJFM
Pochard	NDJ	NDJF
Tufted Duck	NDJF	ONDJFM
Goldeneye	F	DJFM
Red-breasted Merganser	ONDJFM	SONDJFM
Goosander	DJF	
Ruddy Duck	SONDJFM	
Coot	SONDJ	SONDJFM
Oystercatcher	DJF	DJF
Avocet	DJF	DJF
Ringed Plover	DJF	DJF
Grey Plover	DJF	DJF
Knot	DJF	DJF
Sanderling	DJF	DJF
Dunlin	DJF	DJF
Black-tailed Godwit	DJF	DJF
Bar-tailed Godwit	DJF	DJF
Curlew	DJF	DJF
Redshank	DJF	DJF
Turnstone	DJF	DJF

Table 1.3 Table describing the first winter in which waterbird counts occurred for species, or groups of species in each country.

Area	Waders	Wildfowl	Cormorant	Little Grebe	Great Crested Grebe	Coot
England, Scotland & Wales	1969/70	1966/67	1986/87	1985/86	1982/83	1982/83
Northern Ireland	1970/71	1986/87	1986/87	1986/87	1986/87	1986/87

Box 1.1 Worked example of raising alerts using the General Additive Model (GAM) process

Process:

1. Smooth WeBS data using the program GAIM
2. Take value for current year and also those for 5, 10 and 25 years ago and calculate change. This is the 'population change' which is used to raise 25% or 50% alerts.

Alert type	Year	Index	Index value
	1970	100	
	1971	101	
25 year	**1972**	**105**	**105**
	1973	113	
	1974	127	
	1975	153	
	1976	199	
	1977	262	
	1978	322	
	1979	342	
	1980	327	
	1981	302	
	1982	283	
	1983	282	
	1984	300	
	1985	326	
	1986	348	
10 year	**1987**	**351**	**351**
	1988	348	
	1989	359	
	1990	370	
	1991	357	
5 year	**1992**	**333**	**333**
	1993	322	
	1994	354	
	1995	423	
	1996	511	
	1997	**590**	**590**

5- YEAR ALERT: (590 – 333) / 333 = 77% 50% ALERT TRIGGERED

2. UNITED KINGDOM – WATERBIRD POPULATION CHANGES AND ALERTS

2.1 Population Change and Alerts

Figure 2.1 shows the change in numbers of all regularly indexed wader species in the United Kingdom and wildfowl in England, Scotland and Wales combined.

Table 2.2 shows the percentage population change over 5, 10, 25 and all year periods and the Alerts generated using both GAM and Underhill methods.

- European White-fronted Goose has been elevated to a High Alert
- New Medium Alerts have been raised for Ringed Plover and Dunlin
- Mallard, Knot and Turnstone continue to generate a Medium Alerts
- All other species are stable or increasing (mostly increasing).

The situation for grebes, ducks, geese, Cormorant and Coot remains largely unchanged from the previous year. The Medium Alert issued last year for European White-fronted Goose has been raised to a High Alert, as the change over all years has just exceeded 50%. Thos winter's numbers show a small decline from the previous winter and this species is now at an all time low.

The addition of two new wader species (Ringed Plover and Dunlin) to the 'Alert' list gives cause for concern and highlights our lack of understanding of the reasons behind most long-term population changes in waterbird populations. Knot, as an example, is an exception as population models based on survival rates and productivity estimates indicate that changes in productivity has been the major driving force behind population change over the past 30 years (Atkinson *et al.* 2000; Boyd & Piersma 2001). In addition to the species above, Grey Plover has also shown declines over the past four winters. This is in total contradiction to the pattern of year-on-year increases from 1969/70 to 1995/96; the reasons for this are not clear. Five of the 12 routinely monitored waders are currently in decline.

Waterbirds are the most important group in the UK in terms of their international importance. However, unlike passerines where information on survival and productivity is routinely monitored through national schemes such as Constant Effort Site Scheme and the Nest Record Scheme, no such scheme exists for shorebirds. For some species of geese the proportion of juveniles and family size are routinely collected and may be used in explaining changes in population size. The methods for doing so are readily adapted to shorebirds. Atkinson *et al*. (2000) showed that survival and recruitment explained observed changes in numbers of Oystercatcher and Knot wintering on the Wash. The availability of such information would make interpretation of Alerts more robust.

Climate change has been implicated in the changing distribution of most of the UK's common wintering waders. A lower proportion of most wader populations now winter on the south and west coasts and an increasing population now winters on the east coast of the UK. This has been linked to warmer winters on the east coast (BTO, unpublished) although the mechanisms (movement, settlement patterns or changes in demography) are unknown. It is therefore extremely difficult, if not impossible to separate out the effects of climate change against natural variations, or some other anthropogenic impact. Without effective monitoring

of annual survival and recruitment rates and the application of population models, it is also difficult to determine whether populations are in true decline or whether birds are just redistributing themselves around the flyway. This again highlights the need to some form of annual shorebird demographic monitoring.

2.2 Species Generating a High Alert

European White-fronted Goose

This species generated a High Alert over all years and a Medium Alerts over 10 and 25 year periods. This species has undergone sustained decline in the UK. After a peak in the late 1960s, there was a dramatic decline to approximately half the peak numbers in the mid-1970s. A period of stability followed to the mid 1980s and this species has been in gradual decline ever since.

The major wintering sites are, in descending order of importance: the Severn Estuary (Glos), The Swale & North Kent Marshes and the River Twyi in Wales (Table 2.1). In 1966/67, approximately 4,000 birds were recorded in the UK, 800 of which were in Wales. The number of birds in Wales doubled in size to a peak of 1,700 birds in 1969 and this, together with an even larger increase in England increased the total number of birds in the UK to over 10,000 in 1969/70. After this winter a large decline took place and by the mid-1970s numbers had returned to their former levels. The English population fluctuates but is now currently at approximately 3,000 birds. The Welsh population, concentrated around the Dryslwyn area of the River Tywi continued to decline and by the late 1980s this population went to extinction.

During the first 12 years one of the major sites (The Swale) was not counted. Also, during the first 8 years the Severn (Glos) section was only counted during January. As with all species which occur in only a few sites, imputed values from missing counts can contribute to a large proportion of the total counts. For this species, imputed values made up approximately 50% of the total birds estimated to be in the country during these early years. It is therefore unwise to over-interpret changes in numbers during these first 10 years. Furthermore the coverage for this species may also not reflect the true situation (see 3.3). However, there has undoubtedly been a major decline and the virtual extinction of the Welsh and North Kent marshes populations is cause for concern. Birds on the remaining two major sites, The Swale and Severn, remained stable until the late 1980s and have been slowly declining since.

2.3 Species Generating a 25% Alert Using GAMs

Mallard

Mallard continued to raise a Medium Alert over the past 10 years and a new Medium Alert over all years. The decline reported in the last WeBS Alert report is continuing although there are signs that the rate of decline is slowing.

Mallard are one of the most widespread ducks in the United Kingdom and it is not known how representative WeBS sites are for this species. Many are also released every year by wildfowling interests. Nevertheless, Mallard are one of the few ducks that are declining. Numbers on WeBS sites increased slightly from 110,000 birds at the start of counts in 1966/67 to 150,000 birds in the mid-1980s but then declined. Since 1987/88, there has been a highly significant decline at the rate of approximately 5,000 birds per year although the most recent figures suggest that the rate of decline is slowing.

Ringed Plover

The smoothed trajectories for England, Scotland and Northern Ireland show a very similar pattern to those for Turnstone, perhaps indicating that similar factors are acting on both populations. Numbers have fluctuated with two peaks, one in the mid-1970s and one in the late 1980s. Since the 1980s this species has been in sustained decline.

The reasons for this decline are unclear although climate change has been implicated in a change in the distribution of Ringed Plovers within the UK (Rehfisch & Austin, submitted). Since 1969/70 a decreasing proportion of the UK population has wintered in southern and western Britain and a greater proportion now winters on the east coast. These changes have been linked to increasingly benign winter climatic conditions on the east coast (BTO, unpublished data) and may indicate that there the wintering range of Ringed Plovers has shifted eastwards. The exact mechanism for this shift is unclear.

A large proportion of Ringed Plovers also winter on non-estuarine coasts. The number of Ringed Plovers on the UK's non-estuarine coasts has decreased by 15% between the 1984-85 Winter Shorebird Count (WSC) and the 1997-98 Non-estuarine Coastal Waterfowl Survey (NEWS) (Rehfisch, Holloway & Austin in prep.). The distribution of Ringed Plovers on non-estuarine coasts has shifted both north and east (Austin & Rehfisch in prep.). Ringed Plovers have fared best in areas where there has been the greatest relative decrease in the number of days with snow and sleet, and rainfall.

Dunlin

The number of Dunlin in the UK have undergone a very rapid decline over the past four winters. The change in the unsmoothed index indicates a loss of an average of 200,000 birds from the 1996/97 to 1999/2000. The majority of the Dunlin winter in England (approximately 80% in 1999/2000) and, in numerical terms, the loss has been greatest in this country but there have been corresponding declines in Scotland and Northern Ireland (see relevant country chapters). The Welsh population has remained stable at approximately 40,000 birds since the mid-1980s.

The reason for the decline are poorly understood. Like most waders in the UK, a decreasing proportion of the UK population has wintered in south and western regions of the UK (BTO, unpublished data). This changing pattern of abundance has been linked to changes in climatic conditions.

Knot

Knot have continued to trigger a Medium Alert over 25 years and are likely to continue to do so unless a large increase in the population occurs. The graph for Knot, shows a decline in numbers from approximately 350,000 birds at the start of counts to c200,000 birds in the mid-1970s, followed by a period of stability which has continued to the present day. The reasons for the large decline are probably due, in part, to increased spring mortality of adult Knot returning to their Greenland breeding areas in the early 1970s (Boyd 1992). The springs and summers of 1972, 1974 and 1979 were particularly cold and caused many adult deaths. This coupled with poor breeding success, in 1972 and 1974 are believed to have caused a large population decline. The wintering population does not seem to have recovered, but is apparently now stable.

Turnstone

Turnstone have continued to maintain their Medium Alert status. The WeBS counts cover the majority of estuaries but a substantial proportion of birds winter on non-estuarine coasts and so the figures from WeBS should be interpreted along with those from the Non-Estuarine Waterbird Survey (NEWS).

Since the peak in smoothed numbers in 1987, this species has been in sustained decline on UK estuaries. In the 1999/2000 winter the smoothed numbers differed from the previous winter by only one bird suggesting that the decline is levelling off.

The reasons for this decline are unclear but the 33% decline since numbers peaked in 1987 mirrors the 16% decline observed on the UK's non-estuarine coasts between 1984-85 and 1997-98 (Rehfisch *et al*. in prep). The decline in Turnstone numbers on non-estuarine coasts is associated with a northward and eastward shift in its distribution (Austin & Rehfisch in prep.). As for Ringed Plover, Turnstones have fared best in areas that have become warmer during the winter (fewer days of ground frost) and drier (greatest relative decrease in rainfall). However, the decline in Turnstone has been remarkably similar over all four countries indicating a widespread UK decline.

Table 2.1 Percentage change and Alerts over 5,10, 25 and all years of counts. For interpretation of symbols see section 1.6. Changes greater than 1000% have been marked >1000. N/A indicated no counts available or sample size too small.

UNITED KINGDOM	First Year	Last Year	5-year change	10-year change	25-year change	All year change	5-year Alert	10-year Alert	25-year Alert	All year Alert
Little Grebe	1985	1999	18	79	N/A	537		++	N/A	++
Great Crested Grebe	1982	1999	0	14	N/A	51			N/A	++
Cormorant	1986	1999	-4	23	N/A	144			N/A	++
Mute Swan	1966	1999	22	42	106	84		+	++	++
Bewick`s Swan	1966	1999	26	-1	226	327	+		++	++
Whooper Swan	1966	1999	92	42	180	216	++	+	++	++
European White-fronted Goose	1966	1999	-12	-36	-27	-53		!	!	!!
Feral Greylag Goose	1966	1999	48	117	>1000	>1000	+	++	++	++
Canada Goose	1966	1999	10	13	277	616			++	++
Dark-bellied Brent Goose	1966	1999	-16	-16	105	291			++	++
Shelduck	1966	1999	-20	-20	9	27				+
Wigeon	1966	1999	-8	20	60	41			++	+
Gadwall	1966	1999	43	92	804	>1000	+	++	++	++
Teal	1966	1999	15	17	116	347			++	++
Mallard	1966	1999	-10	-27	-23	-31		!		!
Pintail	1966	1999	-2	-20	-13	242				++
Shoveler	1966	1999	8	8	48	119			+	++
Pochard	1966	1999	-9	-5	-25	-15				
Tufted Duck	1966	1999	4	8	0	61				++
Goldeneye	1966	1999	-6	8	0	99				++
Red-breasted Merganser	1966	1999	-4	19	122	390			++	++
Goosander	1966	1999	8	9	83	181			++	++
Coot	1982	1999	7	16	N/A	25			N/A	
Oystercatcher	1969	1999	3	-11	19	37				+
Avocet	1969	1999	93	311	>1000	>1000	++	++	++	++
Ringed Plover	1969	1999	-16	-27	-28	3		!	!	
Grey Plover	1969	1999	-19	0	198	456			++	++
Knot	1969	1999	-15	-22	-22	-46				!
Sanderling	1969	1999	27	21	-2	47	+			+
Dunlin	1969	1999	-19	-16	-36	5			!	
Black-tailed Godwit	1969	1999	36	89	220	648	+	++	++	++
Bar-tailed Godwit	1969	1999	-3	-9	-4	-16				
Curlew	1969	1999	13	17	28	96			+	++
Redshank	1969	1999	8	0	1	55				++
Turnstone	1969	1999	-12	-31	-11	6		!		

Table 2.2 Counts of European White-fronted Geese at major wintering sites in the UK. Blank counts indicate poor quality counts or that no count was made in that month.

