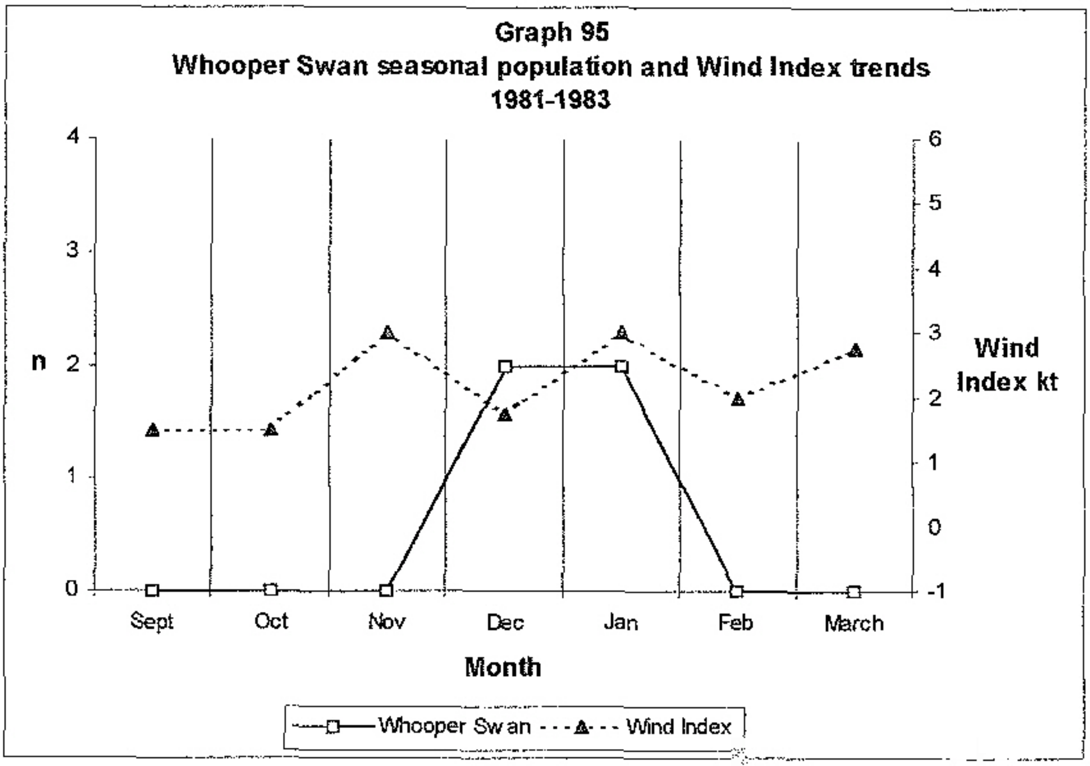
December- January as indices increased to the joint highest velocity in January.



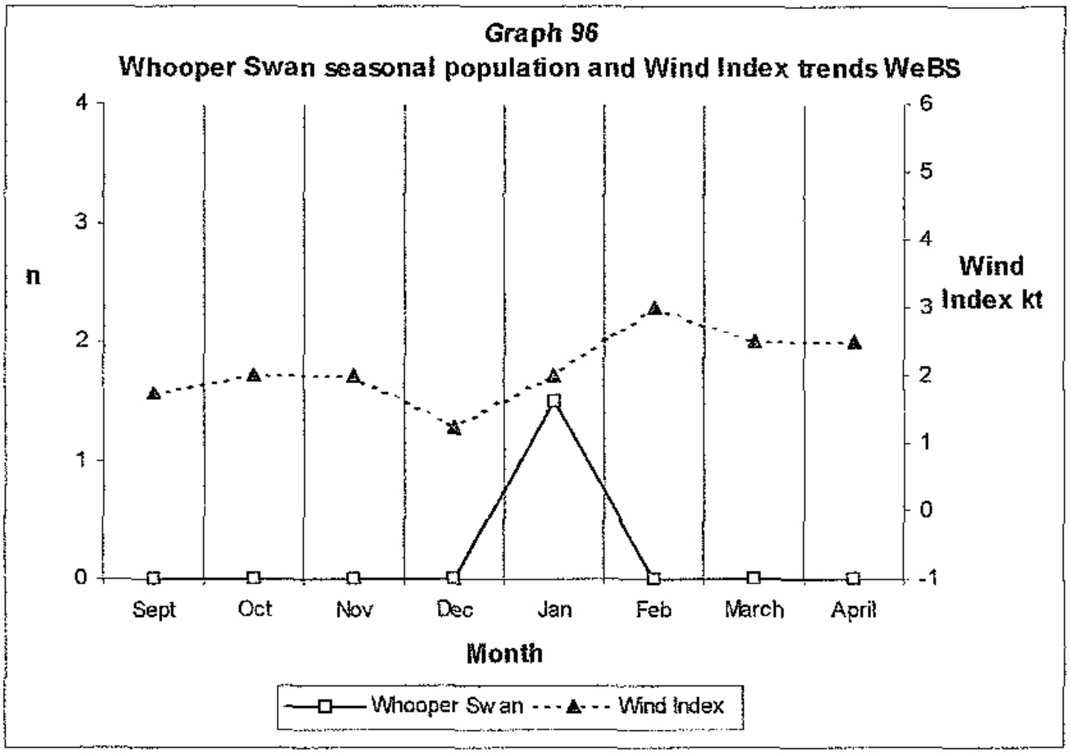
Above trend outliers corresponded during December-January, shown on table 48. Species sub-trend outliers were zeros.

