Gittings, T. (2006). Waterbird monitoring in Cork Harbour: 1994/95-2002/03. In C. Cronin, C. Barton, H. Hussey, & M. Carmody (Eds.), (pp. 319–339). Cork: Cork Bird Report Editorial Team. (Final MS version)

# Waterbird monitoring of Cork Harbour: 1994/95-2002/03

Tom Gittings, 3 Coastguard Cottages, Roches Point, Whitegate, Co. Cork

## Introduction

Cork Harbour is one of the most important sites in Ireland for wintering waterbirds (Crowe & Boland, 2004), and its waterbird populations have been monitored periodically since the 1970s (Hutchinson & O'Halloran, 1984; Smiddy et al., 1995). Since the winter of 1994/95, annual monitoring has been carried out, as part of the Irish Wetland Bird Survey (I-WeBS). This period has coincided with the "hibernation" of the *Cork Bird Report*. Therefore, the only published data from this period has been the summary data for selected species included in the I-WeBS reports (Colhoun, 1998, 2000, 2001a, b, 2002; Crowe & Boland, 2004; Delany, 1996, 1997). The present article continues the series of annual reports published in the *Cork Bird Report* in the early 1990s (Coveney, 1992; Leonard, 1993; Shorten, 1994) with the aims of: making available the results of the Cork Harbour counts; and reviewing trends in waterbird numbers and status during this period.

## Coverage

For the purposes of carrying out waterbird counts, Cork Harbour is currently divided into 19 count sectors. These sectors are counted by nine or ten counters. The objective is for each count sector to be counted around high tide on either the Saturday or Sunday of the nominated weekend in each month between September and March. The actual level of coverage achieved is shown in Table 1. This shows that full coverage only occurred in nine of the 62 months, and only in the winter of 1996/97 was anything approaching full coverage achieved throughout the winter (with only one month having missing counts). In all the other winters, the majority of months have at least one missing count, and the level of coverage was particularly poor in 2000/01 and 2001/02. Several count sectors were not counted at all in particular winters: the Douglas Estuary in 1997/98, 1998/99, and 1999/00; Belvelly-Marino Point, Cuskinny and North Channel-Ballintubrid in 2000/01; and Ballynacorra, the Owenboy Estuary and Rathcoursey & Ahanesk in 2001/02. National summaries of I-WeBS results have generally not mentioned the fact that there has been incomplete coverage of Cork Harbour, with the exception of Crowe and Boland (2004). This latter publication describes coverage in 2000/01 as incomplete, but makes no mention of incomplete coverage in other winters.

Because waterbirds can move between count sectors, it is important try and co-ordinate counts to avoid either double-counting the same birds in more than one sector, or missing birds as they move between sectors. The objective aimed for in the Cork Harbour counts is for all counts to be carried out on the same weekend. Figure 1 shows that this objective was only achieved on 16% of the counts, while nearly 50% of counts included sectors counted a week or more apart, and 15% of counts included sectors counted two weeks or more apart.

## Data analysis

The aims of the data analyses were to: assess the current status of the waterbird populations of Cork Harbour; and to identify trends in these populations across the period covered by this review.

The accepted method for assessing the status of waterbird populations is to calculate the five year mean of the peak annual counts (Colhoun, 2001a). Therefore, to assess current status the most recent five years should be used. However, in the current data set, the most recent five years include two winters (2000/01 and 2001/02) with very poor coverage (see Table 1). Therefore, five year means calculated from these years will inevitably underestimate the populations of many waterbird species. Those species whose peak numbers occur in the autumn will be particularly affected as the worst coverage was generally during the autumn months. Because of this problem, I have calculated a second set of five year means using the most recent five winters *excluding* 2000/01 and 2001/02: i.e., 1996/97-1999/00 and 2002/03. This second data set, however, includes two winters (1997/98 and 1998/99) during which the Douglas Estuary was not counted. Therefore, both sets of five year means are likely to be underestimates.

In order to identify trends in waterbird populations, I have calculated the annual maximum counts for each species. I also plotted out monthly count data for each winter to determine whether high counts may have been exceptional one-off peaks, and, for high counts, examined the dates on which individual sectors were counted to determine whether double-counting may have been involved. However, interpretation of these is complicated by the many gaps in coverage in the data set. The most significant gap in coverage is the absence of counts from the Douglas Estuary for the period 1997/98-1999/00. The Douglas Estuary, along with Dunkettle, forms a fairly discrete unit of Cork Harbour, which is physically separated from the other estuarine areas of Cork Harbour. Therefore, I have also calculated a second set of annual maximum counts excluding the Douglas Estuary and Dunkettle. This provides a more easily interpretable dataset for analysing annual trends. Even so, other gaps in coverage remain. Where the peak count of a species is in a month with gaps in coverage, I have examined the counts for the missing sector(s) in the same month of other winters and estimated an approximate value for the missing counts. I have also used a similar method to determine whether gaps in coverage in any particular winter could have resulted in the peak number in the dataset occurring in a different month from that in which the peak number actually occurred.

The methods described above assume that relatively predictable numbers occur in each count sector, or count sector combination. This is not always the case: sometimes exceptionally high or low one-off counts are recorded for particular count sectors. Therefore the interpretation of trends based on datasets that exclude the Douglas Estuary and Dunkettle and estimate approximate values for missing counts, will contain some errors. An alternative method of deriving population trends from datasets containing missing counts is the Underhill Index method, used by Crowe and Boland (2004). However, this method assumes that the three factors which determine variation between counts (month, year and site) are independent (Underhill & Prys-Jones, 1994). While I have not carried out any formal analyses, visual inspection of the Cork Harbour dataset suggests that the assumptions of independence between site and month factors and between site and year factors does not hold for many species.

All the following discussions of annual trends are based upon the dataset of annual maximum counts, excluding the Douglas Estuary and Dunkettle (Table 3). Because the 1994/95 season only included one full count (January), I have excluded this season from consideration of annual trends.

**Overall results**

Overall, 82 waterbird species were recorded on I-WeBS counts during this period. These included eleven rarities (Black-throated Diver, Pied-billed Grebe, Red-necked Grebe, Black-necked Grebe, American Wigeon, Green-winged Teal, Red-crested Pochard, Ring-necked Duck, Surf Scoter, Long-billed Dowitcher, and Laughing Gull) and one escape (Black Swan). Another 33 species were not recorded in every winter, because they are either summer/passage migrants, scarce winter visitors, or species that are not routinely monitored by I-WeBS counts (Water Rail, Jack Snipe and Kingfisher). There are also six regularly occurring waterbird species that are not reliably monitored by I-WeBS counts in Cork Harbour either because they are not counted in all sectors (Black-headed Gull, Common Gull, Lesser Black-backed Gull, Herring Gull and Great Black-backed Gull), or because I-WeBS count methodology is not appropriate for the species (Snipe). Where relevant, records of all the above species are included in the main body of this *Cork Bird Report*. The present article focuses on the 32 species that regularly occur in Cork Harbour during winter, and that are routinely monitored by I-WeBS counts.

Annual maximum counts for these species in each winter are presented in Tables 2 and 3.

**Internationally Important Species**

Two species (Black-tailed Godwit and Redshank) regularly occurred in internationally important numbers during this period (Table 4).

***Black-tailed Godwit***

Peak numbers in each winter were recorded in either September or October (Figure 2a). However, one of the two winters with peak numbers in October had many missing counts in September. In fact, peak numbers of this species may well occur in August before the I-WeBS counts start. For example, in 1997/98, I counted 1640 Black-tailed Godwits roosting in the Douglas Estuary on 20 August, which is substantially more than any I-WeBS count for this sector carried out during the period under review. Numbers generally decline sharply after the autumn peak and then fluctuate around a much lower level for the rest of the winter.

The annual maxima varied between 1411-3162 over this period, in part reflecting the absence of count data from the Douglas Estuary (one of the main sites for this species) from many of the winters. However, analysis of data, excluding the Douglas Estuary/Dunkettle, and taking account of the missing count sectors in 1995/96 and 2000/01-2002/03, indicates that there was a trend of increasing numbers from 1995/96-1998/99. This was followed by a sharp fall in numbers in 1999/00 with numbers increasing again over the following three winters to reach a similar level in 2002/03 to that attained in 1998/99. In 1998/99, the peak count of 2565 (September) probably represents an overall Cork Harbour population of over 3000, taking account of the lack of coverage of the Douglas Estuary. The peak count of 3162 in 2002/03 (October) was probably not affected significantly by gaps in coverage (as the count sectors not covered rarely hold many Black-tailed Godwits).

The trends described above do not match those reported at a national scale by Crowe and Boland (2004) for the winters 1995/96-2001/02. However, the latter are based on mid-winter (November-February) counts. In Cork Harbour there does not seem to be a consistent relationship between autumn and mid-winter numbers (Figure 3). In mid-winter, Black-tailed Godwit counts are highly variable because large flocks appear to spend most of their time feeding on fields, only visiting the estuarine habitats erratically. Therefore, I-WeBS counts, which largely do not cover fields around Cork Harbour, do not reliably represent the actual numbers of Black-tailed Godwits in the Cork Harbour area in mid-winter.