	SEVERN GLOS		SWALE ESTUARY		R TYWI: DRYSLWYN		NORTH KENT MARSHES		NORTH NORFOLK COAST	
Winter	Jan	Feb	Jan	Feb	Jan	Feb	Jan	Feb	Jan	Feb
1966/67	2450					750	232	356		
1967/68	4200				620	1100		700		
1968/69	6300				1300	1000	904	1625		
1969/70	6500				1700	1000	800			
1970/71	6000				1300	1500	32	900		
1971/72	2600				505					
1972/73					1070		410	435		
1973/74	4500				850		0			
1974/75	1450	1300			165					
1975/76	2500	2800			550					
1976/77	3600	2500			650					
1977/78	2000	2000			450					
1978/79	5000	2200	778	2008	435		284	1100		
1979/80	1850	2100	1260	600	210		460	300		
1980/81	3000	2400	1700	588	406		264	207		
1981/82	1503	4500	400	1212	720		470	635		
1982/83	3040	3000	1493	773	220	320	331	282		
1983/84	2700	3000	443	876	268	280	256	320		
1984/85	3000	4200	850	1300	170	290	320	0		
1985/86	4300	2530	1550	215	298		180	730		
1986/87	2800	3500	445	2550	132		75	95		
1987/88	4600	3700	1400	1054	109		140	640		
1988/89	2850	3260	2050	1200			29	300		
1989/90	3200	3160	1180	1660	0	49	115	20	264	194
1990/91	2400	2600	1750	1000	0	0	85	0	185	218
1991/92	3700	4550	717	510			100	160	103	141
1992/93	1400		82	645	0		21	45	49	181
1993/94	2300	3000	1652	1500	0	42	0	0	316	227
1994/95	2200	1450	888	1681	0		0	0	137	248
1995/96	2000	2170	1267	8			0	0	379	473
1996/97	2306	2780	111	1604	0	0	0	125	152	27
1997/98	2200	2500	520	1402			0	6	238	290
1998/99	1840	1551	973	301			1	51	19	383
1999/2000	1931	1680	455	429					343	300

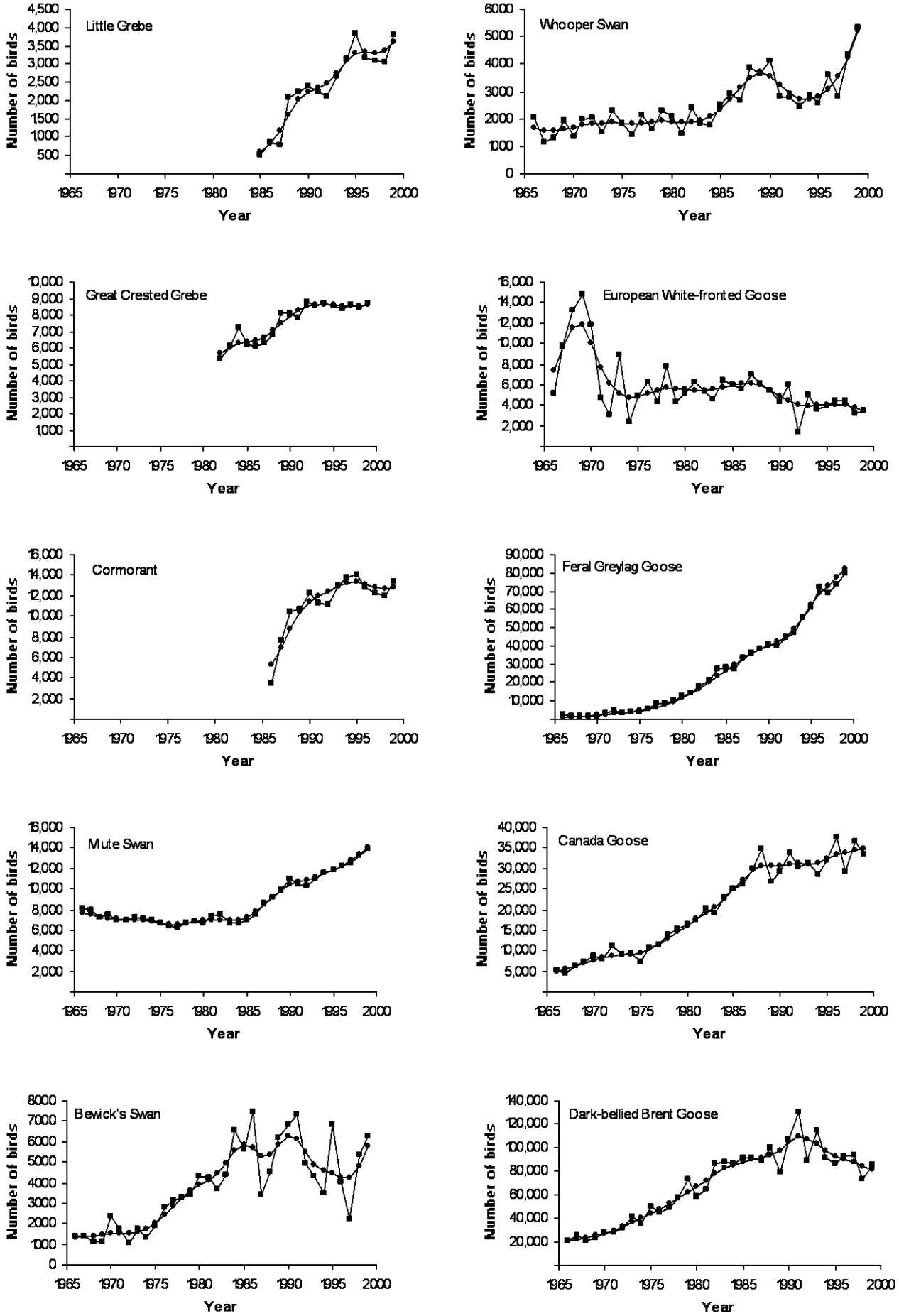
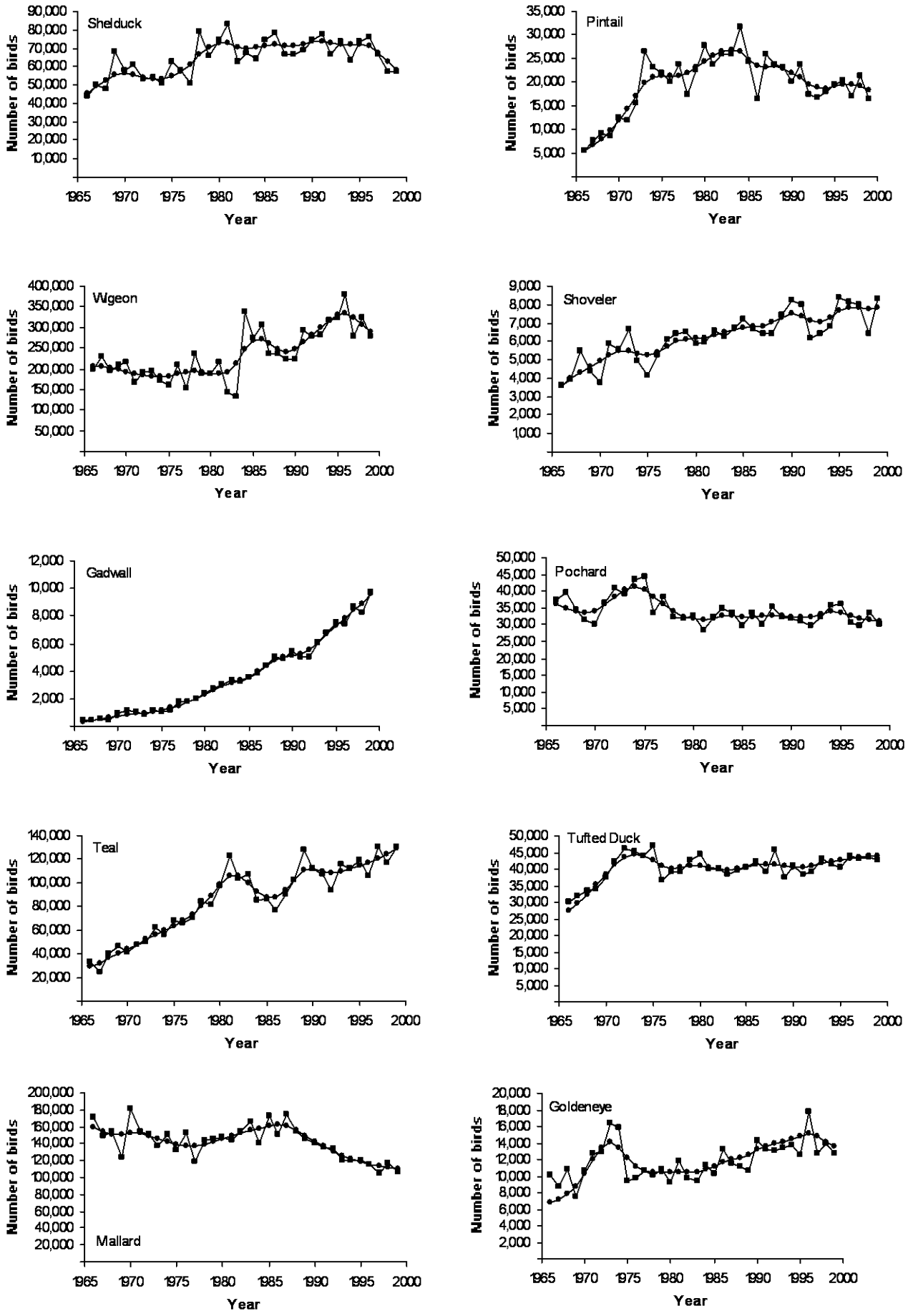


Figure 2.1 United Kingdom waterbird Underhill and smoothed GAM counts for regularly indexed wildfowl species. Units refer to the average number of birds counted per standard index month (see Table 1.2 for standard months). ■ = mean number of birds recorded per month, ● = smoothed average number of birds.



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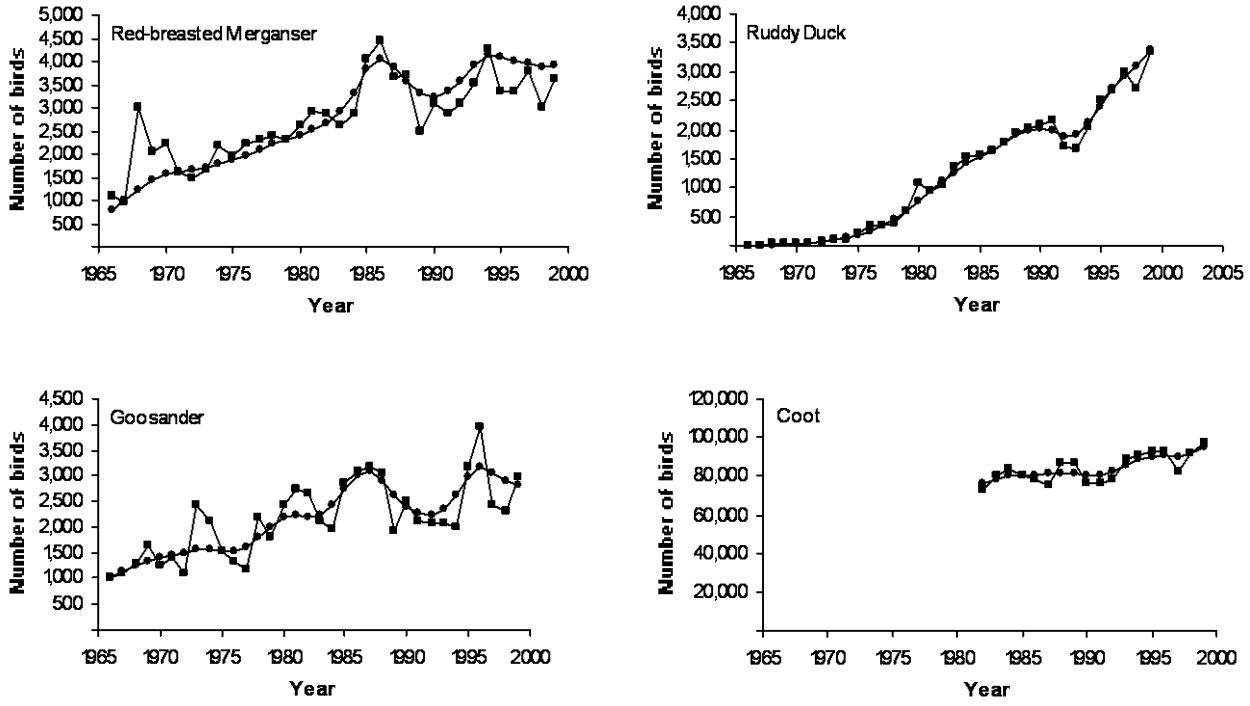

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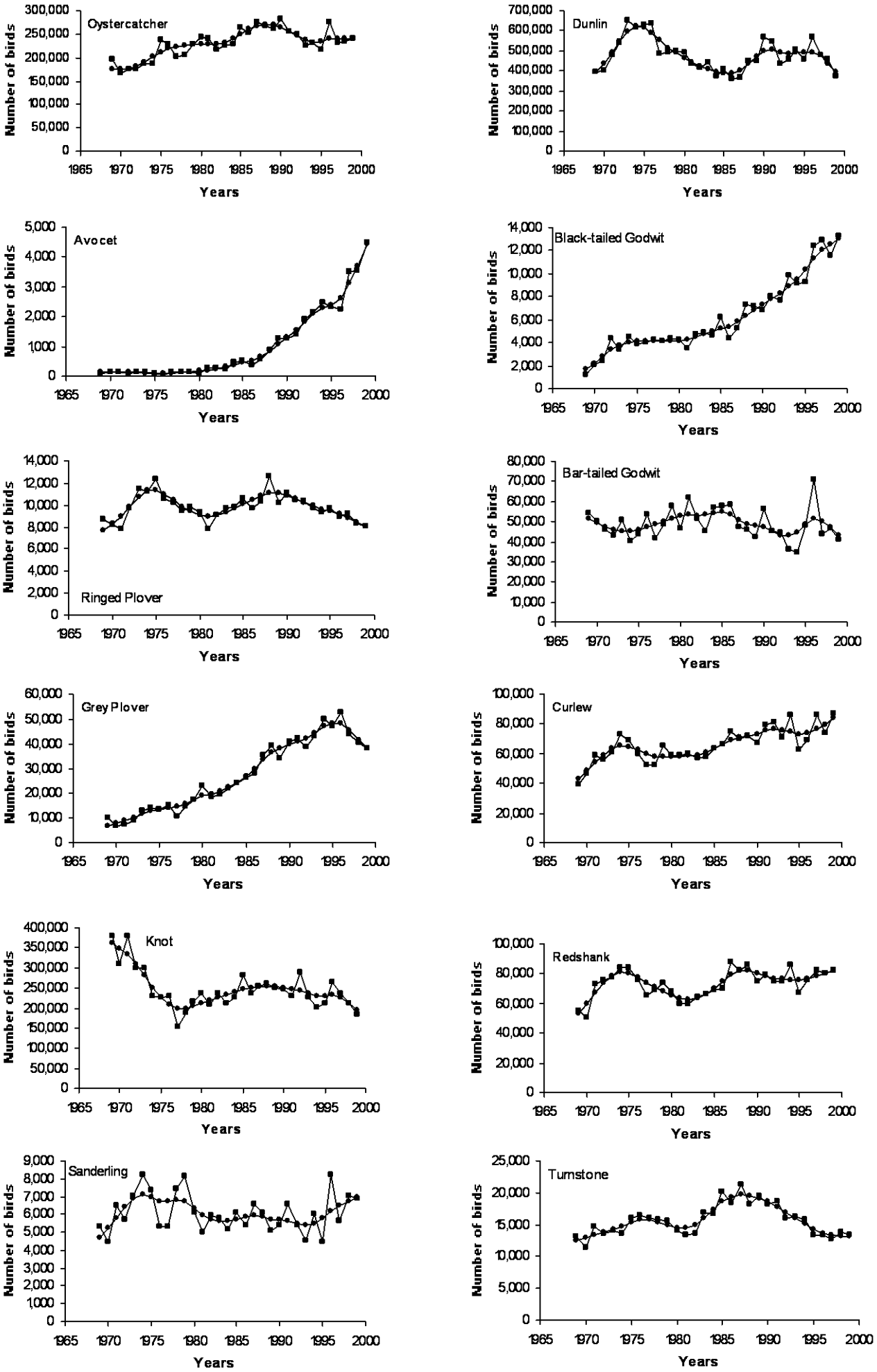


Figure 2.1 Continued.

3.1 Population Change and Alerts

Figure 3.1 shows the change in numbers of all regularly indexed waterbird species in England.

Table 3.1 shows Alerts and population change calculated using both Underhill and GAM methods for all of these species over 5, 10, 25 and all years.

- No species have generated a High Alert
- New Medium Alerts have been issued for Pintail, Ringed Plover and Dunlin.
- European White-fronted Goose, Mallard, Knot and Turnstone continue to trigger Medium Alerts
- All other species are stable or increasing (mostly increasing).

3.2 Species Generating a 50% Alert using GAMs

In England, no waterbird species that are regularly indexed using the WeBS scheme have generated a 50% Alert.