Table 48

Corresponding outliers of Whooper Swan and Wind Index 1981-1983

Month	Whooper Swan populations			Wind Index		
	1981	1982	1983	1981	1982	1983
December	0 b	4 a	_	1 -3	3 -1	_
January	_	0 b	4 a	_	2 m -2	2 2 m

WeBS trends were similar during December-January, shown on graph 96. Trend populations peaked in January, the third joint highest index term.



56% of above trend abundance outliers corresponded with indices, shown on table 49, but of this class the greater populations were more frequent in reverse correspondence at lower indices, shown in table 50. 17 of the 20 medians were zeros; the majority were associated with lower indices.

Table 49

Corresponding outliers of Whooper Swan and Wind Index WeBS

Month	Whooper abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
November	_	r	r	4 a	r	2 a		_	r	r	3 -1	r	4 m 0	_
December	r	16 a	r	r	2 a	r	_	r	2 -2	r	r	4 0	r	_
January	r	0 b	o b	r	_	3 a	r	r	2 1 m -1	3 m -1	r	_	4 m 0	r
March	r	r	r	r	1 a	r	_	r	r	r	r	3 -1	r	_

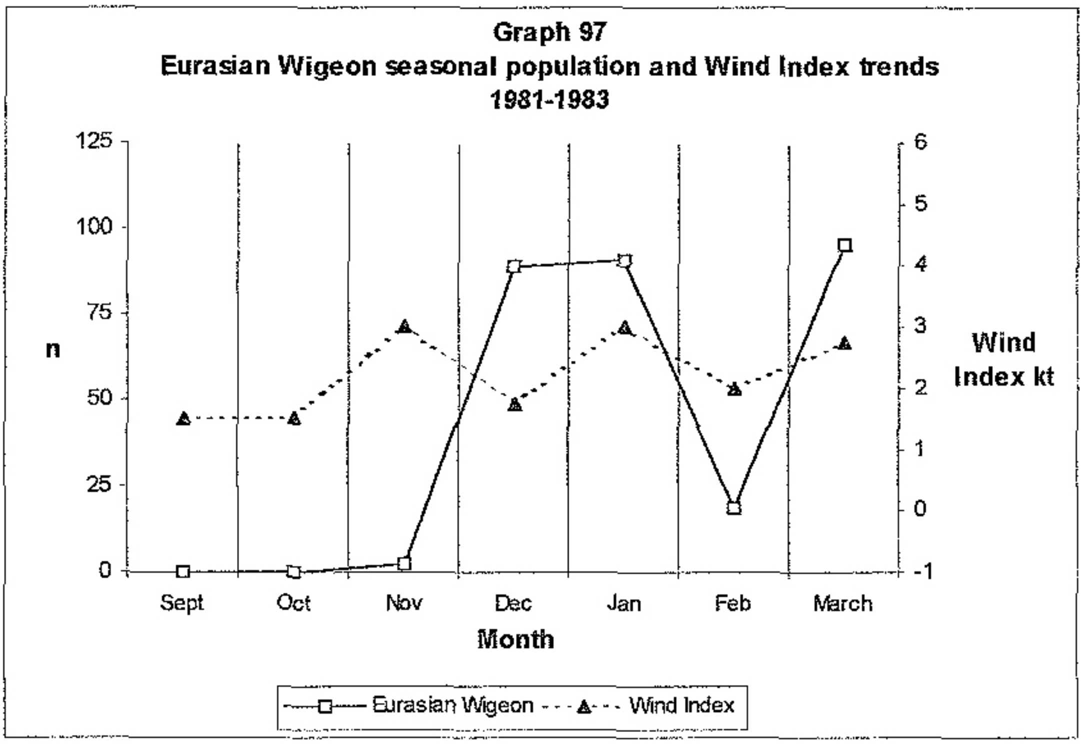
Table 50

Reverse corresponding outliers of Whooper Swan and Wind Index WeBS

Month	Whooper Swan abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
November	_	0 m	0 m	c	0 m	c	_	_	1 -3	1 1 m -2	c	3 1 m	c	_
December	0 m	c	0 m	0 m	c	0 m	_	1 -3	c	1 -3	3 -1	c	1 -3	_
January	23 a	c	c	0 b	_	c	10 a	1 3 m	c	c	4 0	_	c	1 1m -2
February	13 a	0 m	0 m	0 m	3 a	0 m	0 m	1 m -3	3 -1	4 m 0	2 m -2	1 3 m	2 -2	2 m -2
March	0 m	0 m	0 m	0 m	c	0 m	_	2 -2	2 -2	1 -3	1 -3	r	2 -2	

Eurasian Wigeon *Anas penelope*

1981-1983 trends increased during October-November and were dynamic in January-March, shown on graph 97. Trend populations peaked in January, the joint highest index term.