***Redshank***

Peak numbers in most winters were recorded in late autumn (usually November), with the exception of 1995/96 (January). In some winters, numbers remain high from the late autumn peak through the mid-winter period (December and January), while in other winters they decline sharply after the late autumn peak (Fig. 2b).

The annual maxima varied between 1005-2269 over this period. However, in the winters of 2000/01 and 2002/03 the key count sectors (Belvelly-Marino Point and North Channel-Ballintubrid) were not covered in the late autumn period. Excluding the winters of 2000/01 and 2002/03 reduces the variation in the annual maxima to between 2076-2269, suggesting a remarkable degree of stability in the Cork Harbour Redshank population. However, this does not take account of the missing counts from the Douglas Estuary (which can hold large numbers of Redshank). Excluding Douglas Estuary/Dunkettle, increases the variation in the annual maxima to between 1839 and 2249 for the same period. These adjusted maxima show a peak in the winters of 1997/98-1999/00 (2100, 2243 and 2249) with lower numbers in 1995/96, 1996/97 and 2002/03 (1839, 1840 and 1970). Given that the three winters with peak numbers lacked counts from the Douglas Estuary, it is likely that the Cork Harbour Redshank population peaked at over 2500 in the late 1990s.

**Nationally Important Species**

Nineteen species regularly occurred in nationally important numbers during the period under review (Table 4). In addition, while formal thresholds have not been set, the numbers of Little Egrets in Cork Harbour are surely of national importance: in each winter for which national data is available, the Cork Harbour maxima was at least 10% of the national maxima.

Three of these species (Shelduck, Dunlin and Curlew), regularly occur in numbers that are greater than 50% of the threshold for international importance and I discuss trends in the numbers of these species below.

***Shelduck***

Peak numbers in most winters occur in mid-winter (December and January). Much lower numbers usually occur outside this period, but exceptionally high numbers occurred in March 1996 (Fig. 2c).

The annual maxima varied between 722-2621 over this period. However, excluding Douglas Estuary/Dunkettle and the winters of 2000/01 and 2002/03 (which contain many missing counts) reduces the variation to between 1517-2205. Apart from high numbers in the winter of 1996/97, there appears to have been little annual variation in Shelduck numbers over this period. Taking account of the usual annual peak in the Douglas Estuary (c. 200) and the missing counts from Lough Beg and Monkstown Creek in January 2003 (usual combined annual peaks of 200-300), suggests that the Cork Harbour Shelduck population would have exceeded 2000 in every winter except 1997/98.

***Dunlin***

Peak numbers in most winters occur in mid-winter (December and January) with high numbers also sometimes occurring in November and February (Fig. 2d).

The annual maxima varied between 4155-12050 over this period. However, excluding Douglas Estuary/Dunkettle and the winters of 2000/01 and 2002/03 reduces the variation to between 3764-6750. These adjusted maxima show a peak in December 1997. However, on this count the Ballintubrid and Weir Island sectors (which held 1620 Dunlin on this count) were counted a week earlier than the adjacent Belvelly-Marino Point and North Channel-Ballintubrid sectors (which held 5450 Dunlin). As Dunlin numbers in the Ballintubrid and Weir Island sectors are very variable, it is quite possible that some double-counting occurred as a result. Taking this into account, and the missing counts from the Douglas Estuary, the adjusted maxima indicate that the Cork Harbour Dunlin population fluctuated around 10000-12000 in the late 1990s, with no evidence of any significant decline up to the winter of 1999/00. Much lower numbers were recorded from 2000/01 onwards, but interpretation of this data is complicated by the amount of missing counts. However, the peak numbers at most of the key sectors, when they have been counted, have been much lower than in the late 1990s indicating that there has been a real decline. In 2002/03, the peak number, allowing for the missing counts, probably did not exceed 5000 birds, a dramatic decline from the numbers present in the late 1990s.

***Curlew***

Peak numbers in most winter were recorded in either September or October. Numbers from November-February are generally, although not always, significantly lower than the autumn peak and show considerable fluctuations (Fig. 2e). This probably reflects the tendency for a large proportion of the Cork Harbour Curlew population to feed on fields during the winter, and to only use the estuaries as nocturnal roosts. Evening counts, which I have carried out, of roosting Curlews on the Glounthaune Estuary/Slatty Water suggest that I-WeBS counts routinely underestimate the mid-winter Curlew numbers.

The annual maxima varied between 1289-3031 over this period. Excluding Douglas Estuary/Dunkettle and the winters of 2000/01 and 2002/03 does not significantly reduce this variation (1131-2931). These adjusted maxima suggest that numbers were significantly higher between 1997/98-1999/00 compared to 1995/96-1996/97. The 2002/03 maximum suggest a return to the 1995/96-1996/97 levels, even taking into account the missing counts in September 2002 (which could have reduced the 2002/03 maximum by around 300). Taking account of the missing counts, it is likely that the Cork Harbour Curlew population was approaching the threshold for international importance (3500) during 1997/98-1999/00, but in 2002/03 did not significantly exceed 2000.

### *Other nationally important species*

One other nationally important species, Lapwing, shows clear evidence of a substantial decline during the period under review. Interpretation of the data is complicated by the number of missing counts in the mid-winter period (when Lapwing numbers peak) in 2000/01 and 2001/02, and the fact that numbers at individual sub-sites tend to fluctuate substantially across the mid-winter months. However, even when poor coverage is taken into account, numbers in 2001/02 and 2002/03 probably did not significantly exceed 5000, compared to peak counts well over 10000 at the start of this period.

One nationally important species, Little Egret, shows a clear increase during the period under review. This is not surprising given its recent colonisation of Ireland. However, there also has been a change in the seasonal patterns of egret numbers in Cork Harbour (Fig. 2f). During the winters of 1995/96-1999/00 there were no strong seasonal trends, with numbers remaining fairly similar throughout the I-WeBS season. However, in 2000/01-2002/03 numbers show a marked peak in September/October with mid-winter numbers less than 50% of the autumn peak; note that this change in seasonal trends would be even more marked without the effects of the poor autumn coverage in 2000/01-2002/03. This change coincides with the development of the Cork Harbour breeding colony (Colony C in Smiddy, 2002) and presumably reflects the occurrence of young birds from this colony in autumn before they disperse away from Cork Harbour.

Taking account of the missing count data, most of the other nationally important species do not show any consistent trends of either increase or decrease across the period under review. In particular, it is important to note that there is no evidence for a decline in numbers of Bar-tailed Godwits in Cork Harbour, and it is likely that numbers have consistently remained above the threshold for national importance, contrary to Colhoun (2001a; 2001b) and Crowe and Boland (2004). The low counts in the winters of 1997/98-1999/00 were due to the lack of coverage of the Douglas Estuary during this period.

## Conclusions

### *Waterbird populations of Cork Harbour, 1994/95-2002/03*

Two species (Black-tailed Godwit and Redshank) regularly occurred in internationally important numbers during this period. Black-tailed Godwit numbers probably peaked at over 3000 in 1998/99 and 2002/03. Redshank numbers probably peaked at over 2500 in 1997/98-1999/00.

Twenty species regularly occurred in nationally important numbers during this period. Three of these species (Shelduck, Dunlin and Curlew), occurred in numbers that are greater than 50% of the threshold for international importance. Shelduck numbers peaked at over 2600 in 1996/97 but otherwise probably remained fairly stable at around 2000 each winter. Dunlin numbers were probably fairly stable at around 10000-12000 in the late 1990s, but have declined since 2000/01 to less than half this number. Curlew numbers probably peaked at around 3500 in 1997/98-1999/00. Other nationally important species that show strong trends across this period are Lapwing (decline of over 50%) and Little Egret (rapid increase). Contrary to published data, there has probably been no significant change in the status of Bar-tailed Godwits and numbers of this species remain nationally important. The decline in total waterfowl numbers in Cork Harbour reported by Crowe and Boland (2004) is probably largely due to the declines in Lapwing and Dunlin numbers.

### *Has it been worth the effort?*

The level of coverage during this period is not impressive: in only one winter was anything approaching full coverage achieved. This is not to say that incomplete counts are worthless. Firstly, any count, however incomplete, that exceeds either national or international importance thresholds is of nature conservation (and possibly legal) significance and provides data to justify the continued conservation importance of Cork Harbour. However, it could be argued that, at this stage, the conservation importance of Cork Harbour is well established and the effort of annual I-WeBS coverage is not justified simply to confirm the status quo. Secondly, as I have attempted to

do in this article, with sufficient local knowledge and taking gaps in coverage into account, even incomplete counts can indicate annual trends in species populations. Obviously, however, a considerable degree of caution needs to be attached to such interpretations and only large-scale trends (such as the 50% decline in Lapwing and Dunlin numbers) can be reliably detected. It is unfortunate that the national summaries of I-WeBS results have largely ignored the incomplete coverage of Cork Harbour, with the result that misleading interpretations of species status and trends may be derived from these summaries (e.g., the apparently non-nationally important status of Bar-tailed Godwit in Crowe and Boland, 2004).