3.3 Species Generating a 25% Alert using GAMs

European White-fronted Goose **GB Situation: Decrease interspersed by stable periods**

The European White-fronted Goose triggered Medium Alerts over 10 years and all years. As there are only two main wintering sites in England, the impact of missing counts or poor-quality counts is likely to have a large effect on the overall index (see Chapter 2 for further details).

The coverage for this species may also not reflect the true situation. In recent winters, a greater proportion of the UK's population has been wintering at sites such as North Warren & Thorpness Mere, Walland Marsh and Heigham Holmes (1998/99 WeBS Report). These are not covered by the WeBS Alerts because they do not have the requisite number of counts associated with them. For sites to be included, the need to have been counted on more than 50% of available occasions.

Numbers of the English part of the River Severn (the main English wintering site) have undergone a recent decline. Numbers were initially high at approximately 6000 birds during the late 1960s and early 1970s but declined to between 2,000-3,000 birds in the early 1970s. Numbers then steadily rose to a peak of circa 4,000 birds in the early 1990s, after which they declined to their current level of 1,500 birds.

Numbers of the Swale and the North Kent Marshes have fluctuated since counts began in 1978/79 but declined from 2000 to 450 birds in the 1999/2000 winter.

Mallard **GB Situation: Recent decrease**

Mallard have continued to trigger a Medium Alert over a 10 year period and also raised a new Medium Alert over all years. After a period of relative stability during the 1970s and the first half of the 1980s, the smoothed number of Mallard reached their lowest total in the 1991/92 winter. The reasons for this are unclear but see the UK account in Chapter 2 for further details.

Pintail **GB Situation: Increase followed by decrease**

Pintail are a species that can show very large annual changes in number. However, the smoothed index has shown a steady decline since 1983/84 which followed a six-fold increase in numbers from 1966/67 to 1983/84. Numbers are currently still approximately double those counted during the early years.

Ringed Plover **UK Situation: Fluctuating with recent decrease**

Ringed Plover have fluctuated in numbers since counts began in 1969/70, but in line with Turnstone have undergone a period of sustained decline since the mid-1980s. See the UK account in Chapter 2 for a further discussion.

Dunlin **UK Situation: Fluctuating with recent decrease**

The majority of the UK's Dunlin winter on English estuaries and the pattern of changing abundance mirrors that for the United Kingdom. A 25-year Medium Alert has been triggered because of a sudden recent down turn in the index. Dunlin numbers in 1999/2000 were the second-lowest ever recorded. The reasons for this sudden decrease are unknown but may be a result of natural population fluctuations. Without demographic information it is not possible to comment further.

Knot **UK Situation: Decrease followed by stability**

Knot continued to trigger a Medium Alert over all years indicating a moderate long-term decline. Numbers underwent a sharp decline in the early 1970s which has been attributed to increased mortality in the breeding areas. Numbers have not recovered since, thus triggering an Alert over all years. See UK account in Chapter 2 for further details.

Turnstone **UK Situation: Increase followed by decrease**

Turnstone have undergone a recent decline in England, thus triggering a 25% Alert over 10 years. The numbers of birds in England increased from 8,000 birds at the start of counts to a peak of 12,000 birds in the mid 1980s. Since then there was a decline to 8,500 in 1995/96 and numbers have remained at this level over the following three winters. These changes have been mirrored in other UK regions.

Table 3.1 Percentage change and Alerts over 5,10, 25 and all years of counts. For interpretation of symbols see section 1.6. Population size refers to the average number of birds per month recorded on the WeBS sites used.

ENGLAND	First Year	Last Year	5-year change	10-year change	25-year change	All year change	5-year Alert	10-year Alert	25-year Alert	All year Alert
Little Grebe	1985	1999	18	76	N/A	619		++	N/A	++
Great Crested Grebe	1982	1999	0	16	N/A	51			N/A	++
Cormorant	1986	1999	0	32	N/A	180		+	N/A	++
Mute Swan	1966	1999	23	51	124	94		++	++	++
Bewick`s Swan	1966	1999	26	-1	229	329	+		++	++
Whooper Swan	1966	1999	159	237	481	756	++	++	++	++
European White-fronted Goose	1966	1999	-16	-39	-21	-50		!		!
Feral Greylag Goose	1966	1999	47	126	>1000	>1000	+	++	++	++
Canada Goose	1966	1999	9	10	263	598			++	++
Dark-bellied Brent Goose	1966	1999	-16	-17	103	285			++	++
Shelduck	1966	1999	-21	-21	7	20				
Wigeon	1966	1999	-9	28	71	56		+	++	++
Gadwall	1966	1999	44	92	832	>1000	+	++	++	++
Teal	1966	1999	12	16	113	353			++	++
Mallard	1966	1999	-12	-29	-25	-25		!		!
Pintail	1966	1999	-10	-33	-26	249		!	!	++
Shoveler	1966	1999	8	7	50	155			+	++
Pochard	1966	1999	1	7	14	10				
Tufted Duck	1966	1999	10	14	11	88				++
Goldeneye	1966	1999	4	14	81	124			++	++
Red-breasted Merganser	1966	1999	18	34	145	575		+	++	++
Goosander	1966	1999	0	40	162	194		+	++	++
Coot	1982	1999	10	20	N/A	27			N/A	+
Oystercatcher	1969	1999	7	-11	14	44				+
Avocet	1969	1999	93	311	>1000	>1000	++	++	++	++
Ringed Plover	1969	1999	-21	-30	-30	17		!	!	
Grey Plover	1969	1999	-18	4	218	511			++	++
Knot	1969	1999	-13	-23	0	-41				!
Sanderling	1969	1999	29	23	-3	51	+			++
Dunlin	1969	1999	-22	-19	-35	9			!	
Black-tailed Godwit	1969	1999	47	101	261	937	+	++	++	++
Bar-tailed Godwit	1969	1999	6	-1	38	3			+	
Curlew	1969	1999	8	19	28	101			+	++
Redshank	1969	1999	4	6	9	57				++
Turnstone	1969	1999	-12	-28	-8	1		!		

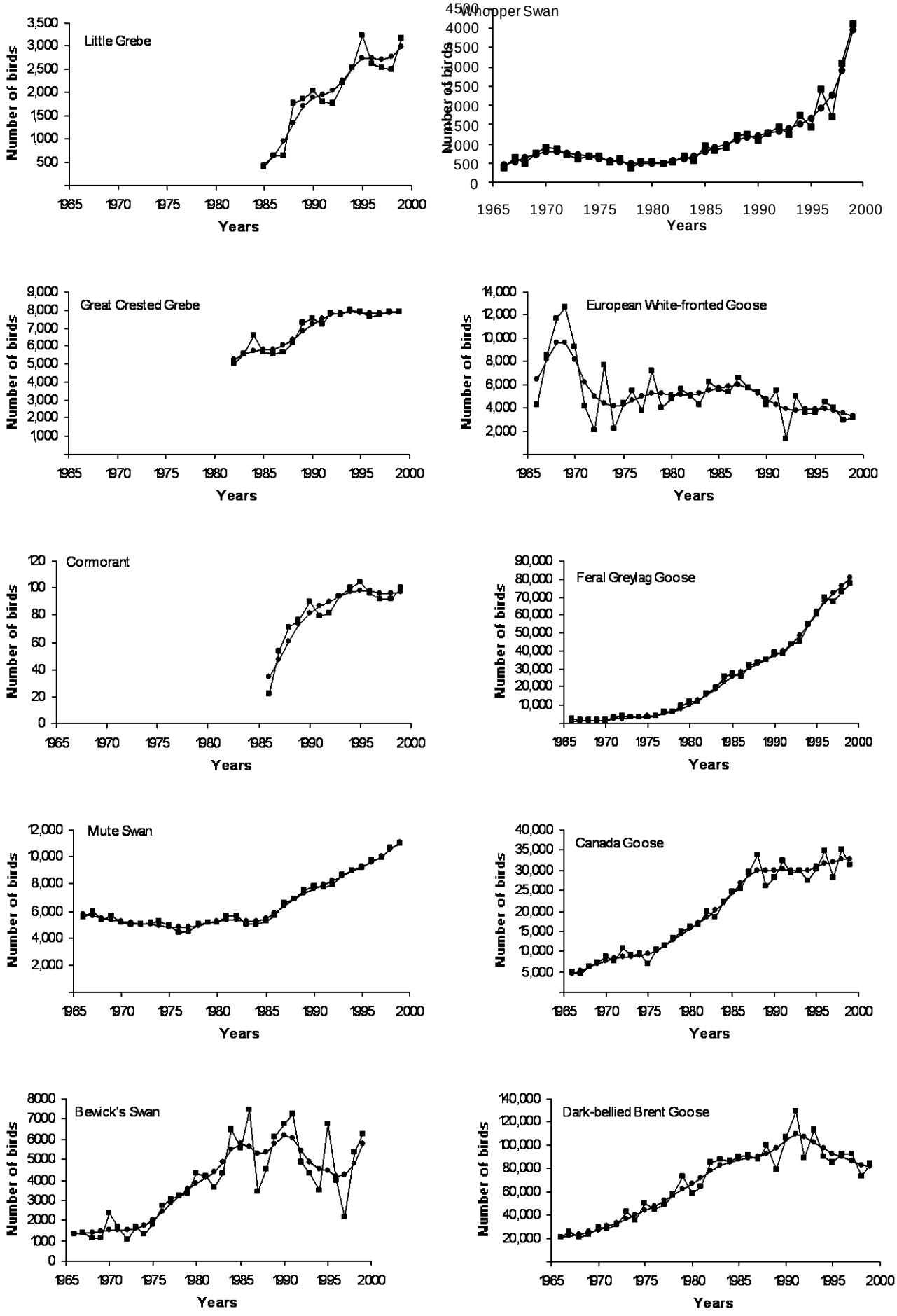
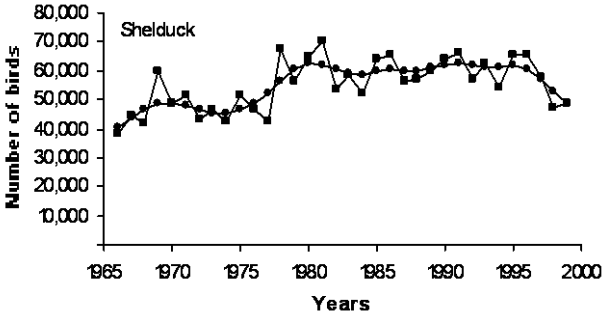
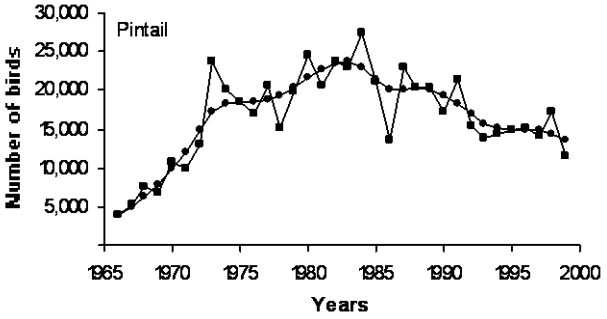
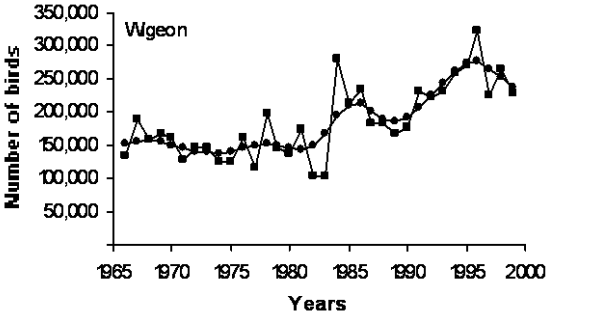
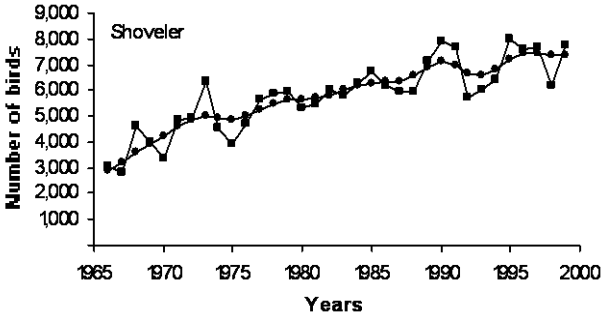


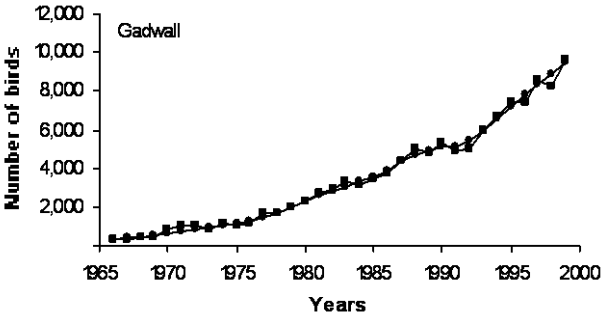
Figure 3.1 English waterbird Underhill and smoothed GAM indices for regularly indexed wildfowl species. ■ = mean number of birds recorded per month, ● = smoothed average number of birds.