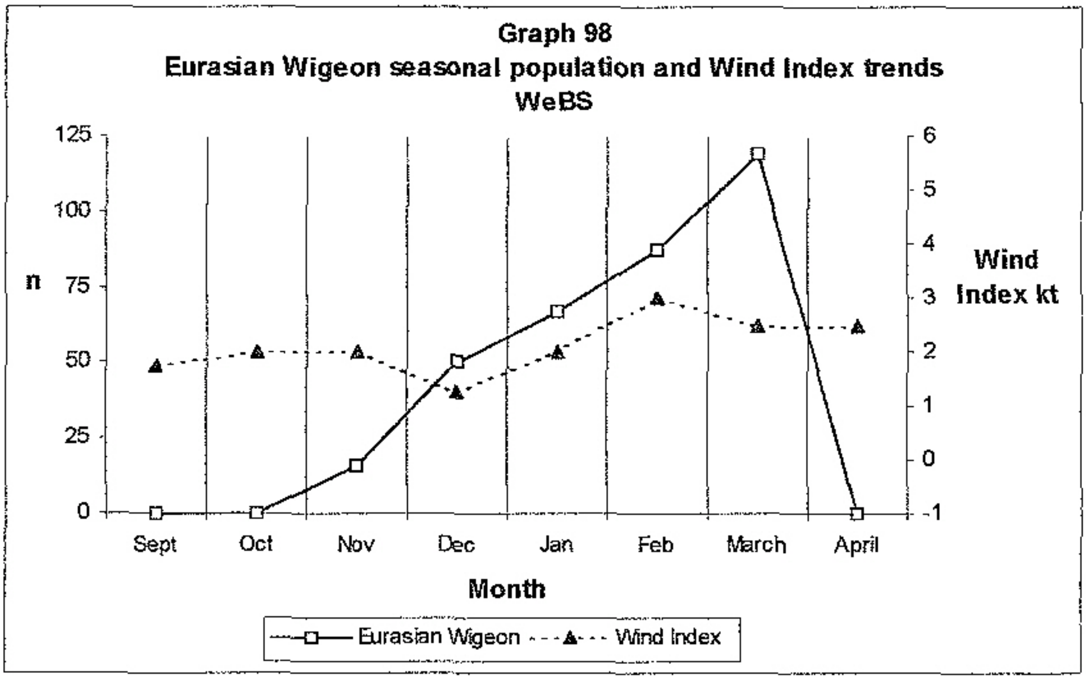
Outliers corresponded for the season, shown on table 51. Above and sub-trend outliers were equally frequent.

Table 51

Corresponding outliers of Eurasian Wigeon and Wind Index 1981-1983

Month	Eurasian Wigeon populations			Wind Index		
	1981	1982	1983	1981	1982	1983
November	0 b	5 a	_	1 m -3	2 1 m -1	_
December	55 b	123 a	_	1 -3	3 -1	_
January	_	60 b	121 a	_	2 m -2	2 2 m
February	_	33 a	4 b	_	3 m -1	1 2 m 1
March	_	99 a	92 b	_	3 -1	0 -4

WeBS trends were similar in December-February, shown on graph 98. Trend populations peaked in March, the second joint highest index term.



Variables had broad correspondence during October-January, shown on table 52, with the notable exception of December 2000. Positive sub-trend abundances were associated with lower indices, shown on table 53. Most sub-trend outliers were zeros, which were distributed amongst the three index classes.

Table 52

Corresponding outliers of Eurasian Wigeon and Wind Index WeBS

Month	Eurasian Wigeon abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	–	r	r	r	85 a	2 a	–	–	r	r	r	1 3 m	3 m -1	–
November	–	0 b	0 b	60 a	r	210 a	–	–	1 -3	1 1 m -2	3 -1	r	4 m 0	–
December	19 b	52 a	0 b	r	246 a	r	–	1 -3	2 -2	1 -3	r	4 0	r	–
January	r	53 b	0 b	80 a	–	155a	12 b	r	2 1 m -1	3 m -1	4 0	–	4 m 0	1 1m -2
February	r	r	109 a	r	r	r	r	r	r	4 m 0	r	r	r	r
March	769 a	128 a	110 b	80 b	r	192 a		2 -2	2 -2	1 -3	1 -3	3 -1	2 -2	–

Table 53

Reverse corresponding outliers of Eurasian Wigeon and Wind Index WeBS

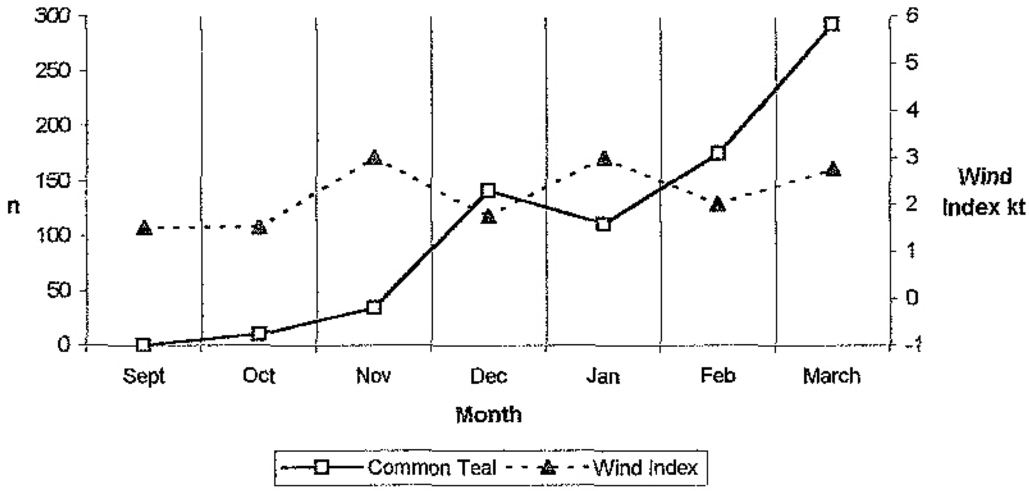
Month	Eurasian Wigeon abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	–	0 m	0 m	0 m	c	c	–	–	1 2 m -1	1 1 m -2	1 3 m	c	c	–
November	–	c	c	c	16 m	c	–	–	c	c	c	3 1 m	c	–
December	c	c	c	48 b	c	1370 a	–	c	c	c	3 -1	c	1 -3	–
January	240 a	c	c	c	–	c	c	1 3 m	c	c	c	–	c	c
February	246 a	30 b	c	0 b	150 a	87 m	20 b	1 m -3	3 -1	c	2 m -2	1 3 m	2 -2	2 m -2
March	c	c	c	c	8 b	c	–	c	c	c	c	3 -1	c	–

Broadly, both surveys' trends increased to mid-winter peaks when above trend outliers corresponded.