One of the key objectives of I-WeBS is to monitor national waterbird populations. Therefore, a relevant question to consider is to what extent has the poor level of coverage in Cork Harbour affected national population estimates and trends? For several species, Cork Harbour holds a significant proportion of the national population (based on the data in Table 1 of Crowe and Boland, 2004): e.g., Shelduck (c. 30%), Black-tailed Godwit (c. 30%), and Redshank (c. 20%). For these species, the Douglas Estuary holds 20-30% (Black-tailed Godwit), or 10-15% (Shelduck and Redshank) of the Cork Harbour population. Moreover, although Cork Harbour only holds around 7% of the national Bar-tailed Godwit population, the Douglas Estuary holds around 90% of the Cork harbour population. Therefore, the lack of coverage of the Douglas Estuary in 1997/98-1999/00 will have reduced the overall national population estimates of these species by 6-9% (Black-tailed Godwit), 6-7% (Bar-tailed Godwit), 3-4.5% (Shelduck) and 2-3% (Redshank). As Crowe and Boland (2004) describe changes in population indices of greater than +2% and less than –1% as representing increases or declines, it seems that the lack of coverage of the Douglas Estuary in 1997/98-1999/00 could have had significant effects on detection of national trends in waterbird populations.

One potentially important factor that I have not considered in detail in this article is the potential effects of lack of co-ordination between count sectors on the accuracy of overall counts. Figure 1 shows that on many counts, different count sectors were counted days or even weeks apart. This is, however, a rather simplistic analysis because three groups of count sectors are relatively isolated and each group is counted by a single observer in one counting session: Saleen, Aghada and Whitegate; Monkstown Creek, Ringaskiddy-Luc Strand and Lough Beg; and the Owenboy Estuary. Therefore, lack of co-ordination of these count sectors with the overall count may not be a significant factor, at least over a period of a few days. However, movement between count sectors in the Inner Harbour and the North Channel will occur over this period of time, due to factors such as tidal cycles between spring and neap tides and weather conditions. Even over short time periods (within counts) movement can occur due to disturbance. There are also some predictable patterns of movement that occur, such as waders feeding on the silt lagoon at Dunkettle on the rising tide, and then moving to the Douglas Estuary roosts at high tide. All these factors mean that, in my view, counts carried out more than a day or two apart in different count sectors in the Inner Harbour and the North Channel are highly likely to have been affected by movement of birds between count sectors, and that, for certain groupings of count sectors, careful co-ordination of counts carried out on the same day is required to avoid this effect.

### *The future*

It is clear from the information presented in this article that achieving adequate I-WeBS coverage of Cork Harbour is difficult. I want to emphasise that I am not criticising either the count organisers, or the counters (except for one individual, who shall remain nameless, who is responsible for the lack of coverage of the Douglas Estuary in 1997/98-1999/00!). As a counter throughout this period, and count organiser in recent years, I fully appreciate the difficulty of the task. There has been an attrition of experienced counters over the years, and a difficulty in finding replacements. Key sectors of Cork Harbour are difficult and challenging to count, and require counters with wader identification skills, and good local knowledge. Even when enough counters can be persuaded to take on sectors for a winter, inevitably some counters will not be able to do counts in particular months and, in these circumstances, it can be very difficult to provide cover given that familiarity with the count sector is necessary. Moreover, simply achieving the required number of counts is no guarantee that reliable data has been collected, but attempting to achieve

close co-ordination of count dates and times would pose a further strain on the already fragile volunteer goodwill.

It may be the case that there simply is not a sufficient pool of willing and experienced volunteers to achieve adequate I-WeBS coverage of Cork Harbour at present. While I-WeBS monitoring of Cork Harbour has the potential to produce valuable data, completion of I-WeBS counts should not be considered as an end in itself and regular audit of the quality of the data generated is necessary.

**Acknowledgements**

Thanks are due to all those who participated in the counts: Anita Donaghy, Tom Gittings, Carla Hill, Harry Hussey, the Hutchinson family, Alec Jeffrey, Lesley Lewis, Eleanor Mayes, Paul Moore, Tony Nagle, John O'Halloran, Barry O'Mahony, Denis O'Sullivan, George Phipps, Mark Shorten, Pat Smiddy, Jim Wilson, Mark Wilson. The counts were co-ordinated by Mark Shorten (1994/95), Carol Styles (1995/96 and 1996/97), Paul Moore (1997/98-2001/02) and Tom Gittings (2002/03). Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a joint scheme of BirdWatch Ireland, National Parks and Wildlife Service and The Wildfowl & Wetlands Trust, and I am grateful to Olivia Crowe for facilitating this and other assistance.

**References**

Colhoun, K. (1998) I-WeBS Report 1996-97: Results of the third winter of the Irish Wetland Bird Survey. Birdwatch Ireland, Dublin.

Colhoun, K. (2000) I-WeBS Report 1997-98: Results of the fourth winter of the Irish Wetland Bird Survey. Birdwatch Ireland, Dublin.

Colhoun, K. (2001a) I-WeBS 1999-00: summary of the sixth I-WeBS season. I-WeBS News, 2-14.

Colhoun, K. (2001b) I-WeBS Report 1998-99: Results of the fifth winter of the Irish Wetland Bird Survey. Birdwatch Ireland on behalf of the I-WeBS partners (BWI/NPW/WWT), Dublin.

Colhoun, K. (2002) Waterbird monitoring in Ireland 2000/01: Results of the seventh year of the Irish Wetland Bird Survey (I-WeBS). Irish Birds, 7, 43-52.

Coveney, J.A. (1992) Cork Harbour counts: an interim report. Cork Bird Report, 1991, 71-75.

Crowe, O. & Boland, H. (2004) Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2001/02. Irish Birds, 7, 313-326.

Delany, S. (1996) I-WeBS Report 1994-95: Results of the first winter of the Irish Wetland Bird Survey. IWC Birdwatch Ireland, Dublin.

Delany, S. (1997) I-WeBS Report 1995-96: Results of the second winter of the Irish Wetland Bird Survey. Birdwatch Ireland, Dublin.

Hutchinson, C.D. & O'Halloran, J. (1984) The waterfowl of Cork Harbour. Irish Birds, 2, 445-456.

Leonard, P.G. (1993) Cork Harbour Counts 1992-1993. Cork Bird Report, 1992, 74-80 and 100.

Shorten, M. (1994) Waterfowl counts in Co. Cork in the winters 1992/93 and 1993/94. Cork Bird Report, 1993, 69-72.

Smiddy, P. (2002) Breeding of the Little Egret *Egretta garzetta* in Ireland, 1997-2001. Irish Birds, 7, 57-60.

Smiddy, P., O'Halloran, J., Coveney, J.A., Leonard, P.G., & Shorten, M. (1995) Winter waterfowl populations of Cork Harbour: an update. Irish Birds, 5, 285-294.

Underhill, L.G. & Prys-Jones, R. (1994) Index numbers for waterbird populations. I. Review and methodology. Journal of Applied Ecology, 31, 463-480.

Gittings, T. (2006). Waterbird monitoring in Cork Harbour: 1994/95-2002/03. In C. Cronin, C. Barton, H. Hussey, & M. Carmody (Eds.), (pp. 319–339). Cork: Cork Bird Report Editorial Team. (Final MS version)

Table 1. Coverage achieved in I-WeBS counts of Cork Harbour, 1994/95-2002/03.

| | Count sectors not covered: | | | | | | |
|---|---|---|---|---|---|---|---|
| Winter | Sep. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. |
| 1994/95 | | | | | | | |
| 1995/96 | Bn, DE, Dk, LB, MC, OE, RLS | DE, Dk, LB, MC, OE, RLS | | Dk | | LB, MC, OE, RLS | MC, OE, RLS |
| 1996/97 | | | | LB, MC, OE, RLS | | | |
| 1997/98 | DE | DE | | DE, Dk | DE | DE, Dk | DE |
| 1998/99 | DE | DE | DE | DE | DE, Dk | DE, LB, MC, OE, RLS | DE, Dk, LB, MC, OE, RLS |
| 1999/00 | DE, Dk | DE, Dk | DE | DE | DE, Dk | DE, | DE, Dk |
| 2000/01 | Bn, BMP, Ck, DE, Dk, LB, MC, NCB, OE, R&A, RLS | BMP, Ck, DE, NCB, RLS | BMP, Ck, Dk, LB, MC, NCB, OE, RLS | Bn, BMP, Ck, NCB, R&A | BMP, Ck, LB, MC, NCB, OE, RLS | BMP, Ck, LB, MC, NCB, OE, RLS | |
| 2001/02 | Bn, BMP, Ck, DE, LB, MC, NCB, OE, R&A, RLS | Bn, BMP, Ck, Dk, LB, MC, NCB, OE, R&A, RLS | Bn, BMP, Ck, LB, MC, NCB, OE, R&A, RLS | Bn, LB, MC, OE, R&A, RLS | Bn, OE, R&A | Bn, Dk, OE, R&A | Bn, BMP, Ck, DE, GSW, LB, MC, NCB, OE, R&A, RLS |
| 2002/03 | BMP, Ck, Dk, LB, MC, NCB, OE, RLS | Bn, OE, R&A | OE | | LB, MC, RLS | Dk | Dk |

Count sectors: Bn = Ballynacorra; BMP = Belvelly-Marino Point; Ck = Cuskinny; DE = Douglas Estuary; Dk = Dunkettle; GSW = Glounthaune Estuary/Slatty Water; LB = Lough Beg; MC = Monkstown Creek; NCB = North Channel-Ballintubrid; OE = Owenboy Estuary; R&A = Rathcoursey & Ahanesk; RLS = Ringaskiddy-Luc Strand.