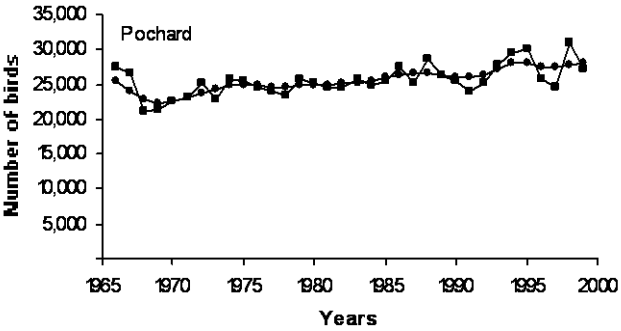


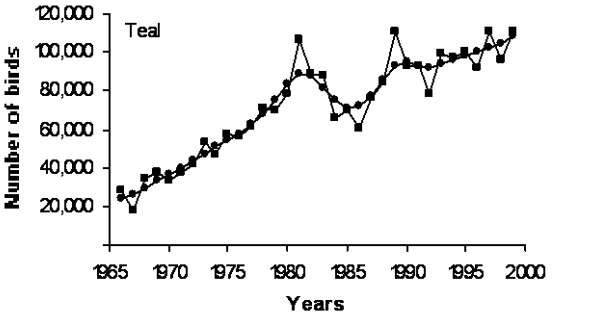


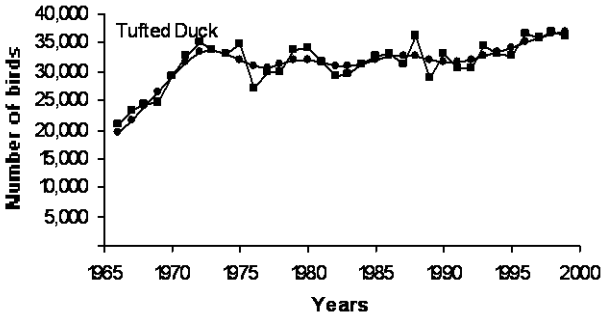


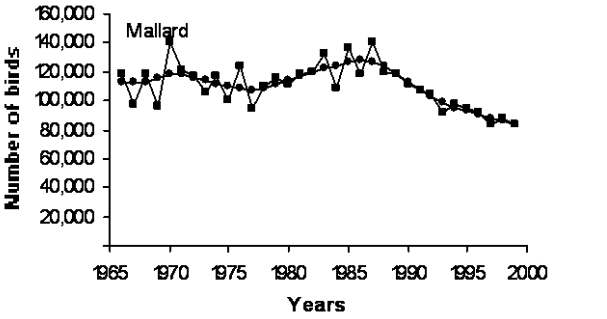












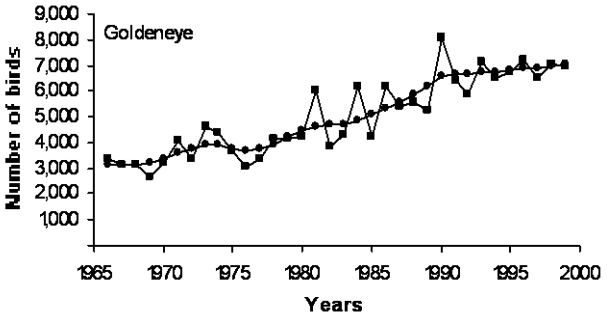
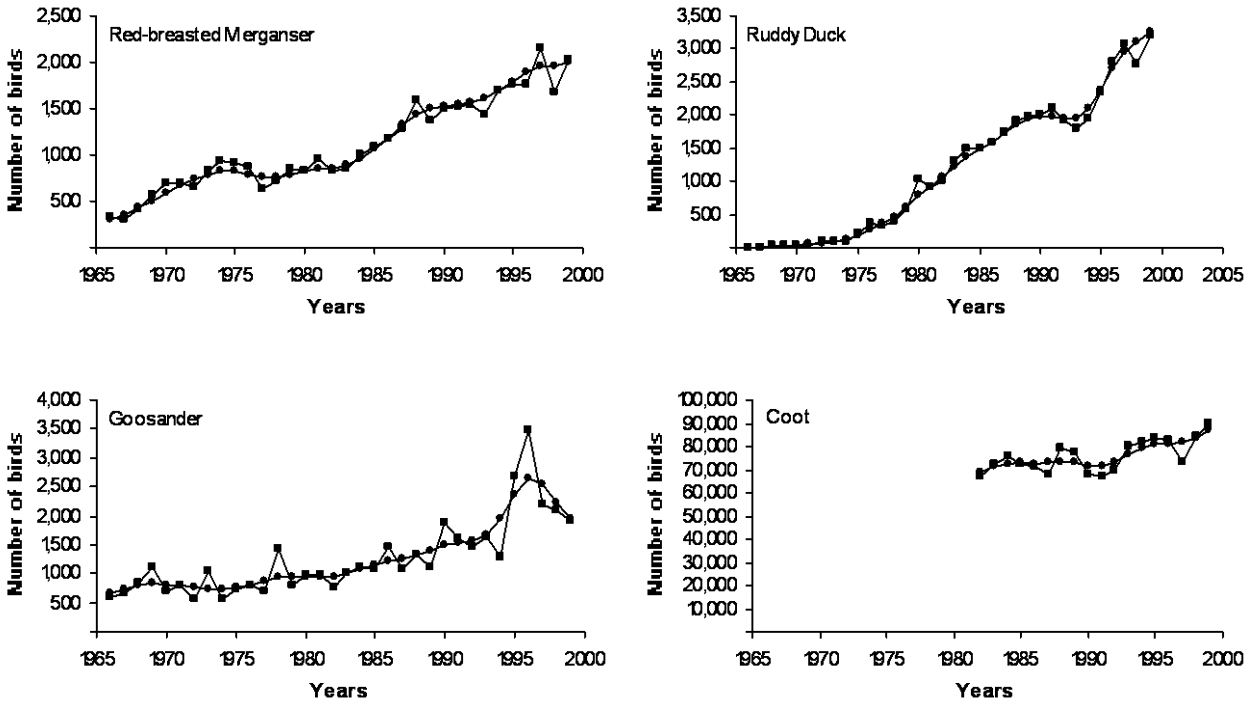


Figure 3.1 Continued.



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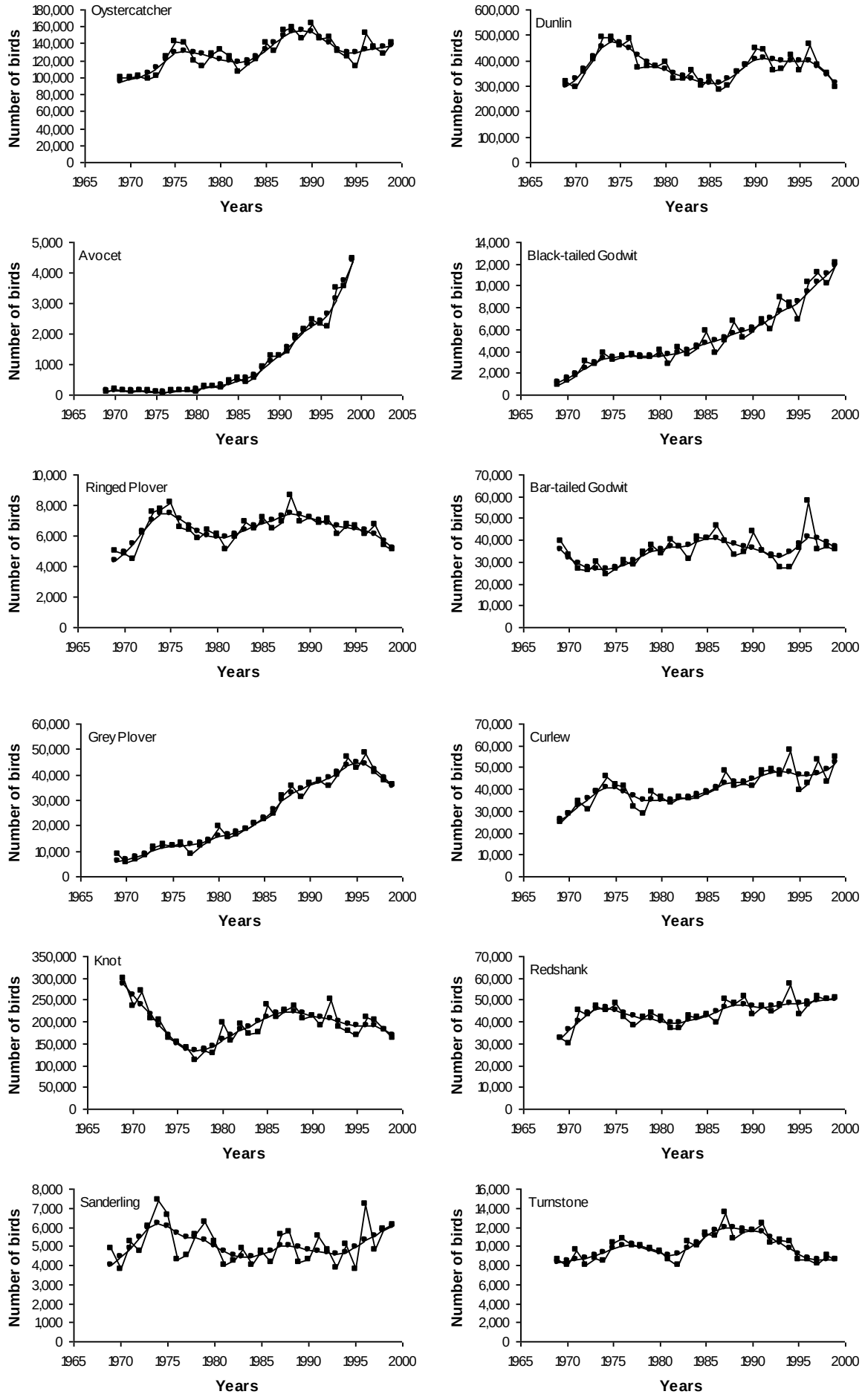


Figure 3.1 Continued.

4. NORTHERN IRELAND

4.1 Population Change and Alerts

Figure 4.1 shows the changes in number of all regularly indexed waterbird species in Northern Ireland.

Table 4.1 shows the Alerts issued for Northern Ireland waterbirds.

Table 4.2 shows the 5, 10, 25 and all year Alerts (see Chapter 1 for details).

There has been an improvement in the number of Alerts issued for Northern Ireland. A general upturn in waterbird numbers led to Alerts for Little Grebe, Shoveler, Goldeneye and Sanderling being removed. The remaining species had their status unaffected.

Three species have triggered negative 50% Alerts, nine more species generated negative 25% Alerts using GAMs. The remaining species are either stable or increasing.

- High Alerts are reissued for: Bewick's Swan, Knot and Bar-tailed Godwit.
- Medium Alerts are reissued for: Whooper Swan, Gadwall, Pochard, Ringed Plover, and Turnstone.
- The status of Little Grebe, Shoveler, Goldeneye and Sanderling improved so that previous Alerts have been removed.

4.2 Species Generating a High Alert

The All Ireland situation for Alert species was taken from I-WeBS.

Bewick's Swan **All Ireland Situation: Increase**
On the WeBS sites used for this analysis, Bewick's Swans have shown a very large decline, decreasing from an average of 400-500 birds per month in the late 1980s and early 1990s to less than 50 birds in 1998/99. Numbers have declined on Lough Neagh & Lough Beg and Lough Foyle, two of the main sites in Northern Ireland for this species. There is no evidence of a recovery.

Knot **All Ireland Situation: Moderate increase**
From the start of counts in 1970/71 there was a steady decline in the number of wintering Knot from 10,000-15,000 birds to less than 2,000 in the late 1980s. Numbers then recovered with a very large peak of 30,000 birds in 1995/96 before declining to 5,000-7,000 birds. The 25 year Alert reflects the pattern of long-term decline from the start of the counts.

Bar-tailed Godwit **All Ireland Situation: Moderate increase**
Bar-tailed Godwits triggered a High Alert over the whole period of counting. There has been a consistent decline in numbers over this period from 4,000-5,000 birds in 1970/71 to 1,000 birds in 1999/2000.

4.3 Species Triggering a Medium Alert

Whooper Swan **All Ireland Situation: Large fluctuations**

Whooper Swans have shown a consistent decline in numbers from approximately 2,000 birds at the start of counts in 1986/87 to 1,000 birds in 1998/99. This decline has triggered Alerts over 10 and all years. The Waterbird Alert System covers two of the three SPAs cited for Whooper Swan (Lough Foyle and Lough Neagh & Lough Beg) but does not cover Upper Lough Erne. However, these former two sites hold most birds in Northern Ireland (I-WeBS) and the change is still likely to be significant across the country.

Gadwall **All Ireland Situation: Large increase**

Two sites, Lough Neagh & Lough Beg and Strangford Lough are important for Gadwall in Northern Ireland, although none support an average population larger than the international importance threshold of 300 birds. Numbers of Gadwall increased from the start of counts to a peak of *c*200 birds per month in 1994/95. Numbers have since dropped, triggering a Medium Alert over the past five years. The population at Strangford Lough has remained relatively stable but has declined on Lough Neagh & Lough Beg.

Pochard **All Ireland Situation: Large fluctuations**

Counts of Pochard have been characterised by an increase in numbers followed by a decrease to a similar numbers of birds as at the start of counts. Counts have been low in the past few years, thus triggering an Alert over a 10 year period. Although a longer series of data would be needed to be confident, there does seem to be have been a downward trend in numbers from 1991/92. Lough Neagh and Lough Beg are the most important site in the UK for this species, holding between 20,000 and 25,000 birds and decline there will have contributed most to the change in the Northern Irish total. In comparison, Abberton Reservoir, the next most important UK site, only supports 2,000-3,000 birds.

Ringed Plover **All Ireland Situation: Slight decrease**

Although very variable from year to year, Ringed Plover numbers increased from the 500-600 birds at the start of counts to a peak of over 900 in 1984/95. Numbers then declined to the current level of 400-600 birds, thus triggering a Medium Alert over 10 years.

Turnstone **All Ireland Situation: Moderate increase**

Turnstone numbers have changed in line with the national index. Numbers fell from 1,500 to 1,000 birds from the start of counts to the mid-1970s before rising to a peak of 2,000-2,500 birds in the mid- to late-1990s. Numbers fell from 1990/91 to around 1,000 birds, half the previous peak level. The reasons for this decline are unclear but the change in numbers across the UK may be related to changes in winter climatic conditions (BTO, unpublished data).

Table 4.1 The Alert status of waterbird species in the current winter (1999/2000) and the previous winter (1998/1999). This table indicates the highest priority Alert issued for each species irrespective of the time period over which it occurred, i.e. if both High and Medium Alerts were issued for a species, only the High Alert is shown. For a breakdown of changes over different time periods, see Table 4.2. Arrows indicate any change in Alert status between years: ⇑ - a higher alert status; ⇓ - a lower alert status; ⇔ no change between years.

Species	1998/99 Status	1999/2000 Status	Direction
Little Grebe	Medium Alert		⇓
Great Crested Grebe			
Cormorant			
Mute Swan			
Bewick's Swan	High Alert	High Alert	⇔
Whooper Swan	Medium Alert	Medium Alert	⇔
European White-fronted Goose			
Feral Greylag Goose			
Canada Goose			
Dark-bellied Brent Goose			
Light-bellied Brent Goose			
Shelduck			
Wigeon			
Gadwall	Medium Alert	Medium Alert	⇔
Teal			
Mallard			
Pintail			
Shoveler	Medium Alert		⇓
Pochard	Medium Alert	Medium Alert	⇔
Tufted Duck			
Goldeneye	Medium Alert		⇓
Red-breasted Merganser			
Goosander			
Ruddy Duck			
Coot			
Oystercatcher			
Medium Alert			
Ringed Plover	Medium Alert	Medium Alert	⇔
Grey Plover			
Knot	High Alert	High Alert	⇔
Sanderling	Medium Alert		⇓
Dunlin			
Black-tailed Godwit			
Bar-tailed Godwit	High Alert	High Alert	⇔
Curlew			
Redshank			
Turnstone	Medium Alert	Medium Alert	⇔

Table 4.2 Percentage change and Alerts over 5,10, 25 and all years of counts. For interpretation of symbols see Section 1.6.

NORTHERN IRELAND	First Year	Last Year	5-year change	10-year change	25-year change	All year change	5-year Alert	10-year Alert	25-year Alert	All year Alert
Little Grebe	1986	1999	-19	4	N/A	160			N/A	++
Great Crested Grebe	1986	1999	12	57	N/A	66		++	N/A	++
Cormorant	1986	1999	82	91	N/A	476	++	++	N/A	++
Mute Swan	1986	1999	24	35	N/A	76		+	N/A	++
Bewick's Swan	1986	1999	-84	-95	N/A	-89	!!	!!	N/A	!!
Whooper Swan	1986	1999	-15	-26	N/A	-30		!	N/A	!
Light-bellied Brent Goose	1986	1999	26	15	N/A	162	+		N/A	++
Shelduck	1986	1999	30	40	N/A	137	+	+	N/A	++
Wigeon	1986	1999	34	-6	N/A	9	+		N/A	
Gadwall	1986	1999	-31	-23	N/A	61	!		N/A	++
Teal	1986	1999	26	-11	N/A	43	+		N/A	+
Mallard	1986	1999	-8	-7	N/A	11			N/A	
Pintail	1986	1999	59	41	N/A	146	++	+	N/A	++
Shoveler	1986	1999	-6	-1	N/A	25			N/A	+
Pochard	1986	1999	-1	-25	N/A	-1		!	N/A	
Tufted Duck	1986	1999	-18	-12	N/A	36			N/A	+
Goldeneye	1986	1999	-18	-36	N/A	-34		!	N/A	!
Red-breasted Merganser	1986	1999	-11	-13	N/A	30			N/A	+
Coot	1986	1999	20	16	N/A	57			N/A	++
Oystercatcher	1970	1999	62	36	229	211	++	+	++	++
Ringed Plover	1970	1999	24	-25	16	10		!		
Grey Plover	1970	1999	-16	68	292	-17		++	++	
Knot	1970	1999	-23	71	-69	-66		++	!!	!!
Sanderling	1970	1999	619	725	230	>1000	++	++	++	++
Dunlin	1970	1999	1	6	37	18			+	
Black-tailed Godwit	1970	1999	278	90	222	26	++	++	++	+
Bar-tailed Godwit	1970	1999	-42	-31	-64	-71	!	!	!!	!!
Curlew	1970	1999	82	11	4	-24	++			
Redshank	1970	1999	80	35	100	103	++	+	++	++
Turnstone	1970	1999	20	-42	13	-7		!		