Eurasian Teal *Anas crecca*

1981-1983 trends were similar during October-November and February-March; populations lagged indices one month in November-December and January-February, shown on graph 99. Populations peaked in March, the second highest index term.

Graph 99
Eurasian Teal seasonal population and Wind Index trends
1981-1983



Species above trend outliers corresponded during November 1982-January *1983, shown on table 54, and were in reverse correspondence in February-* March 1983, shown on table 55.

Table 54

Corresponding outliers of Eurasian Teal and Wind Index 1981-1983

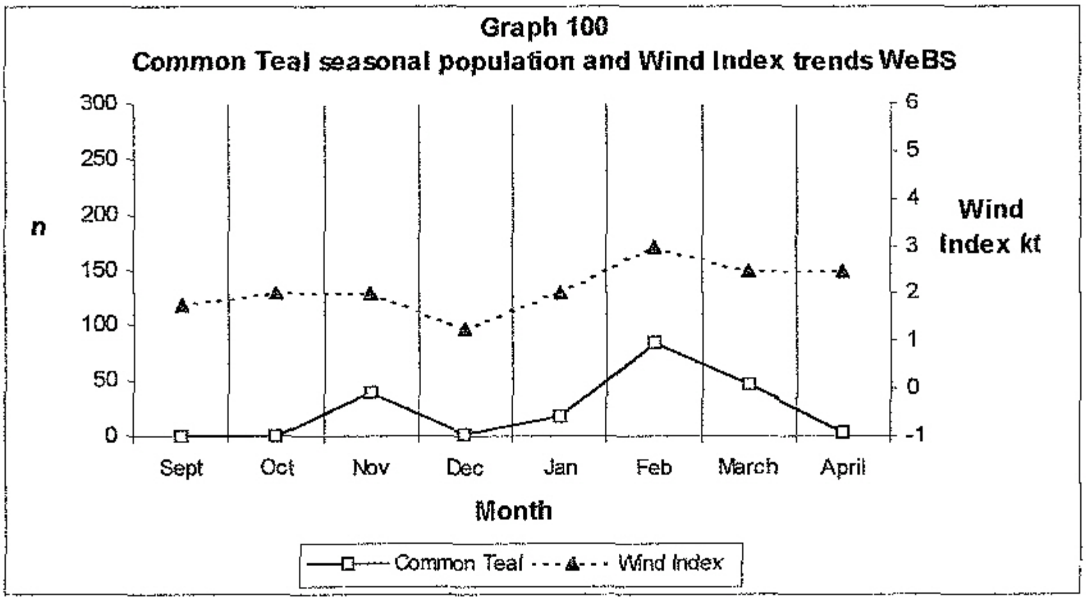
Month	Eurasian Teal populations			Wind Index		
	1981	1982	1983	1981	1982	1983
November	4 b	65 a	_	1 m -3	2 1 m -1	_
December	54 b	228 a	_	1 -3	3 -1	_
January	_	15 b	207 a	_	2 m 2	2 2 m

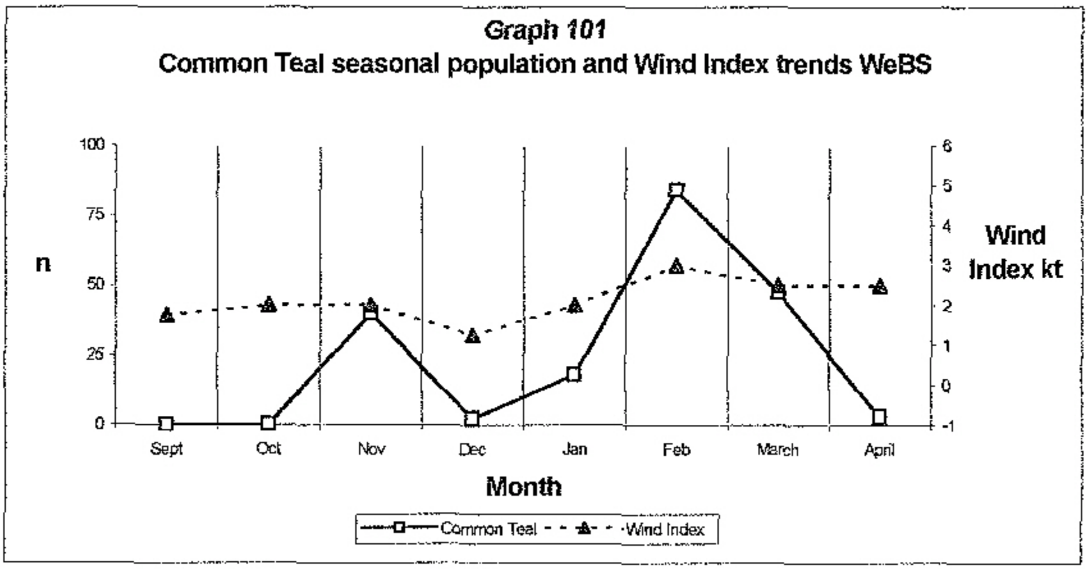
Table 55

Reverse corresponding outliers of Eurasian Teal and Wind Index 1981-1983

Month	Eurasian Teal populations			Wind Index		
	1981	1982	1983	1981	1982	1983
October	1 b	19 a	_	2 -2	1 -3	_
February	_	122 b	227 a	_	3 m -1	1 2 *m* -1
March	_	139 b	446 a	_	3 -1	0 -4

WeBS trends were dynamically similar during November-March, shown on graphs 100 and 101. *Populations peaked in February, the highest index term.*





Above trend outliers' demonstrated greater correspondence frequency during October-March, a period of overall increases, shown on table 56, compared to reverse correspondence, shown on table 57. The 11 zero sub-trend outliers were correspondingly more frequent.