Blank cells indicate that full coverage was achieved. Cells with a diagonal line indicate that no co-ordinated I-WeBS count was carried out.

Coverage of the Douglas Estuary in 2001/02 was severely affected by bridge maintenance work, and many counts were considered to be gross underestimates.

Gittings, T. (2006). Waterbird monitoring in Cork Harbour: 1994/95-2002/03. In C. Cronin, C. Barton, H. Hussey, & M. Carmody (Eds.), (pp. 319–339). Cork: Cork Bird Report Editorial Team. (Final MS version)

Table 2. Annual maximum counts, including the Douglas Estuary and Dunkettle.

| | 1994-95 | 1995-96 | 1996-97 | 1997-98 | 1998-99 | 1999-00 | 2000-01 | 2001-02 | 2002-03 |
|---|---|---|---|---|---|---|---|---|---|
| Great Northern Diver | 6 | 1 | 2 | 4 | 1 | 8 | 3 | 1 | 1 |
| Little Grebe | 64 | 54 | 67 | 75 | 56 | 50 | 58 | 59 | 60 |
| Great Crested Grebe | 282 | 287 | 330 | 275 | 166 | 218 | 171 | 287 | 240 |
| Cormorant | 347 | 991 | 564 | 219 | 284 | 556 | 244 | 392 | 326 |
| Little Egret | 2 | 7 | 10 | 16 | 20 | 18 | 27 | 39 | 61 |
| Grey Heron | 51 | 130 | 91 | 117 | 71 | 61 | 114 | 57 | 97 |
| Mute Swan | 28 | 39 | 57 | 31 | 46 | 42 | 25 | 15 | 42 |
| Shelduck | 1841 | 2124 | 2621 | 1517 | 1875 | 1870 | 722 | 1108 | 1903 |
| Wigeon | 2601 | 2178 | 2262 | 1403 | 1683 | 1402 | 1272 | 1519 | 1931 |
| Teal | 986 | 1381 | 912 | 1033 | 994 | 1214 | 1139 | 1079 | 1492 |
| Mallard | 343 | 441 | 619 | 617 | 671 | 572 | 431 | 362 | 489 |
| Pintail | 17 | 93 | 42 | 58 | 63 | 41 | 2 | 74 | 73 |
| Shoveler | 55 | 101 | 54 | 123 | 103 | 148 | 74 | 48 | 103 |
| Pochard | 31 | 83 | 198 | 32 | 38 | 11 | 19 | 21 | 27 |
| Tufted Duck | 58 | 87 | 139 | 41 | 34 | 20 | 46 | 36 | 29 |
| Goldeneye | 35 | 30 | 35 | 12 | 18 | 14 | 18 | 28 | 11 |
| Red-breasted Merganser | 116 | 134 | 138 | 101 | 110 | 128 | 64 | 77 | 95 |
| Moorhen | 25 | 36 | 115 | 22 | 28 | 21 | 21 | 19 | 24 |
| Coot | 91 | 28 | 79 | 28 | 35 | 96 | 24 | 13 | 26 |
| Oystercatcher | 1364 | 1150 | 2709 | 2412 | 1587 | 1421 | 1698 | 1061 | 1570 |
| Ringed Plover | 0 | 56 | 145 | 64 | 59 | 52 | 78 | 66 | 28 |
| Golden Plover | 4431 | 1554 | 7525 | 1520 | 3000 | 3432 | 4009 | 6888 | 4262 |
| Grey Plover | 114 | 136 | 51 | 173 | 72 | 44 | 5 | 6 | 108 |
| Lapwing | 15204 | 10280 | 12099 | 7232 | 4861 | 4116 | 7267 | 2816 | 4016 |
| Knot | 17 | 37 | 39 | 20 | 16 | 17 | 80 | 79 | 306 |
| Dunlin | 12050 | 11094 | 12769 | 9413 | 8847 | 8240 | 6632 | 5155 | 4924 |
| Black-tailed Godwit | 309 | 1411 | 1823 | 2060 | 2565 | 1692 | 1615 | 2128 | 3162 |
| Bar-tailed Godwit | 332 | 456 | 517 | 124 | 16 | 52 | 351 | 419 | 477 |
| Curlew | 1669 | 1421 | 1701 | 3031 | 2927 | 2223 | 1297 | 1329 | 1817 |
| Redshank | 1344 | 2269 | 2076 | 2146 | 2243 | 2269 | 1005 | 1138 | 2170 |
| Greenshank | 22 | 31 | 48 | 46 | 46 | 61 | 31 | 25 | 60 |
| Turnstone | 65 | 127 | 122 | 76 | 166 | 146 | 93 | 66 | 145 |

Gittings, T. (2006). Waterbird monitoring in Cork Harbour: 1994/95-2002/03. In C. Cronin, C. Barton, H. Hussey, & M. Carmody (Eds.), (pp. 319–339). Cork: Cork Bird Report Editorial Team. (Final MS version)

Table 3. Annual maximum counts, excluding the Douglas Estuary and Dunkettle.

| | 1994-95 | 1995-96 | 1996-97 | 1997-98 | 1998-99 | 1999-00 | 2000-01 | 2001-02 | 2002-03 |
|---|---|---|---|---|---|---|---|---|---|
| Great Northern Diver | 6 | 1 | 2 | 4 | 1 | 8 | 3 | 1 | 1 |
| Little Grebe | 64 | 51 | 65 | 75 | 56 | 50 | 58 | 56 | 52 |
| Great Crested Grebe | 282 | 222 | 267 | 275 | 166 | 218 | 171 | 187 | 236 |
| Cormorant | 299 | 977 | 447 | 199 | 281 | 526 | 224 | 369 | 311 |
| Little Egret | 2 | 7 | 10 | 16 | 20 | 18 | 27 | 36 | 54 |
| Grey Heron | 30 | 107 | 76 | 95 | 71 | 61 | 94 | 37 | 48 |
| Mute Swan | 26 | 39 | 55 | 31 | 46 | 42 | 25 | 14 | 42 |
| Shelduck | 1719 | 1937 | 2205 | 1517 | 1875 | 1868 | 614 | 1005 | 1716 |
| Wigeon | 1692 | 1694 | 1749 | 1403 | 1683 | 1382 | 1022 | 1218 | 1606 |
| Teal | 902 | 1265 | 673 | 1033 | 994 | 1207 | 848 | 897 | 1210 |
| Mallard | 326 | 399 | 525 | 614 | 671 | 562 | 369 | 358 | 459 |
| Pintail | 17 | 93 | 42 | 58 | 63 | 41 | 2 | 74 | 73 |
| Shoveler | 48 | 100 | 54 | 123 | 103 | 148 | 74 | 48 | 95 |
| Pochard | 31 | 83 | 198 | 32 | 38 | 11 | 19 | 21 | 27 |
| Tufted Duck | 56 | 74 | 111 | 41 | 34 | 20 | 22 | 17 | 24 |
| Goldeneye | 20 | 4 | 14 | 12 | 18 | 14 | 1 | 2 | 6 |
| Red-breasted Merganser | 114 | 130 | 138 | 101 | 110 | 128 | 64 | 72 | 95 |
| Moorhen | 25 | 35 | 114 | 22 | 28 | 21 | 21 | 19 | 24 |
| Coot | 89 | 25 | 79 | 28 | 35 | 96 | 24 | 13 | 26 |
| Oystercatcher | 1352 | 1150 | 1439 | 1972 | 1489 | 1421 | 1698 | 944 | 1067 |
| Ringed Plover | 0 | 56 | 115 | 59 | 50 | 52 | 78 | 66 | 28 |
| Golden Plover | 630 | 1553 | 2670 | 1520 | 937 | 500 | 1130 | 1780 | 890 |
| Grey Plover | 114 | 130 | 51 | 173 | 72 | 44 | 5 | 5 | 91 |
| Lapwing | 11477 | 7400 | 8299 | 5832 | 4561 | 3116 | 5357 | 2266 | 2406 |
| Knot | 1 | 37 | 37 | 20 | 16 | 17 | 23 | 9 | 190 |
| Dunlin | 5493 | 6660 | 5769 | 9158 | 8297 | 6740 | 3332 | 4155 | 3764 |
| Black-tailed Godwit | 256 | 1096 | 1348 | 2010 | 2480 | 1692 | 1615 | 1880 | 2322 |
| Bar-tailed Godwit | 63 | 59 | 232 | 114 | 12 | 36 | 31 | 49 | 47 |
| Curlew | 1486 | 1131 | 1475 | 2931 | 2847 | 2223 | 1297 | 1194 | 1297 |
| Redshank | 1153 | 1839 | 1840 | 2100 | 2243 | 2249 | 847 | 1053 | 1970 |
| Greenshank | 22 | 31 | 46 | 45 | 46 | 61 | 28 | 22 | 59 |
| Turnstone | 60 | 127 | 122 | 71 | 166 | 146 | 93 | 66 | 145 |