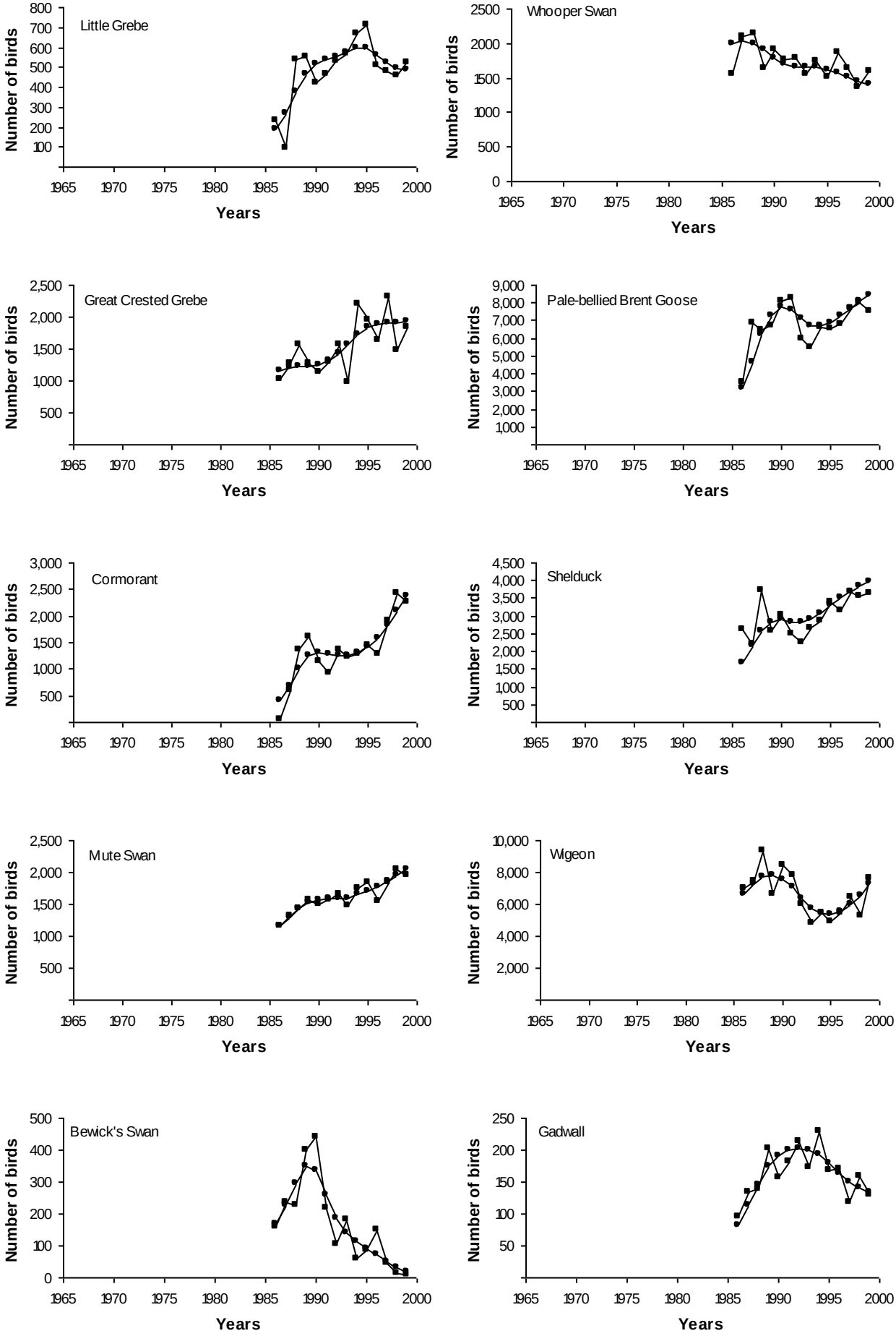
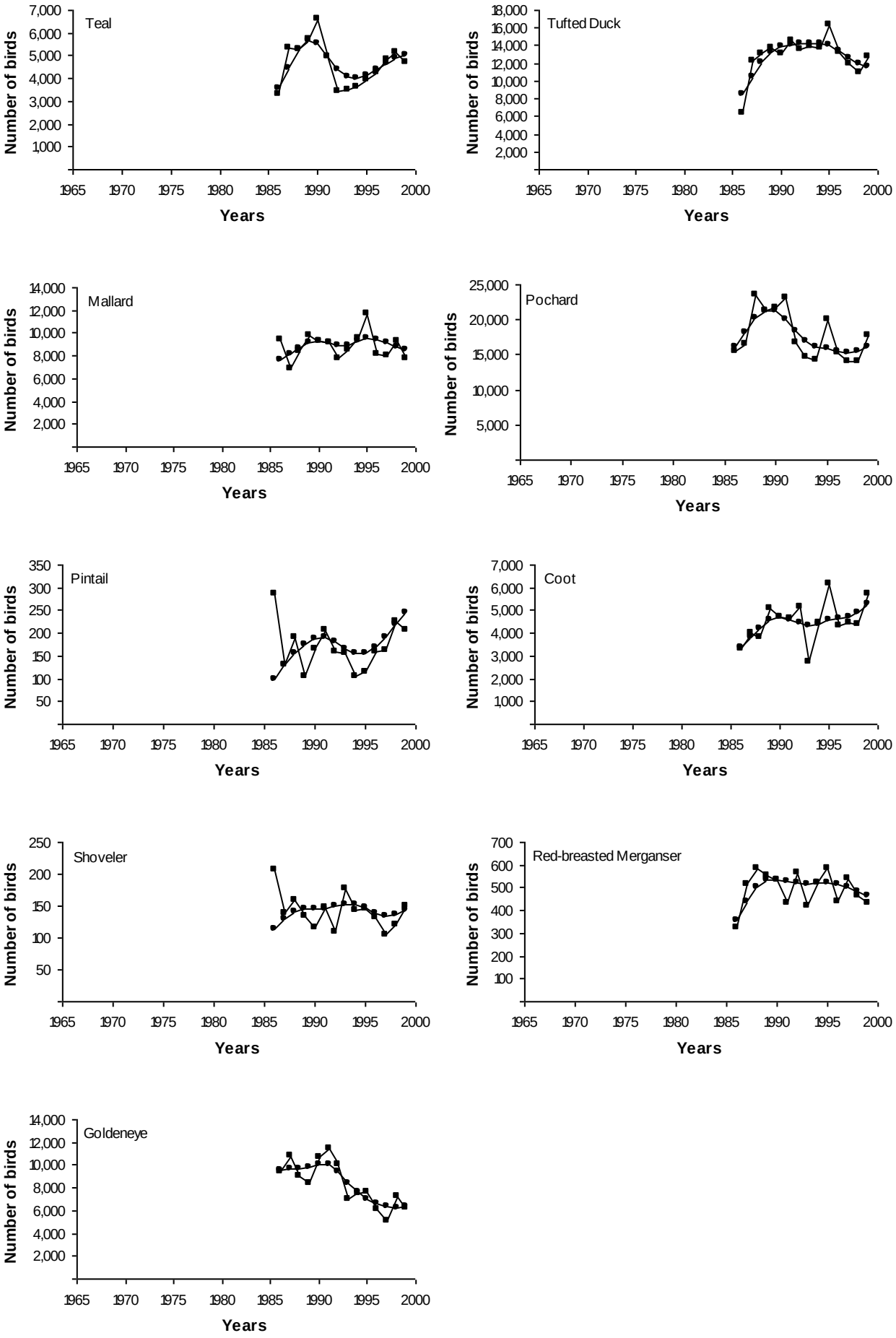


Figure 4.1 Changes in numbers of regularly indexed waterbirds in Northern Ireland (Underhill and smoothed). ■ = mean number of birds recorded per month, ● = smoothed average number of birds.



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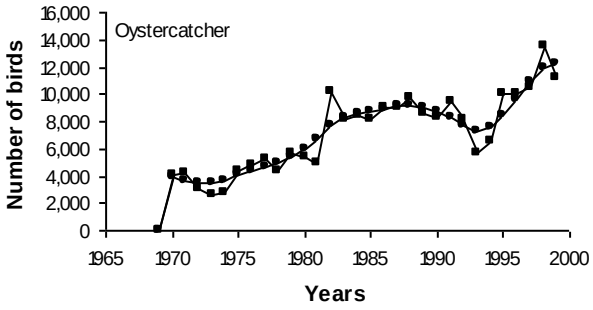
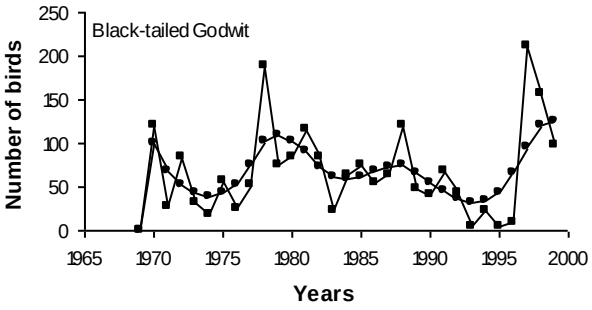
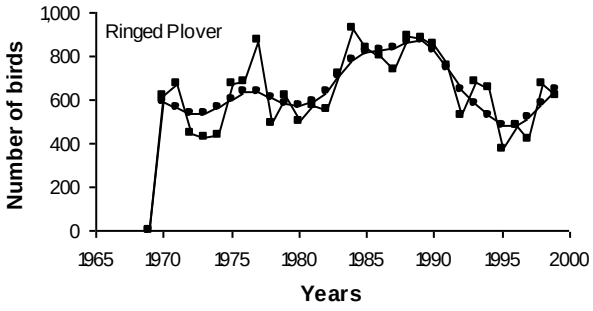
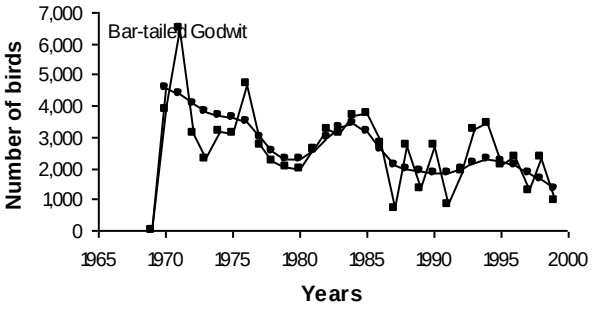
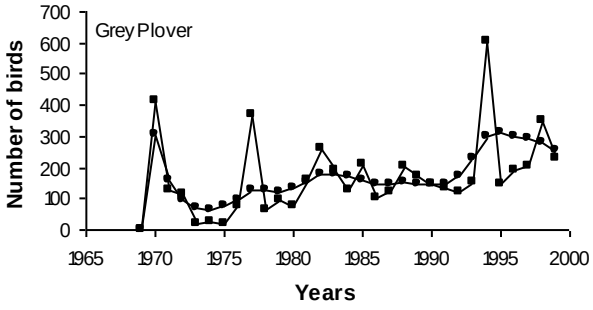
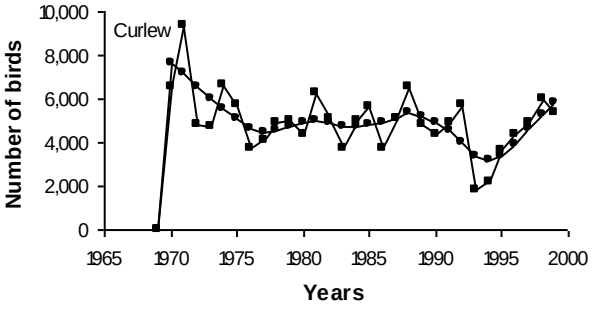


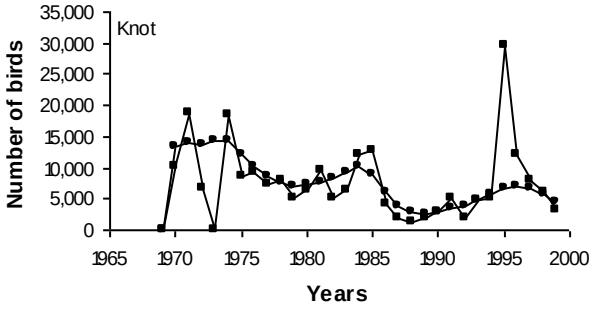


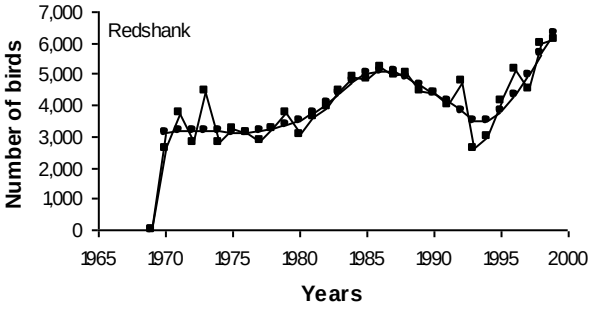


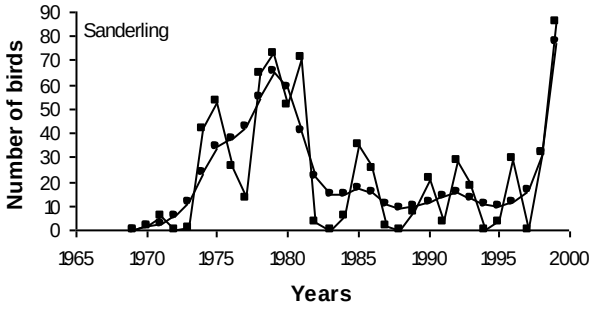












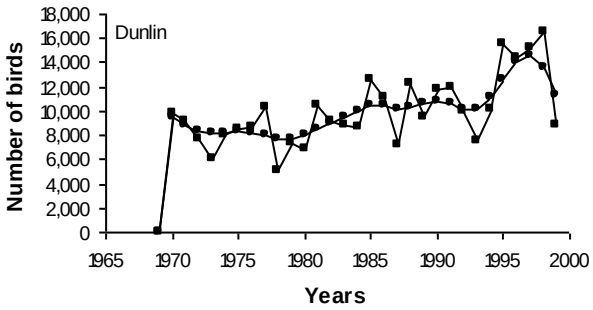


Figure 4.1 Continued.

5. SCOTLAND

5.1 Population Change and Country Alerts

Table 5.1 summarises the Alerts issued for Scotland for the current and previous winter.

Figure 5.1 shows the Underhill indices and smoothed GAM estimates of the population size of each regularly indexed species of waterbird in Scotland.

Table 5.2 details population change over 5, 10 and 25 years and raises country alerts for those species showing changes in their population of ± 25% (a Medium Alert) or ± 50% (a High Alert).

- Six High Alerts and 12 Medium Alerts (including one feral species) have been issued. No Alerts have been issued for eight species (Table 5.1).
- High Alerts have been reissued for Bewick's Swan, Whooper Swan, Shoveler, Pochard
- The status of Mallard has been raised to a High Alert, whereas that for Goosander has been lowered to a Medium Alert
- New Medium Alerts have been issued for Pintail and Goldeneye. Canada Goose also triggered a Medium Alert, but is a feral species.
- Tufted Duck and Red-breasted Merganser continue to trigger Medium Alerts.
- All other species are stable or increasing (mostly increasing).