Table 56

Corresponding outliers of Eurasian Teal and Wind Index WeBS

Month	*Eurasian Teal abundances*							*Wind Index*						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	_	r	r	r	200a	13 a	_	_	r	r	r	1 3 m	3 m -1	_
November	_	0 b	0 b	40 a	80 a	160 a	_	_	1 -3	1 1 m -2	3 -1	3 1 m	4 m 0	_
December	*0 b*	*r*	*0 b*	*4 a*	*100 a*	*r*	_	1 -3	*r*	1 -3	3 -1	4 0	r	_
January	r	0 b	0 b	36 a	_	155 a	0 b	r	2 1 m -1	3 m -1	4 0	_	4 m 0	1 1m -2
February	r	700a	r	r	125 a	85 a	r	r	3 -1	r	r	1 3 m	2 -2	r
March	362 a	r	10 b	38 b	57 a	100a	_	2 -2	r	1 -3	1 -3	3 -1	2 -2	_
April	_	r	70 a	r	0 b	r	_	_	r	3 -1	r	0 -4	r	_

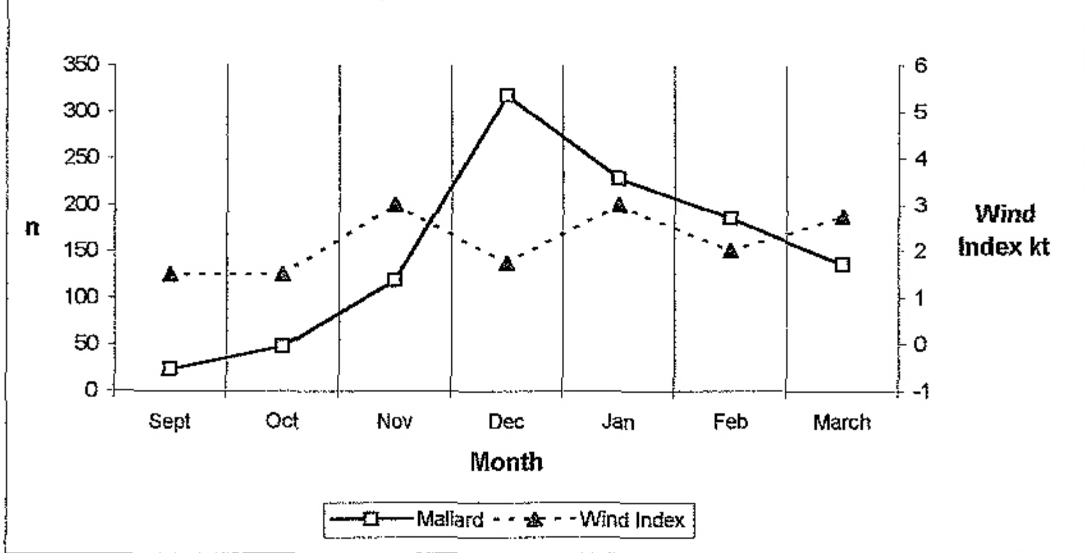
Table 57

Reverse corresponding outliers of Eurasian Teal and Wind Index WeBS

Month	Eurasian Teal abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	_	0 m	0 m	0 m	c	c	_	_	1 2 m -1	1 1 m -2	1 3 m	c	c	_
December	c	0 b	c	c	c	201 a	_	c	2 -2	c	c	c	1 -3	_
January	1200a	c	c	c	_	c	c	1 3 m	c	c	c	_	c	c
February	84 m	c	6 b	0 b	c	c	15 b	1 m -3	c	4 m 0	2 m -2	c	c	2 m -2
March	c	34 b	c	c	c	c	_	c	2 -2	c	c	c	c	_
April	_	3 m	c	2 b	c	35 a	_	_	2 -2	c	2 -2	c	0 -4	_

Mallard *Anas platyrhynchos*

1981-1983 trends increased during October-November and declined in January-February, shown on graph 102. Populations peaked in December, the second lowest index term.



Graph 102
Mallard seasonal population and Wind Index trends 1981-1983

Outliers sequentially corresponded in October 1981-1982 and December 1981-1982-January 1982-1983, shown on table 58 and were in reverse correspondence during February1981-1982-March 1982-1983, shown on table 59.