Table 4. Mean annual five year maxima.

| | Five year maxima | | Importance thresholds | |
|---|---|---|---|---|
| | 98/99-02/03 | 96/97-99/00 and 02/03 | International | National |
| Great Northern Diver | 3 | 3 | 50 | - |
| *Little Grebe* | *57* | *62* | - | *30* |
| *Great Crested Grebe* | *216* | *246* | - | *35* |
| *Cormorant* | *360* | *390* | *1200* | *105* |
| *Little Egret* | *33* | *25* | *800* | |
| Grey Heron | 80 | 87 | 4500 | 105 |
| Mute Swan | 34 | 44 | 2400 | 100 |
| *Shelduck* | *1496* | *1957* | *3000* | *125* |
| *Wigeon* | *1561* | *1736* | *12500* | *1000* |
| *Teal* | *1184* | *1129* | *4000* | *500* |
| *Mallard* | *505* | *594* | *20000* | *500* |
| *Pintail* | *51* | *55* | *600* | *20* |
| *Shoveler* | *95* | *106* | *400* | *40* |
| Pochard | 23 | 61 | 3500 | 350 |
| Tufted Duck | 33 | 53 | 10000 | 300 |
| Goldeneye | 18 | 18 | 3000 | 100 |
| *Red-breasted Merganser* | *95* | *114* | *1250* | *25* |
| Moorhen | 23 | 42 | | |
| Coot | 39 | 53 | 15000 | 300 |
| *Oystercatcher* | *1467* | *1940* | *9000* | *700* |
| Ringed Plover | 57 | 70 | 500 | 100 |
| *Golden Plover* | *4318* | *3948* | *18000* | *1500* |
| *Grey Plover* | *47* | *90* | *1500* | *50* |
| *Lapwing* | *4615* | *6465* | *20000* | *2000* |
| Knot | 100 | 80 | 3500 | 250 |
| *Dunlin* | *6760* | *8839* | *14000* | *1200* |
| **Black-tailed Godwit** | **2232** | **2260** | **700** | **80** |
| *Bar-tailed Godwit* | *263* | *237* | *1000* | *175* |
| *Curlew* | *1919* | *2340* | *3500* | *1000* |
| **Redshank** | **1765** | **2181** | **1500** | **250** |
| *Greenshank* | *45* | *52* | *3000* | *20* |
| *Turnstone* | *123* | *131* | *700* | *100* |

Internationally important species are shown in bold. Nationally important species are shown in italics.

Gittings, T. (2006). Waterbird monitoring in Cork Harbour: 1994/95-2002/03. In C. Cronin, C. Barton, H. Hussey, & M. Carmody (Eds.), (pp. 319–339). Cork: Cork Bird Report Editorial Team. (Final MS version)

**Figure Legends**

Figure 1. Degree of co-ordination of Cork Harbour counts. This graph shows the frequency distribution across all Cork Harbour I-WeBS counts of the number of days between the earliest and latest dates on which counts were carried out each month.

Figure 2. Seasonal trends in numbers of selected waterbird species in Cork Harbour (excluding Douglas Estuary/Dunkettle). For most species, no data is included for 2000/01 and 2001/02 due to the poor levels of coverage in those winters. Note that there was no count in November 1997.

Figure 3. Relationship between autumn and winter peak counts of Black-tailed Godwits in Cork Harbour. All counts exclude Douglas Estuary and Dunkettle. Data has been adjusted to take account of missing count sectors as follows: 1995/96 autumn + 150; 2000/01 autumn + 300; 2000/01 winter + 200; 2001/02 autumn + 300.

**Fig. 1**

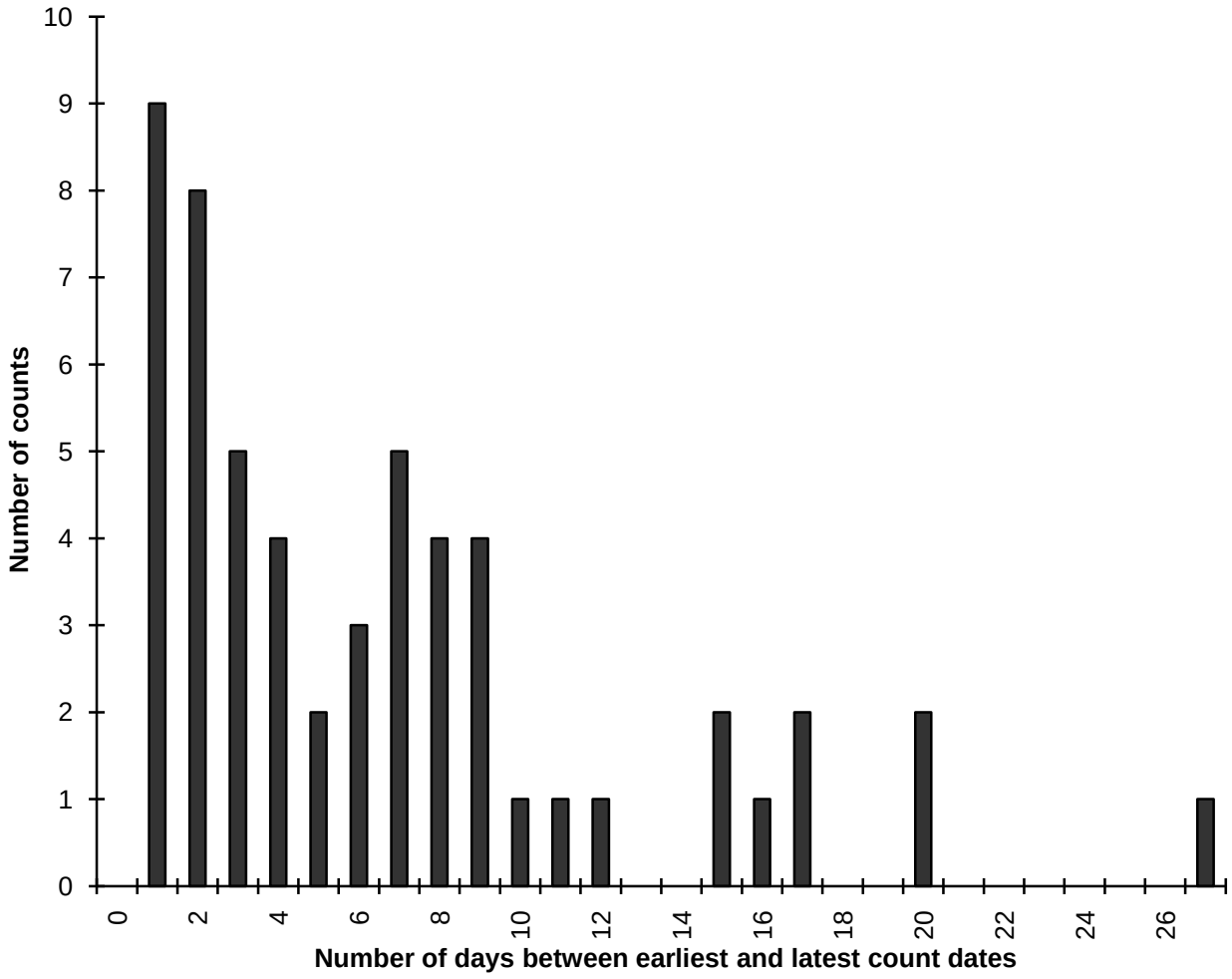

Number of counts
0
1
2
3
4
5
6
7
8
9
10
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Number of days between earliest and latest count dates