5.2 Species Generating a High Alert

Two new High Alerts were issued (Knot and Mallard) and Goosander was reduced to a Medium Alert status.

Whooper Swan **GB Situation: Increasing**

Whooper Swans have undergone a decline over the past 10 years. From 1966/67 onwards there was a steady increase in the number of birds on Scottish WeBS sites to the mid-1980s. A rapid increase ensued to a peak of 3,000 birds in 1990/91, followed by a rapid decrease to current levels of *c*1,000 birds, similar to previous levels.

Bewick's Swan **GB Situation: Increase then stable**

Bewick's Swans are not a species that are usually associated with Scotland. However, from the early 1970s an increasing number of Bewick's Swans wintered on the Solway, peaking at approximately 50-60 birds in the early 1980s. From this time, numbers have declined to less than 5 birds in the past 5 years.

Mallard **GB Situation: Recent decrease**

Mallard numbers have remained stable over the past 25 years. However at the beginning of counts in 1966/67 it was estimated that approximately 40,000 birds per month wintered in Scotland. However the following three winters saw a decline in birds to approximately 25,000 birds. Numbers have remained reasonably stable since, although there has been a downward trend in the past ten winters, mirroring the national trend.

Pochard **GB Situation: Stable**

Pochard numbers have shown a very large decline in numbers since the early 1970s. At their peak approximately 14,000-18,000 birds wintered in Scotland but this number declined rapidly to the present level of *c*5,000 birds in only 5-6 years. Since then there have been small between-year fluctuations, but in the past few winters the number of birds has continued to decline.

Knot UK: Decrease followed by stability

Knot showed a consistent decline in numbers from 1969/70 to the mid-1980s followed by a period of stability or slight increase which has continued to this day. The 25 and all year 25% Alerts were triggered by this initial decline. The decline is significant in terms of the number of birds as numbers fell from a peak of 40,000 birds to the current level of *c*20,000 birds. These changes closely mirror the national trend.

5.3 Species Generating a Medium Alert

Pintail **GB Situation: Increase followed by decrease**

Scottish Pintail have continued their very rapid decline since 1996 and have declined by approximately a third since this date. However, these high levels were a result of a rapid increase from 1991 onwards and the current decline is returning numbers to previous levels. Pintail are an extremley mobile species. Numbers on a site can undergo rapid changes both within and between seasons.

Tufted Duck GB Situation: Stable

Tufted Duck numbers increased slightly in Scotland over the first 10 year of counts and then underwent a slow steady decrease, thus triggering the 25 year Medium Alert. Numbers have fallen from approximately 8,000 birds in the early- to mid-1970s to 6,000 birds currently. The decline has not been consistent between years but has been characterised by periods of stability interspersed by periods of decline.

Goldeneye GB Situation: Increasing

Goldeneye have triggered a Medium Alert over 25 years. In the 1970s, thousands of birds used to winter in the southern complex of the Firth of Forth but have declined as water quality improved.

Red-breasted Merganser GB Situation: Increasing

Mergansers have triggered a 25% five year Alert. Sea duck are notoriously difficult to count and the numbers on WeBS counts often fluctuate widely between years. In Scotland, as with the national picture, numbers have been characterised by sharp peaks and troughs in counts. In the last few years of counting, numbers were in a trough, thus triggering a 5 year Alert. Overall, the trend of Red-breasted Mergansers in Scotland is upwards as indicated by the 50% positive Alert triggered over 25 years.

Goosander **GB Situation: Increasing**

Goosander raised an alert due to a decline in the population since the 1987/88 winter. Prior to that this species underwent an increase from 300 birds to 1,750 birds in 1987/88. Goosander numbers fluctuate widely between years but the general trend was of an increase in the population on Scottish WeBS sites. Since 1988/89, numbers have remained steady at 500-1,000 birds.

Coot **GB Situation: Increase**

Coot have undergone a rapid decline over the past four winters and thus triggered a Medium Alert over 5 years. This fluctuation may be within the normal range for Coot in Scotland and further data is required to determine whether this represents a sustained decline or not.

Grey Plover **UK Situation: Increase followed by recent decrease**

In line with the recent national decrease, Grey Plover in Scotland have undergone a very rapid decline over the past four winters and have triggered a Medium Alert over 5 years. For a species that has shown year on year increases from 1969/70 to 1995/96, this decline is unprecedented and the causes for it unknown.

Dunlin **UK Situation: Fluctuating with recent decrease**

Dunlin numbers in Scotland have fluctuated in a broadly similar manner to the national situation. The 25 year Medium Alert has been triggered by the increase of birds during the mid 1970s and subsequent decline. Numbers are now at similar levels to the beginning of counts in 1969/70.

Bar-tailed Godwit **UK Situation: Stable**

The smoothed trajectory indicates that Bar-tailed Godwits have been in sustained decline in Scotland since 1981, thus triggering Alerts over 5, 10 and 25 year periods. The national trend is one of stability but large declines have also occurred in Wales and Northern Ireland.

Redshank **UK Situation: Stable**

Redshank have been increasing in Scotland since 1981/82 and the 25 year Medium Alert has been triggered because of very high numbers recorded during the period 1972/73-1977/78.

Turnstone **UK: Increase followed by decrease**

The changes in numbers of Turnstone in Scotland closely follow the national trend. Numbers increased from 1969/70 to 1990/91 and thereafter have declined, thus triggering a 10 year Alert. See Chapter 2 for a further discussion of changes in Turnstone numbers.

Table 5.1 The Alert status of waterbird species in the current winter (1999/2000) and the previous winter (1998/1999). This table indicates the highest priority Alert issued for each species irrespective of the time period over which it occurred, i.e. if both High and Medium Alerts were issued for a species, only the High Alert is shown. For a breakdown of changes over different time periods, see Table 5.2. Arrows indicate any change in Alert status between years: ⇑ - a higher alert status; ⇓ - a lower alert status; ⇔ no change between years.

Species	1998/99 status	1999/2000 status	Change in Alert status
Little Grebe			
Great Crested Grebe			
Cormorant			
Mute Swan			
Bewick's Swan	High Alert	High Alert	⇔
Whooper Swan	High Alert	High Alert	⇔
Canada Goose		(Medium Alert)	
Shelduck			
Wigeon			
Gadwall			
Teal			
Mallard	Medium Alert	High Alert	⇑
Pintail		Medium Alert	⇑
Shoveler	High Alert	High Alert	⇔
Pochard	High Alert	High Alert	⇔
Tufted Duck	Medium Alert	Medium Alert	⇔
Goldeneye		Medium Alert	
Red-breasted Merganser	Medium Alert	Medium Alert	⇔
Goosander	High Alert	Medium Alert	⇓
Coot		Medium Alert	⇑
Oystercatcher			
Avocet			
Ringed Plover			
Grey Plover		Medium Alert	⇑
Knot	Medium Alert	High Alert	⇑
Sanderling			
Dunlin		Medium Alert	⇑
Black-tailed Godwit			
Bar-tailed Godwit		Medium Alert	⇑
Curlew			
Redshank		Medium Alert	⇑
Turnstone	Medium Alert	Medium Alert	⇔

Table 5.2 Percentage change and Alerts over 5,10, 25 and all years of counts. For interpretation of symbols see section 1.6.

SCOTLAND	First Year	Last Year	5-year change	10-year change	25-year change	All year change	5-year Alert	10-year Alert	25-year Alert	All year Alert
Little Grebe	1985	1999	11	88	.	285		++	N/A	++
Great Crested Grebe	1982	1999	-10	2	.	45			N/A	+
Cormorant	1986	1999	-11	-4	.	49			N/A	+
Mute Swan	1966	1999	19	13	59	60			++	++
Bewick`s Swan	1966	1999	-95	-98	-99	-99	!!	!!	!!	!!
Whooper Swan	1966	1999	-20	-67	-25	-28		!!	!	!
Canada Goose	1966	1999	-34	-29	360	49858	!	!	++	++
Shelduck	1966	1999	-12	-11	7	125				++
Wigeon	1966	1999	-2	-4	36	-9			+	
Gadwall	1966	1999	-13	104	114	520		++	++	++
Teal	1966	1999	18	24	142	250			++	++
Mallard	1966	1999	-1	-16	-15	-51				!!
Pintail	1966	1999	-28	46	-19	61	!	+		++
Shoveler	1966	1999	-27	-8	-14	-55	!			--
Pochard	1966	1999	-49	-51	-83	-68	!	!!	!!	!!
Tufted Duck	1966	1999	-20	-22	-37	-7			!	
Goldeneye	1966	1999	-17	0	-43	70			!	++
Red-breasted Merganser	1966	1999	-32	-2	106	201	!		++	++
Goosander	1966	1999	0	-43	-25	104		!	!	++
Coot	1982	1999	-26	-23	.	4	!		N/A	
Oystercatcher	1969	1999	4	7	26	60			+	++
Avocet	1969	1999	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ringed Plover	1969	1999	-8	-9	6	54				++
Grey Plover	1969	1999	-44	-12	146	662	!		++	++
Knot	1969	1999	-19	10	-40	-51			!	!!
Sanderling	1969	1999	83	44	128	61	++	+	++	++
Dunlin	1969	1999	-16	4	-39	22			!	
Black-tailed Godwit	1969	1999	72	113	226	511	++	++	++	++
Bar-tailed Godwit	1969	1999	-29	-33	-34	-19	!	!	!	
Curlew	1969	1999	20	32	35	176		+	+	++
Redshank	1969	1999	16	4	-27	58			!	++
Turnstone	1969	1999	-23	-33	-16	42		!		+

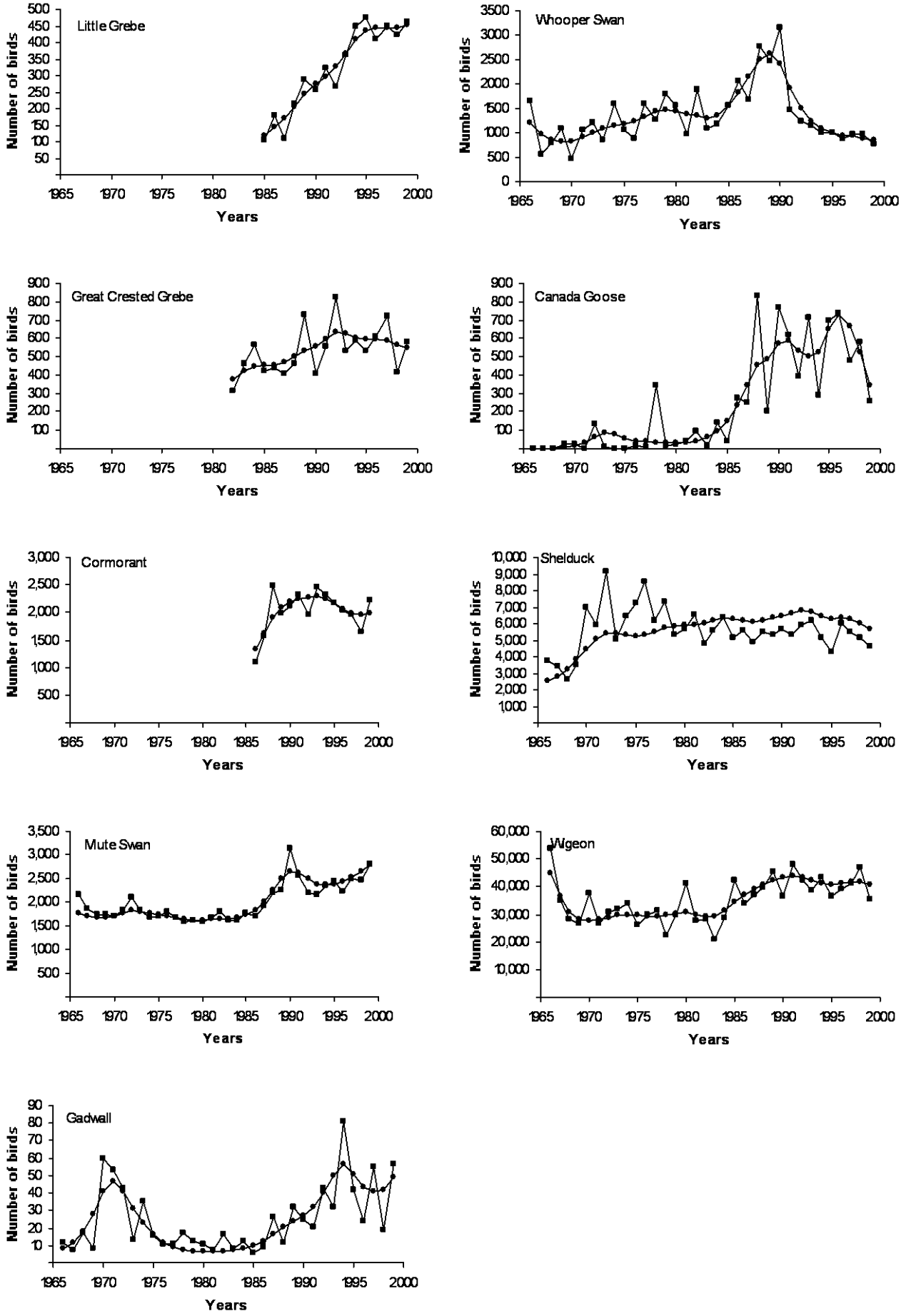
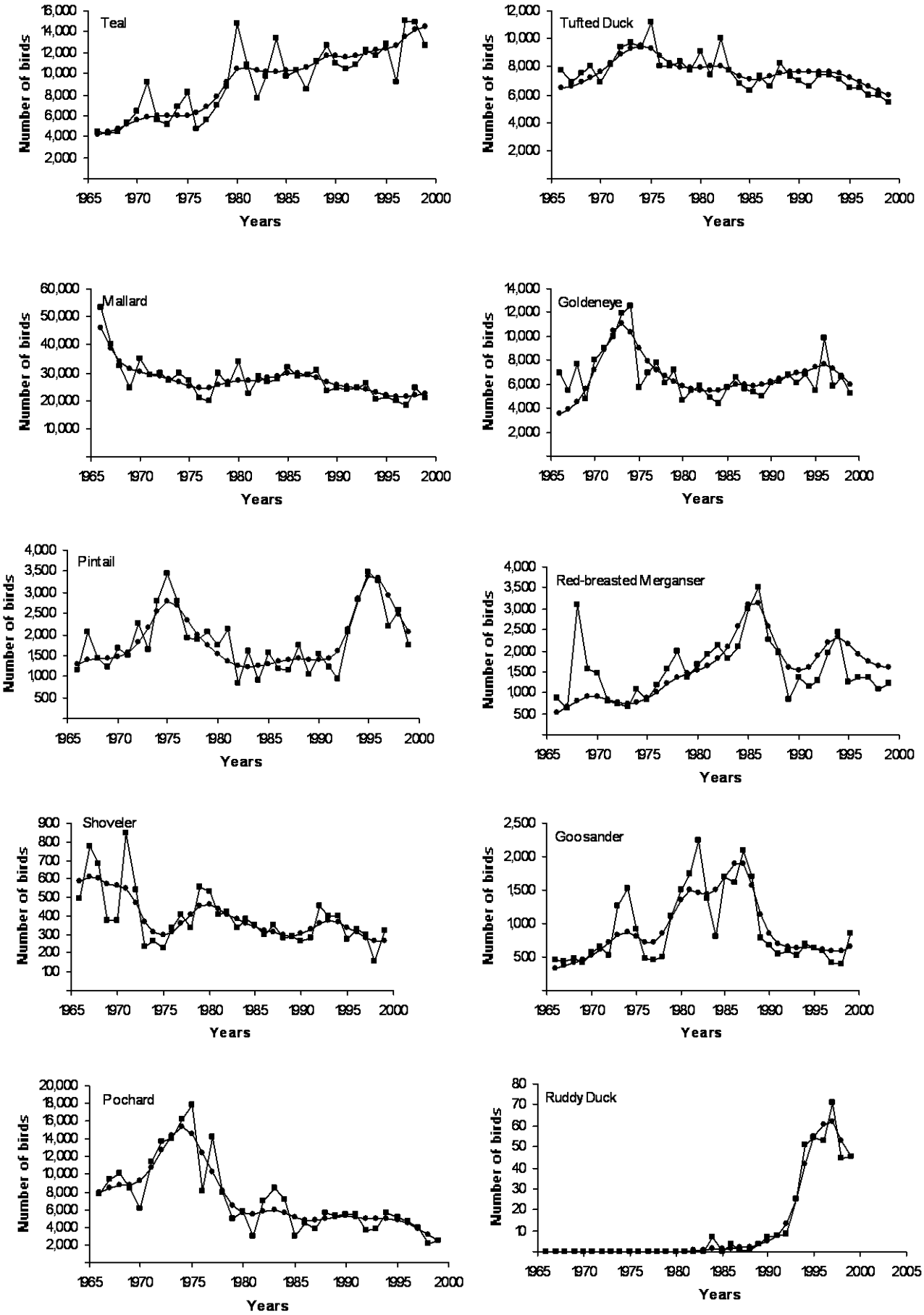


Figure 5.1 Changes in the average number of birds recorded per month on WeBS sites in Scotland (Underhill & smoothed GAM). ■ = mean number of birds recorded per month, ● = smoothed average number of birds.