Table 58

Corresponding outliers of Mallard and Wind Index 1981-1983

Month	Mallard populations			Wind Index		
	1981	1982	1983	1981	1982	1983
October	51 a	44b	_	2 -2	1 -3	_
December	229 b	406 a	_	1 -3	3 -1	_
January	_	37 b	420 a	_	2 m -2	2 2 m

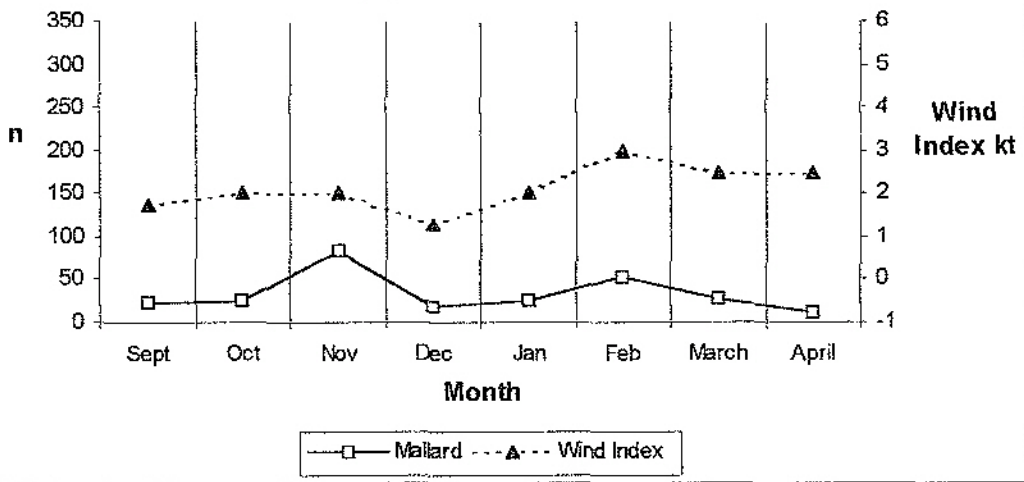
Table 59

Reverse corresponding outliers of Mallard and Wind Index 1981-1983

Month	Mallard populations			Wind Index		
	1981	1982	1983	1981	1982	1983
November	128 a	109 b	_	1 m -3	2 1 m -1	_
February	_	45 b	326 a	_	3 m -1	1 2 m -1
March	_	67 b	205 a	_	3 -1	0 -4

WeBS trends were dynamically similar during November-March, shown on graph 103. Populations peaked in November, the third highest index term.

Graph 103
Mallard seasonal population and Wind Index trends WeBS



Above trend outliers corresponded more frequently during October-January, shown on table 60, compared to February-April when abundance classes were in reverse correspondence, shown on table 61.

Table 60

Corresponding outliers and median class of Mallard and Wind Index WeBS

Month	Mallard numbers								Wind Index							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
October	_	26 a	r	r	500 a	133 a	r	_	_	3 -1	r		4 0	3 -1	r	_
November	-	83 b	r	138 a	r	86 a	r	_	_	1 -3	r	4 0	r	4 0	r	_
December	6 b	m	37 a	53 a	r	r	29 a	_	1 -3	m	4 0	4 0	r	r	4 0	_
January	162 a	m	r	30 a	_	107 a	r	r	4 0	r	r	4 0	_	4 0	r	r
February	r	84 a	r	r	112 a	r	r	r	r	3 -1	r	r	4 0	r	r	r
March	r	r	r	21 b	r	m	_	r	2 -2	2 -2	1 -3	1 -3	3 -1	2 -2	1 -3	1 -3
April	_	r	26 a	r	r	9 b	_	32 a	_	r	3 -1	r	r	0 -4	r	0 -4

Table 61

Reverse corresponding outliers and median class of Mallard and Wind Index WeBS

Month	*Mallard abundances*							*Wind Index*						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
September	_	_	_	_	46 a	2 b	_	_	_	_	_	2 -2	3 -1	_
October	_	26 m	c	12 b	c	c	_	_	1 2 m -1	c	1 3 m	c	c	_
November	_	*c*	*c*	*c*	*84 m*	*c*	_	_	*c*	*c*	*c*	3 1 m	c	_
December	c	c	37 a	c	12 b	c	_	c	c	1 -3	c	4 0	c	_
January	162 a	c	c	c	_	c	c	1 3 m	c	c	c	_	c	c
February	54 m	c	12 b	9 b	112 a	c	31 b	1 m -3	c	4 m 0	2 m -2	1 3 m	c	2 m -2
March	c	27 b	50 a	c	20 b	c	_	c	2 -2	1 -3	c	3 -1	c	_
April	_	7 b	c	12 m	20 a	c	_	_	2 -2	c	2 -2	0 -4	c	_

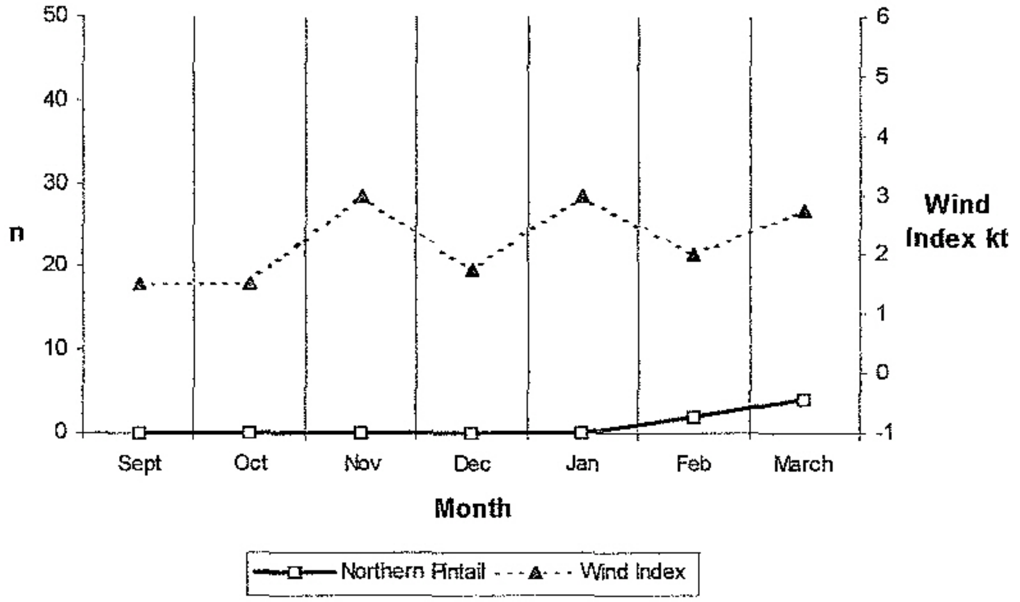
In summary, 1981-1983 trend populations were greater than WeBS' and both showed autumnal increases.