**Fig. 2a: Black-tailed Godwit**

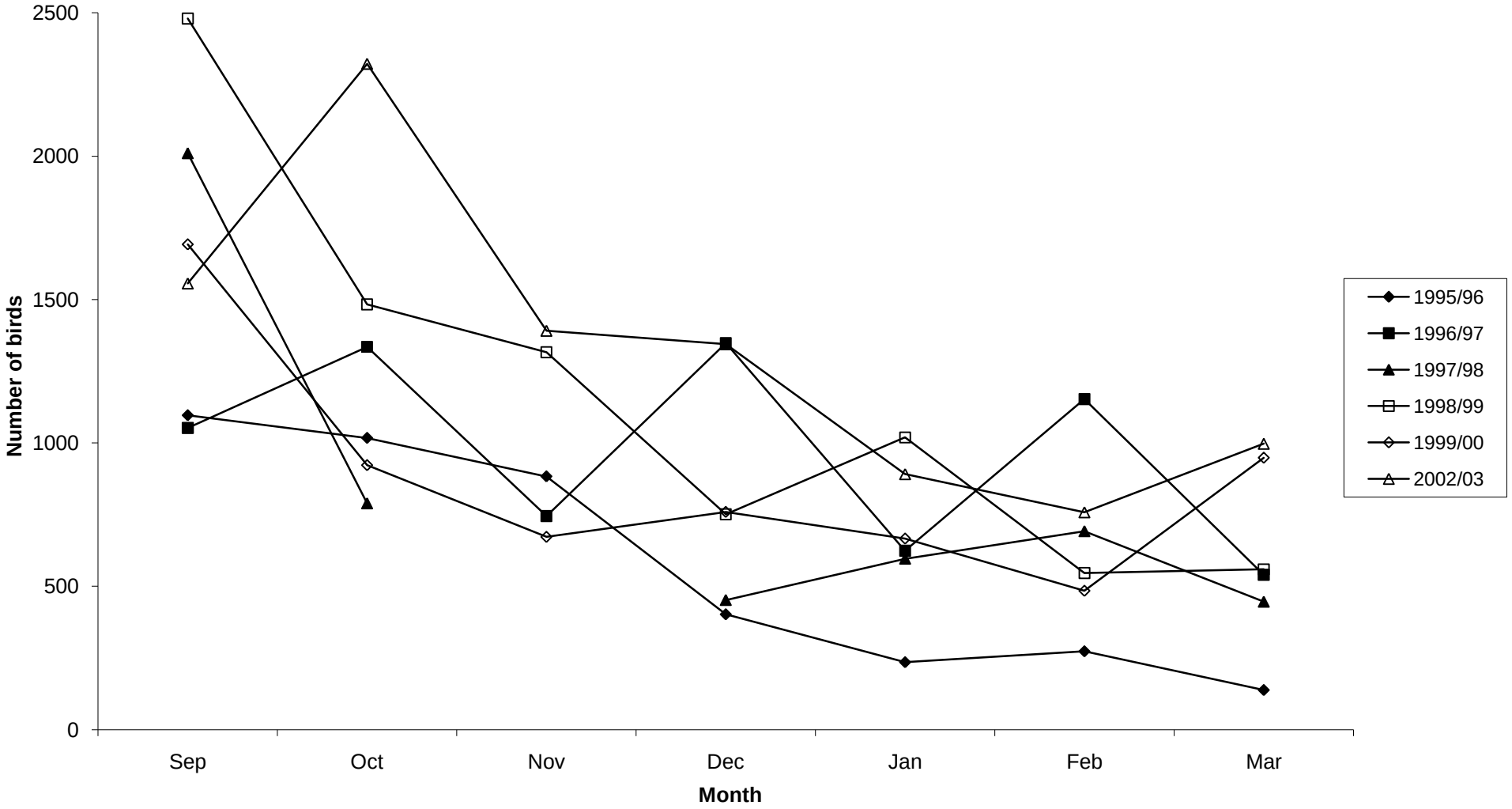


**Fig. 2b: Redshank**

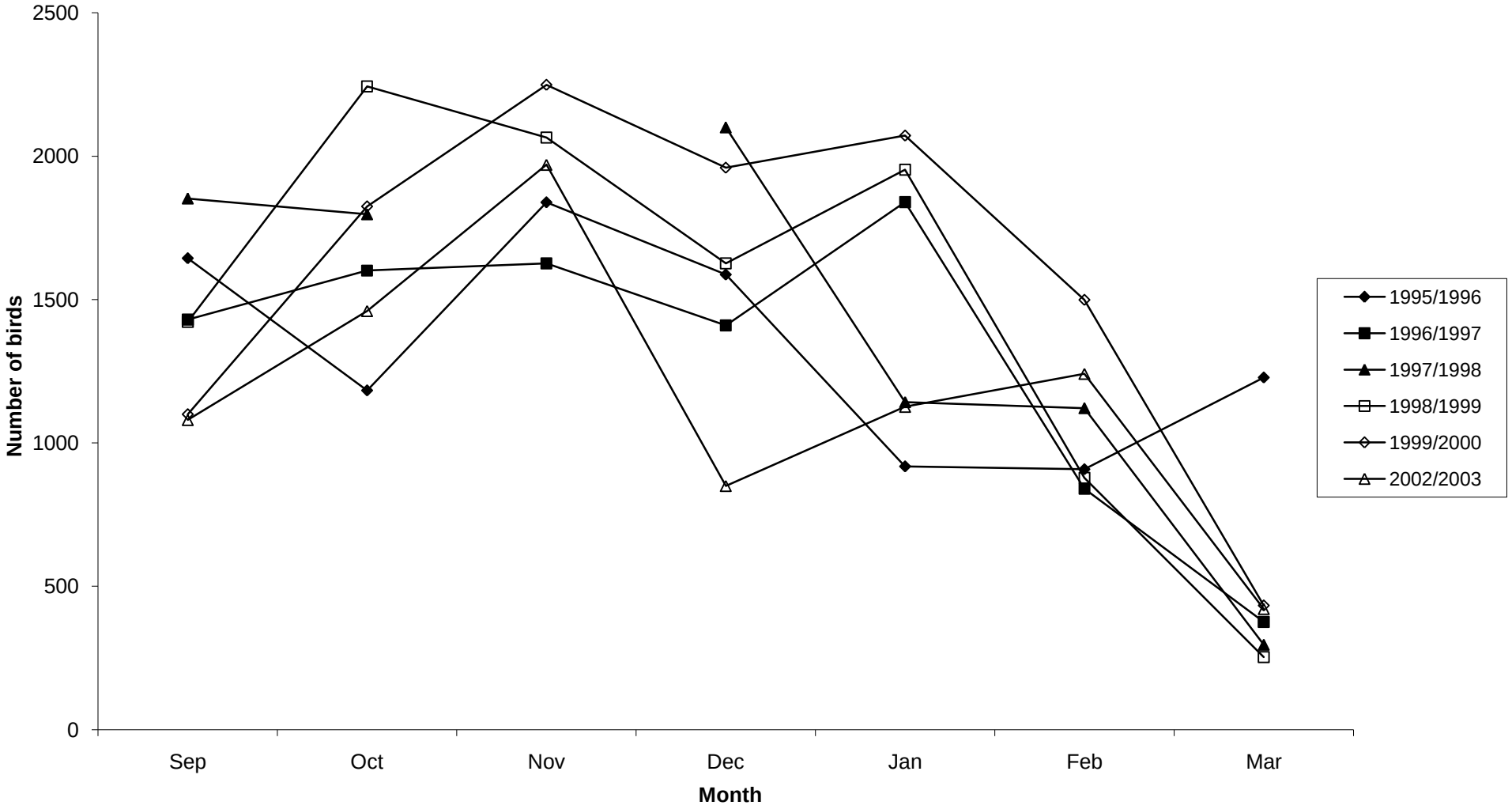


**Fig. 2c: Shelduck**

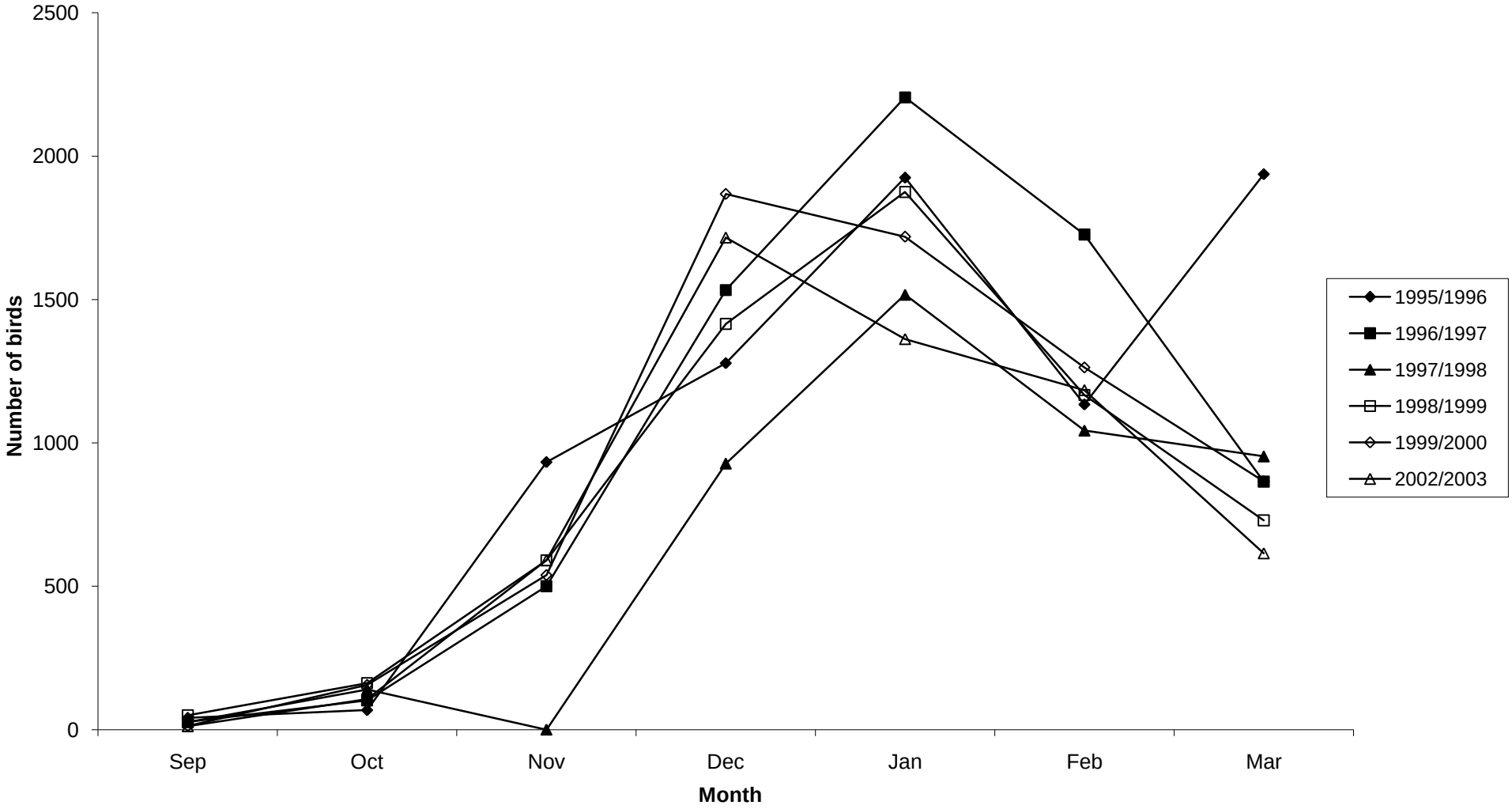