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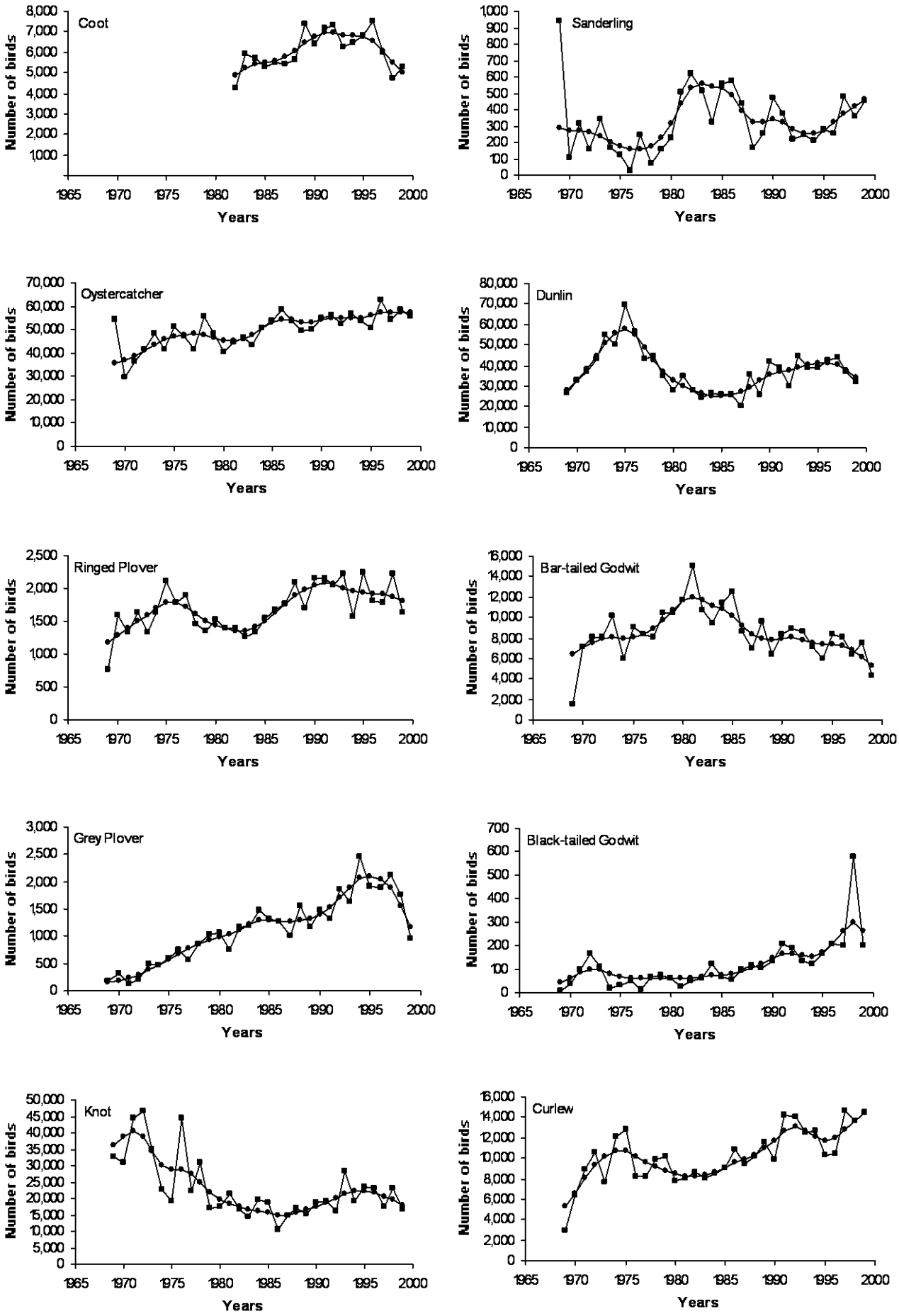

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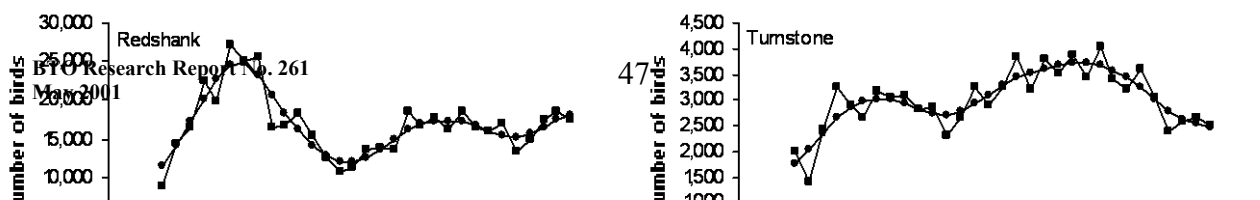


Figure 5.1 Continued.

6. WALES

6.1 Population Change and Alerts

Table 6.1 shows the Alert status of birds for the current winter and the previous winter and the change between them.

Figure 6.1 shows the changes in number of all regularly indexed waterbird species in Wales.

Table 6.2 shows the population change and 5, 10, 25 and all year Alerts generated by using GAMs (see Chapter 1 for details).

- High Alerts have been issued for seven species: European White-fronted Goose, Pochard, Ringed Plover, Grey Plover, Knot, Dunlin and Bar-tailed Godwit.
- Medium Alerts have been issued for six species: Cormorant, Mallard, Oystercatcher Sanderling, Redshank and Turnstone.
- Feral Greylag Goose and Wigeon and Shoveler improved their status and previous Alerts have been removed.
- Only two of the eleven commonly occurring shorebirds are not triggering Alerts in Wales.
- All other species are stable or increasing.

6.2 Species Generating a High Alert

Bewick's Swan and Whooper Swan
Very small numbers of both of these species (<100) have wintered in Wales. Although High Alerts were issued, the number of birds occurring in Wales is too small and these Alerts should be disregarded.

European White-fronted Goose **GB Situation: Decreasing**
Numbers of White-fronted Goose in Wales have deceased dramatically from a peak of 1,500 birds in the early 1970s to less than 10 in recent years. This has resulted in a High Alert over all periods considered - see comments under the UK section in Chapter 2.

Pochard **GB Situation: Stable**
Pochard in Wales have shown a long-term, but fluctuating, decline in numbers and a High Alert has been issued as numbers have declined by approximately 70% since the start of counts. Numbers fell from 1,800 in the 1960s to around 800 by the late 1970s. A subsequent increase to numbers of between 1,000 and 1,700 has been followed by a further fluctuating decline.

Ringed Plover **UK Situation: Stable**
After initial fluctuations, numbers of Ringed Plover in Wales have shown a steady decline, dropping from 1,500 birds in the 1970s to 500 at present. This has resulted in 50% Alerts over 10-year and 25-year periods and for all years combined and a 25% alert for the last five years. The distribution of these waders is moving eastward with warming winters.

Knot **UK Situation: Decrease followed by stability**

Knot numbers in Wales have fluctuated greatly from year to year, but have shown an overall downward trend. Numbers peaked at almost 50,000 in the 1970s, but had declined to less than 10,000 by the last two winters. The smoothed index has indicated declines of over 50% over 10-year and 25-year periods and for all years combined and a decline of over 25% in the last five years.

Bar-tailed Godwit **UK Situation: Stable**

Bar-tailed Godwit numbers in Wales have dropped from over 6,000 in the early 1970s to less than 1,000 since the mid-1980s. The smoothed index shows that numbers have been more stable since then, but has indicated declines of over 50% over the last 25 years and for all years combined.

6.3 Species Triggering a Medium Alert

Cormorant **GB Situation: Increase then decrease**

Numbers of Cormorants in Wales rose from less than 200 in 1986/87 to almost 900 in 1994/95. A subsequent decline to less than 500 has resulted in a 25% Alert being triggered for the past five years. Over all years considered, however, the species has still shown an upward trend of over 50%.

Feral Greylag Goose **GB Situation: Increasing**

The population of feral Greylag Geese in Wales has shown an upward but fluctuating trend since the 1960s, when less than 100 were counted. The population had reached 2,500 by the late 1980s, but has declined since, triggering a 25% Alert for the past 10-year period. Over the past 25 years and all years combined, however, the population has shown increases of over 50%.

Wigeon **GB Situation: Increasing**

Numbers of Wigeon in Wales have shown long-term fluctuations, rising to a peak of over 35,000 in 1986/87 but declining subsequently to previous levels of 10-20,000. The smoothed index indicates a decline of over 25% over the past 10-year period but an increase of over 25% over all years considered.

Mallard **GB Situation: Recent decrease**

Mallard numbers in Wales rose to over 6,000 by the early 1980s but have since gradually declined to present levels of around 3,000. 25% Alerts have been triggered for the past five- and 10-year periods.

Pochard **GB Situation: Stable**

Pochard in Wales have shown a long-term, but fluctuating, decrease in numbers and an Alert has been issued for a drop of over 25% for all years considered. Numbers fell from 1,800 in the 1960s to around 800 by the late 1970s. A subsequent increase to numbers of between 1,000 and 1,700 has been followed by a further fluctuating decline.

Oystercatcher **UK Situation: Increasing**

Oystercatcher numbers in Wales rose from under 40,000 in the 1970s to over 50,000 during the 1980s. A decline of over 25% since then to 1970s levels has given rise to a 5 and 10 year Medium Alert.

Grey Plover **UK Situation: Increase with recent decrease**

Grey Plover numbers in Wales have fluctuated widely from year to year, but when smoothed, they showed a pattern of gradual increase until the late-1980s followed by gradual decline.

The index indicates a population of over 2,000 in the 1980s declining to one of less than 1,500 at present. This has triggered a Medium Alert for the last 10-year period. Numbers are now the lowest ever recorded.

Dunlin **UK Situation: Fluctuating with recent decrease**

Dunlin numbers in Wales have shown a fluctuating pattern and have triggered an alert due to a decrease of over 25% over the past 25 years. Numbers peaked in the early 1970s at over 80,000 but had declined to 40,000 by 1985/86. The population has been stable for the past 15 years.

Redshank **UK Situation: Stable**

Numbers of Redshank in Wales rose to a peak of over 12,000 in the late 1980s, but have declined since to around 7,000. This has resulted in a Medium Alert being triggered for the past 10-year period.

Turnstone **UK Situation: Increase followed by decrease**

Turnstone numbers peaked in Wales at around 2,000 birds in the late 1980s. The population declined sharply after this to around 1,000 birds, a similar number to that found in the 1970s, but has since stabilised. The decline over the past 10 years has resulted in the Alert.

Table 6.1 The Alert status of waterbird species in the current winter (1999/2000) and the previous winter (1998/1999). This table indicates the highest priority Alert issued for each species irrespective of the time period over which it occurred, i.e. if both High and Medium Alerts were issued for a species, only the High Alert is shown. For a breakdown of changes over different time periods, see Table 4.2. Arrows indicate any change in Alert status between years: ⇑ - a higher alert status; ⇓ - a lower alert status; ⇔ no change between years.

Species	Status in 1998/1999	Status in 1999/2000	Change in Alert Status
Little Grebe			
Great Crested Grebe			
Cormorant	Medium Alert	Medium Alert	⇔
Mute Swan			
Bewick's Swan	(High Alert)	(High Alert)	⇔
Whooper Swan	(High Alert)	(High Alert)	⇔
European White-fronted Goose	High Alert	High Alert	⇔
Feral Greylag Goose	Medium Alert		⇓
Canada Goose			
Dark-bellied Brent Goose			
Light-bellied Brent Goose			
Shelduck			
Wigeon	Medium Alert		⇓
Gadwall			
Teal			
Mallard	Medium Alert	Medium Alert	⇔
Pintail			
Shoveler	High Alert		⇓
Pochard	Medium Alert	High Alert	⇑
Tufted Duck			
Goldeneye			
Red-breasted Merganser			
Goosander			
Ruddy Duck			
Coot			
Oystercatcher	Medium Alert	Medium Alert	⇔
Avocet			
Ringed Plover	High Alert	High Alert	⇔
Grey Plover	Medium Alert	High Alert	⇑
Knot	High Alert	High Alert	⇔
Sanderling		Medium Alert	⇑
Dunlin	Medium Alert	High Alert	⇑
Black-tailed Godwit			
Bar-tailed Godwit	High Alert	High Alert	⇔
Curlew			
Redshank	Medium Alert	Medium Alert	⇔
Turnstone	Medium Alert	Medium Alert	⇔

Table 6.2 Population change (%) and Site Alerts for waterbirds on SPAs in Wales over 5, 10, 25 and all years. (++ / -- = 50% Alert, + / - = 25% Alert)

WALES	First Year	Last Year	5-year change	10-year change	25-year change	All year change	5-year Alert	10-year Alert	25-year Alert	All year Alert
Little Grebe	1985	1999	32	115	.	299.65	+	++	N/A	++
Great Crested Grebe	1982	1999	8	9	.	264.01			N/A	++
Cormorant	1986	1999	-34	-10	.	50.57	!		N/A	++
Mute Swan	1966	1999	1	69	54	12.42		++	++	
Bewick's Swan	1966	1999	-86	-83	-78	-9.19	!!	!!	!!	
Whooper Swan	1966	1999	-68	-87	-88	-56.26	!!	!!	!!	!!
European White-fronted Goose	1966	1999	-90	-99	-100	-100	!!	!!	!!	!!
Feral Greylag Goose	1966	1999	57	-12	231	35490	++		++	++
Canada Goose	1966	1999	90	336	2739	865	++	++	++	++
Dark-bellied Brent Goose	1966	1999	32	19	2346	31282	+		++	++
Shelduck	1966	1999	-6	-14	65	103			++	++
Wigeon	1966	1999	-19	-9	-5	25				
Gadwall	1966	1999	89	88	335	2153	++	++	++	++
Teal	1966	1999	61	16	133	495	++		++	++
Mallard	1966	1999	-14	-25	-27	17		!	!	
Pintail	1966	1999	174	98	400	476	++	++	++	++
Shoveler	1966	1999	285	156	199	478	++	++	++	++
Pochard	1966	1999	-30	-29	-43	-68	!	!	!	!!
Tufted Duck	1966	1999	6	13	-22	3				
Goldeneye	1966	1999	-4	17	35	180			+	++
Red-breasted Merganser	1966	1999	-11	-13	-8	460				++
Goosander	1966	1999	67	81	236	1069	++	++	++	++
Coot	1982	1999	2	16	.	30			N/A	+
Oystercatcher	1969	1999	-32	-44	-10	-22	!	!		
Avocet	1969	1998	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ringed Plover	1969	1999	-10	-37	-62	-60		!	!!	!!
Grey Plover	1969	1999	-54	-68	-28	23	!!	!!	!	
Knot	1969	1999	-72	-77	-89	-89	!!	!!	!!	!!
Sanderling	1969	1999	-30	-26	-33	-13	!	!	!	
Dunlin	1969	1999	-4	-11	-51	-29			!!	!
Black-tailed Godwit	1969	1999	-24	18	51	101			++	++
Bar-tailed Godwit	1969	1999	-41	-38	-93	-90	!	!	!!	!!
Curlew	1969	1999	2	-6	27	63			+	++
Redshank	1969	1999	-22	-44	-11	5		!		
Turnstone	1969	1999	1	-41	-21	2		!		