Northern Pintail *Anas acuta*

1981-1983 trends were increased during February-March and January-February increased lagged one month to indices, shown in graph 104. Trend populations peaked in March, the second highest index term.

Graph 104

Northern Pintail seasonal population and Wind Index trends 1981-1983



Median abundance outliers were in reverse correspondence in February-March 1982-1983, shown on table 62.

Table 62

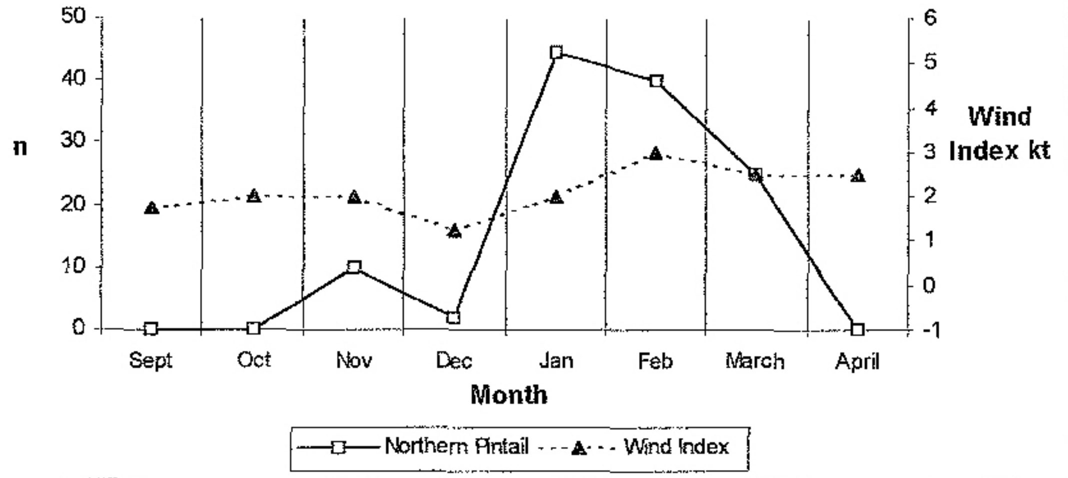
Corresponding outliers of Northern Pintail and Wind Index 1981-1983

Month	Northern Pintail populations			Wind Index		
	1981	1982	1983	1981	1982	1983
February	_	2 m	2 m	_	3 m -1	1 2 m 1
March	_	4 m	4 m	_	3 -1	0 -4

WeBS trends were similar during November-January and February-March, shown in graph 105. Trend populations peaked in January, the third highest index term.

Graph 105

Northern Pintail seasonal population and Wind Index trends WeBS



Outliers showed broad correspondence during November-January, the overall period of trend increases, shown on table 63; for the remainder of the season abundances were approximately equal in correspondence and reverse correspondence, shown also in table 64.

Table 63

Corresponding outliers and median class of Northern Pintail and Wind Index WeBS

Month	Northern Pintail abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	_	r	r	r	4 a	r	_	_	r	r	r	1 3 m	r	_
November	_	*0 b*	*0 b*	*r*	*r*	*320 a*	_	_	1 -3	1 1 m -2	r	r	4 m 0	_
December	0 b	r	0 b	r	140 a	r	_	1 -3	r	1 -3	r	4 0	r	_
January	r	4 b	0 b	127 a	_	135 a	0 b	r	2 1 m -1	3 m -1	4 0	_	4 m 0	1 1m -2
February	r	250 a	r	r	15 b	42 a	r	r	3 -1	r	r	1 3 m	2 -2	r
March	65 a	r	12 b	r	r	38 a	_	2 -2	r	1 -3	r	r	2 -2	_
April	_	4 a	r	r	r	r	_	_	2 -2	r	r	r	r	_