**Fig. 2d: Dunlin**

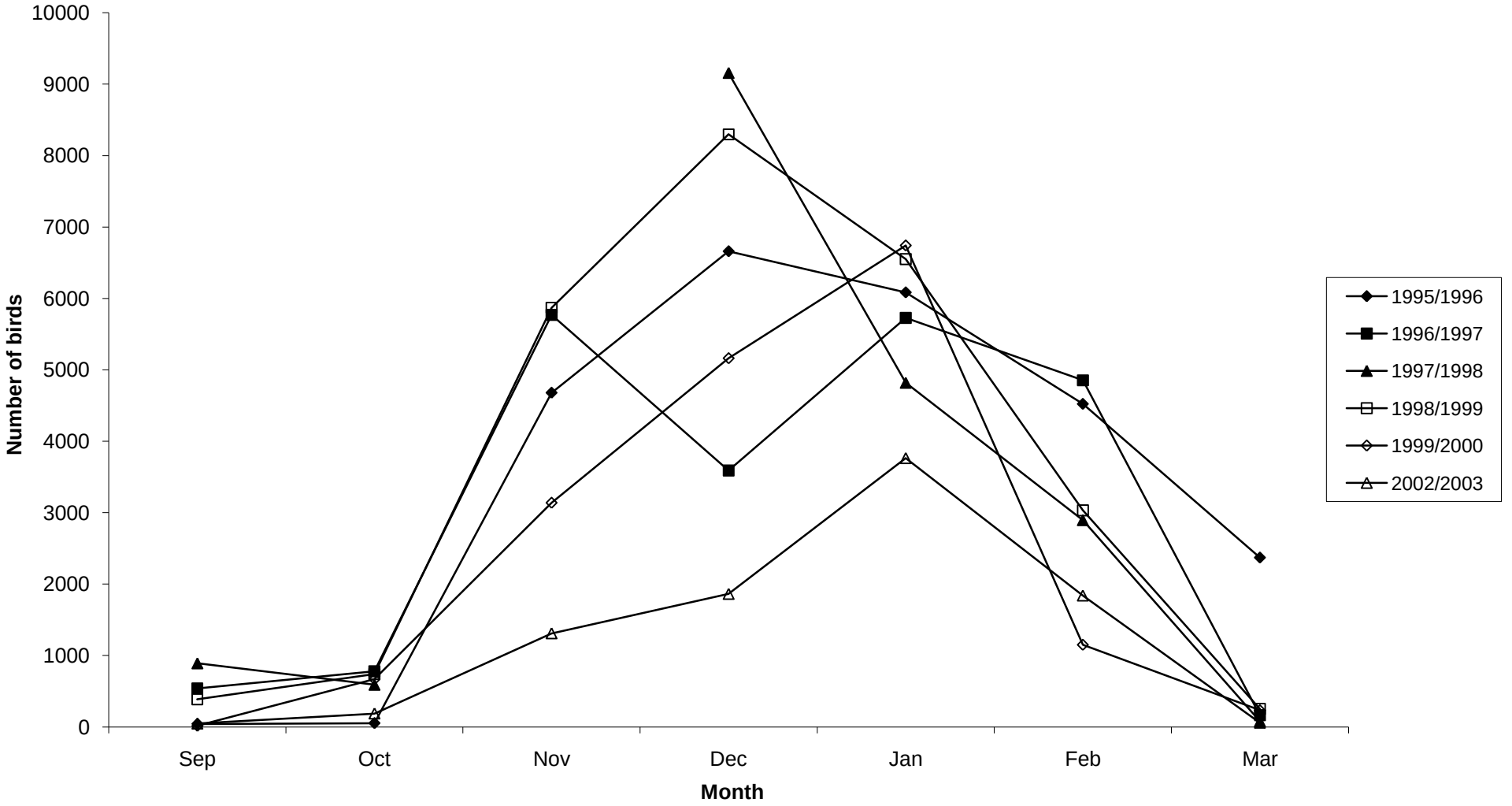


**Fig. 2e: Curlew**

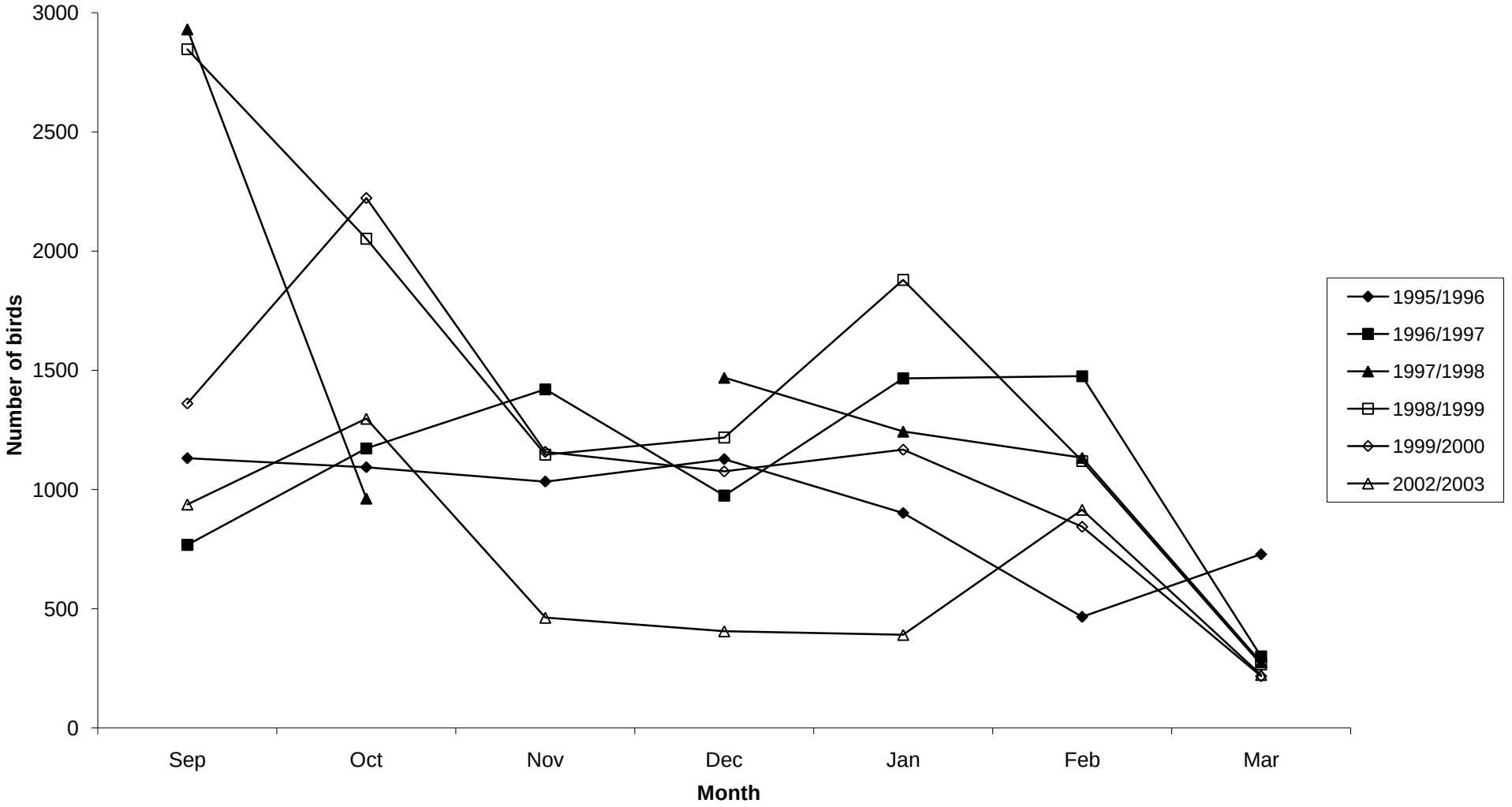


**Fig. 2f: Little Egret**

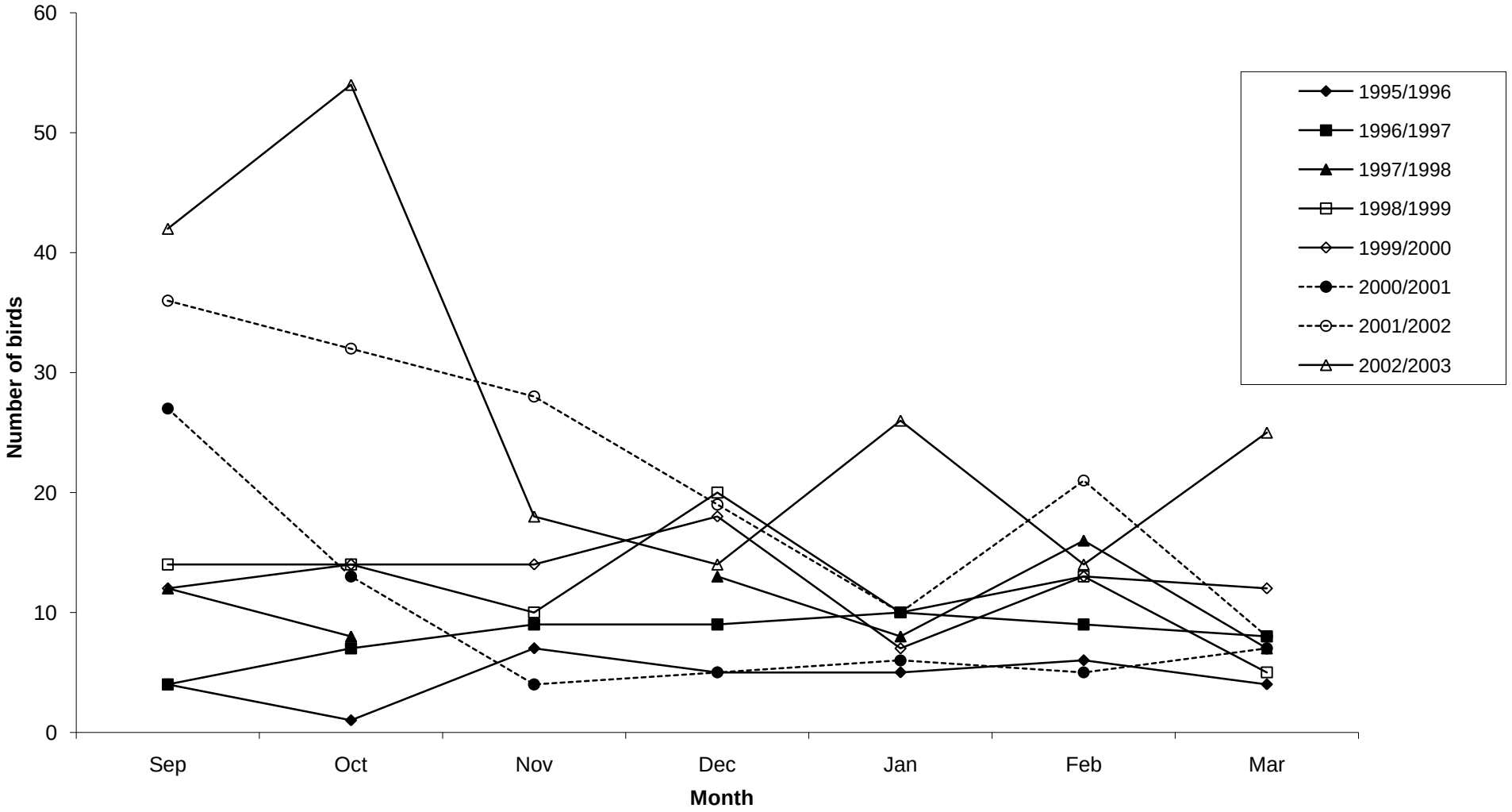