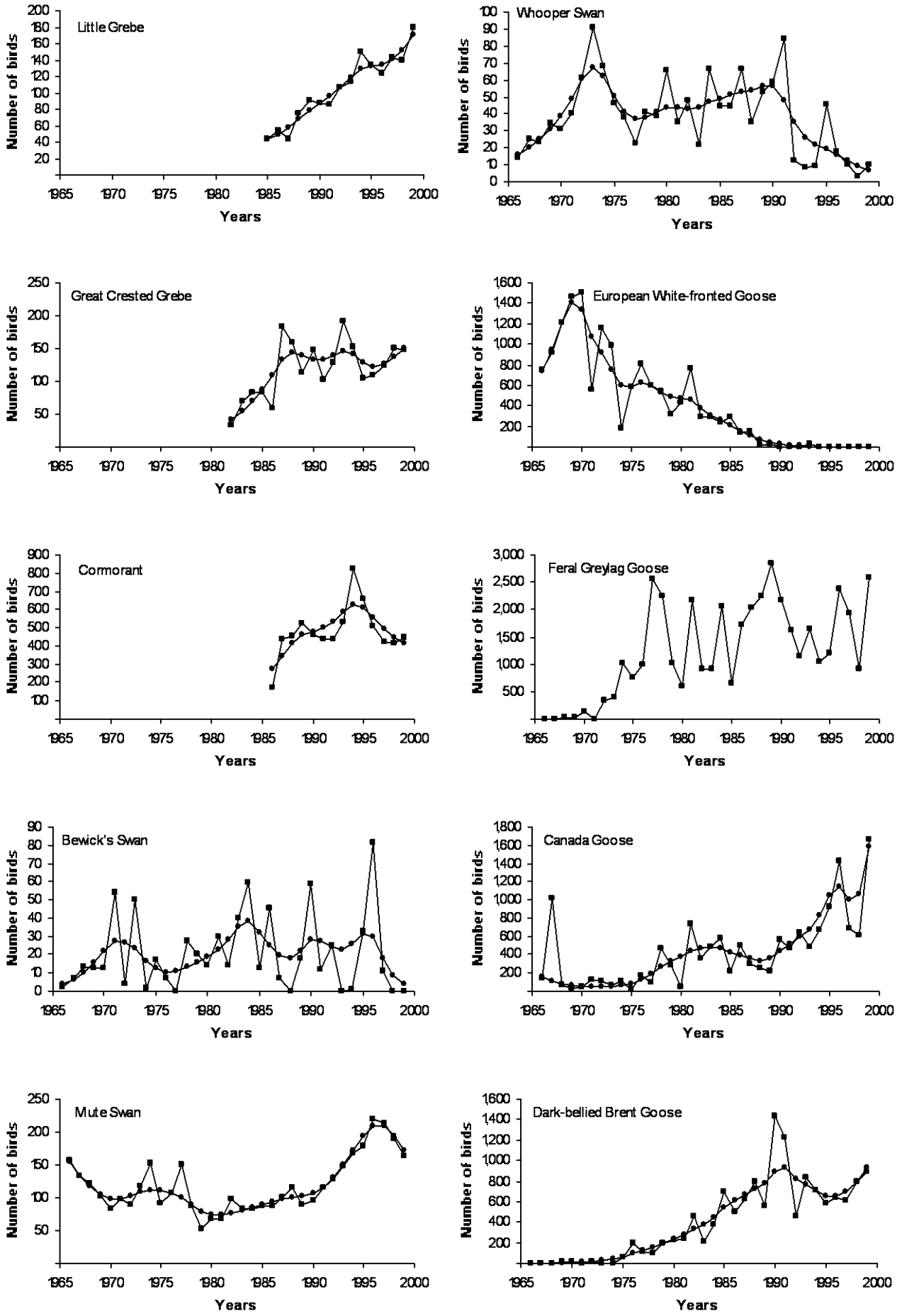
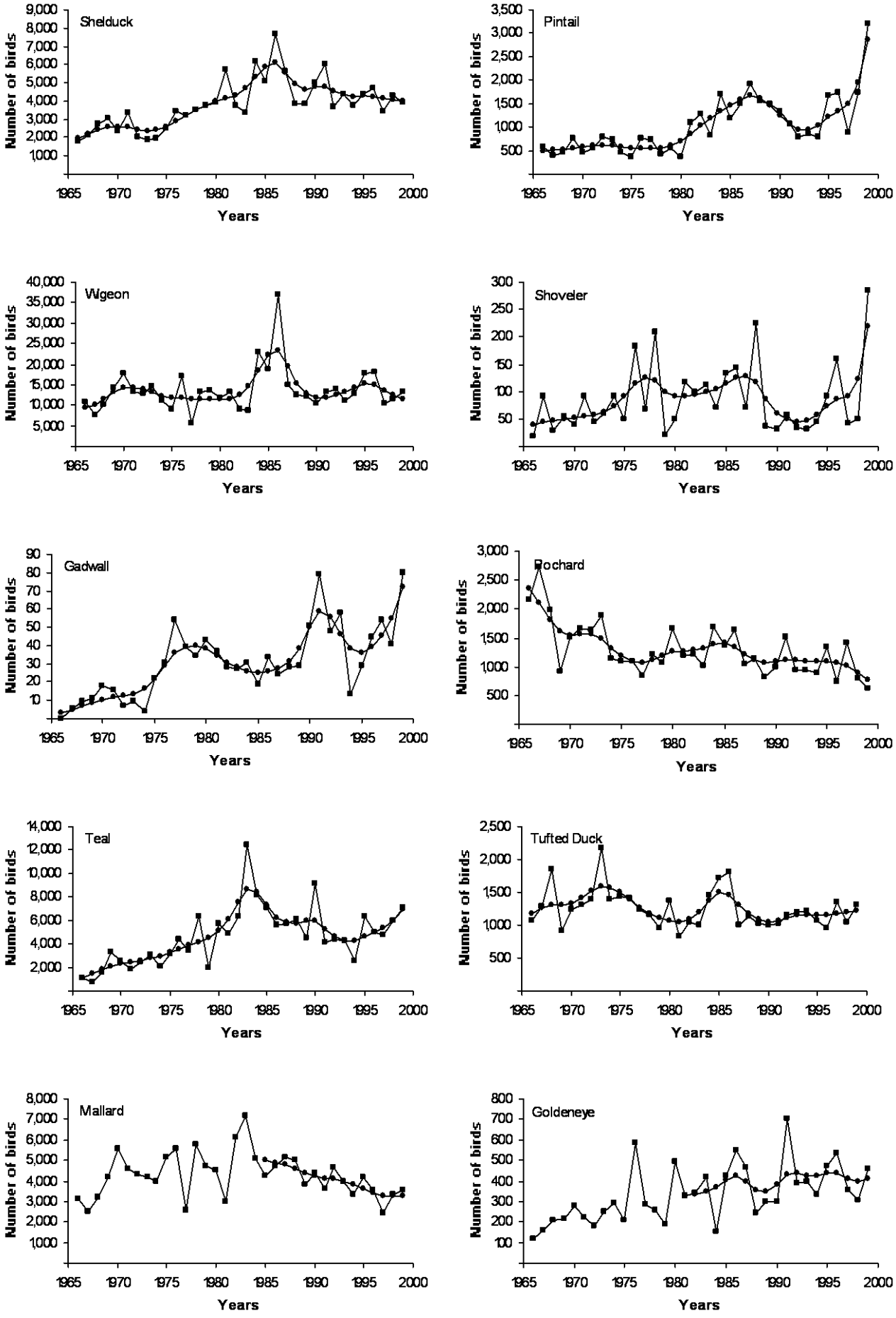


Figure 6.1 Changes in the average number of birds recorded per month on WeBS sites in Wales. ■ = mean number of birds recorded per month, ● = smoothed average number of birds.



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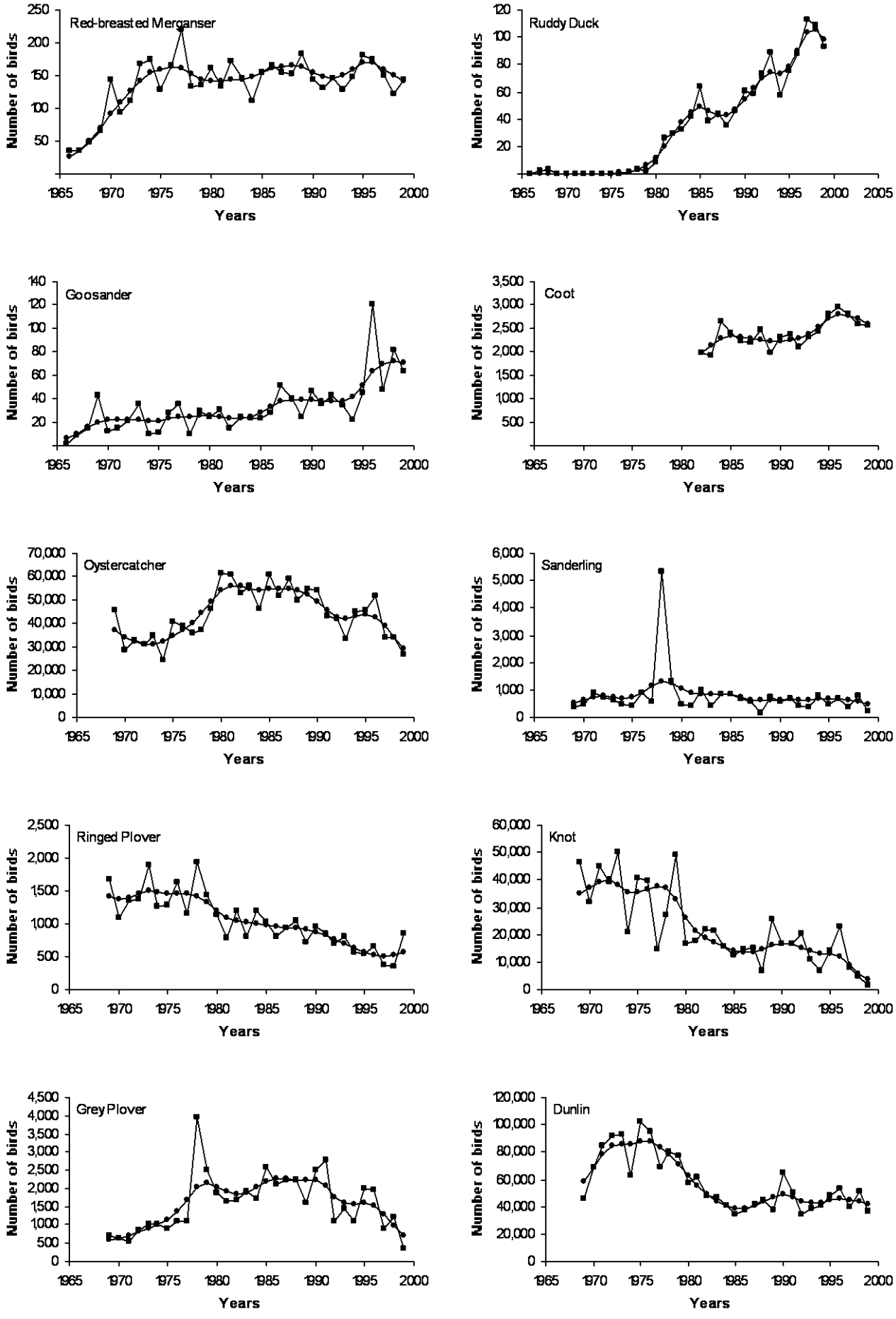

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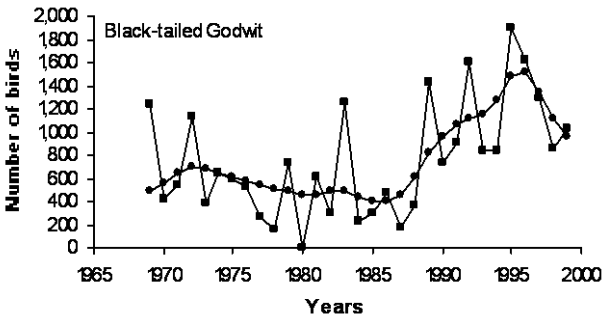

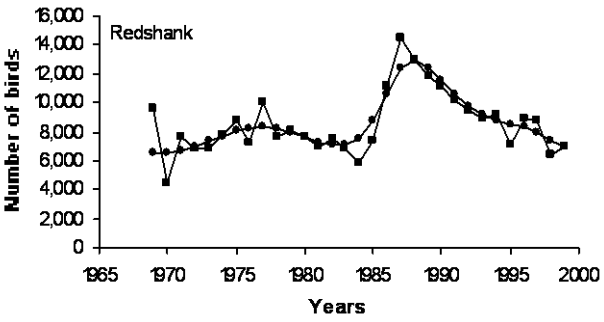

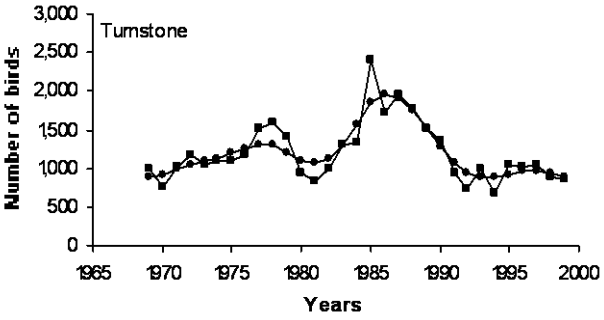

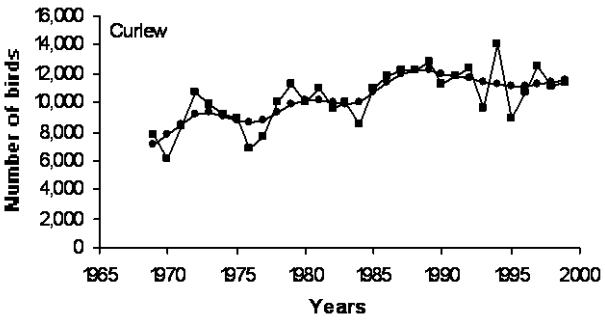

Figure 6.1 Continued.

Acknowledgements

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