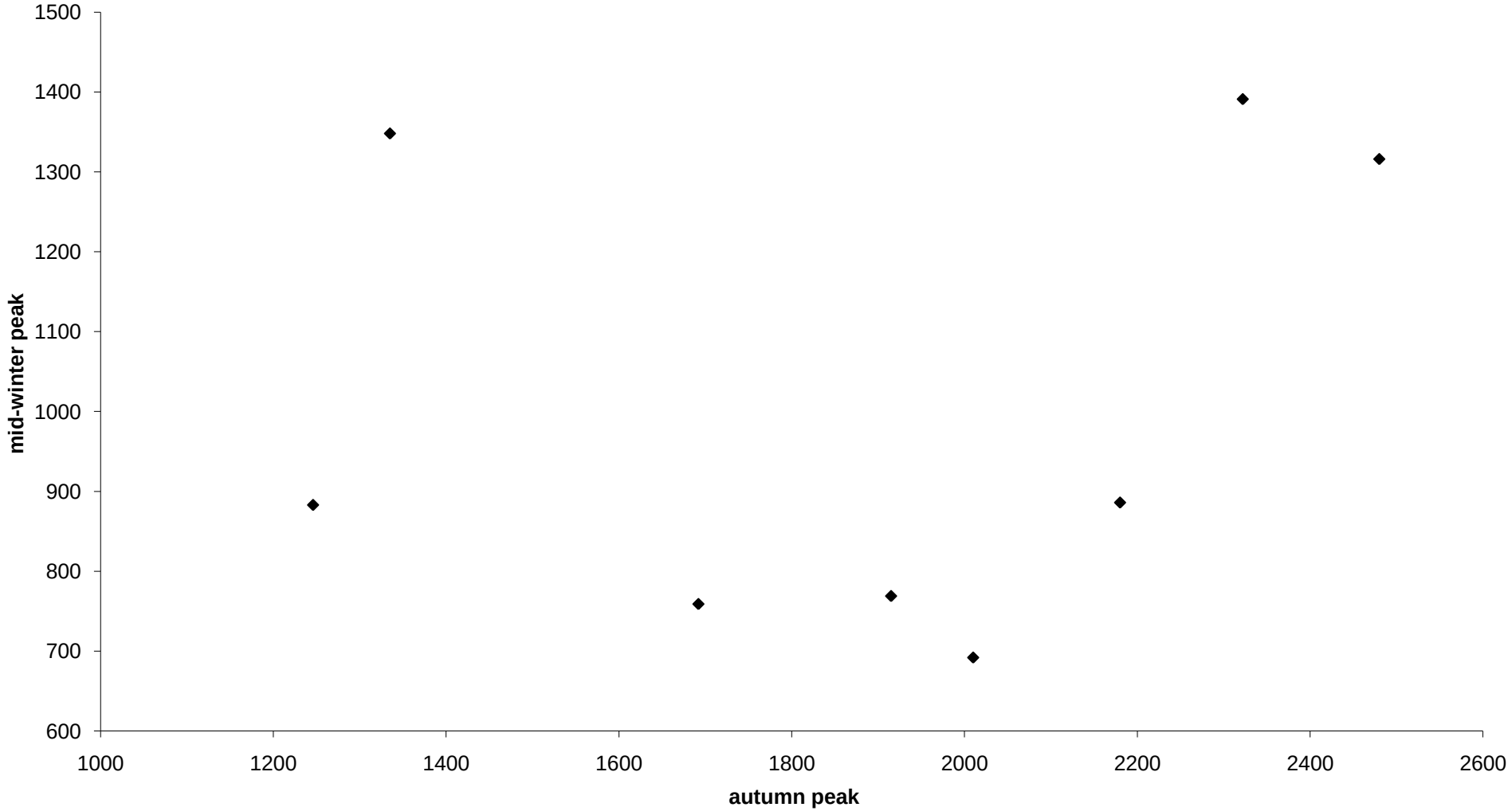


**Fig. 3**


1500
1400
1300
1200
1100
1000
900
800
700
600
mid-winter peak
1000
1200
1400
1600
1800
2000
2200
2400
2600
autumn peak