Table 64

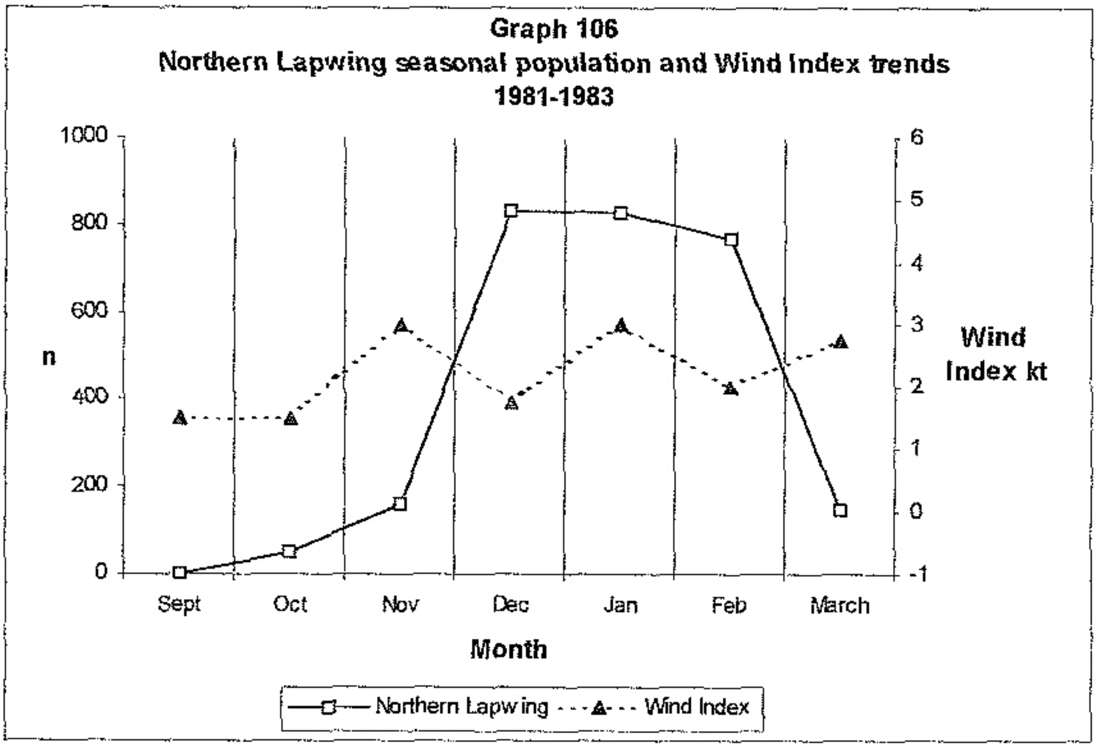
Reverse corresponding outliers of Northern Pintail and Wind Index WeBS

Month	Northern Pintail abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	_	0 m	0 m	0 m	c	0 m	_	_	1 2 m -1	1 1 m -2	1 3 m	c	3 m -1	_
November	_	c	c	10 m	10 m	c	_	_	c	c	3 -1	3 1 m	c	_
December	c	2 m	c	2 m	c	198 a	_	c	2 -2	c	3 -1	c	1 -3	_
January	85 a	c	c	c	_	c	c	1 3 m	c	c	c	_	c	c
February	70 a	c	0 b	0 b	c	c	40 m	1 m -3	c -1	4 m 0	2 m -2	c	c	2 m -2
March	c	9 b	c	42 a	5 b	c	_	c	2 -2	c	1 -3	3 -1	c _	_
April	_	c	0 m	0 m	0 m	0 m	_	_	c	3 -1	2 -2	0 -4	0 -4	_

Survey's median abundances tended to occur at lower indices, except during November 1998 and 1999.

Northern Lapwing *Vanellus vanellus*

1981-1983 population trends peaked in December, the second lowest index term, shown in graph 106.



Above trend outliers were in sequential correspondence between November 1982-January 1983 and were in reverse correspondence between February-March 1983, shown on tables 65 and 66 respectively.

Table 65

Corresponding outliers of Northern Lapwing and Wind Index 1981-1983

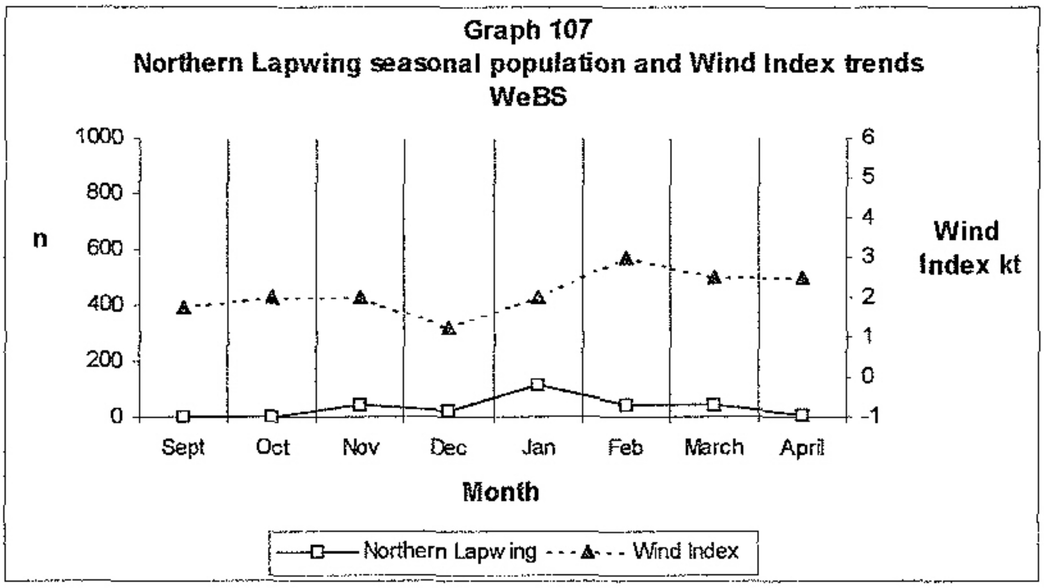
Month	Northern Lapwing populations			Wind Index		
	1981	1982	1983	1981	1982	1983
October	73 a	32 b	_	2 -2	1 -3	_
November	150 b	167 a	_	1 m -3	2 1 m -1	_
December	200 b	1458 a	_	1 -3	3 -1	_
January	_	693 b	960 a	_	2 m -2	2 m -2

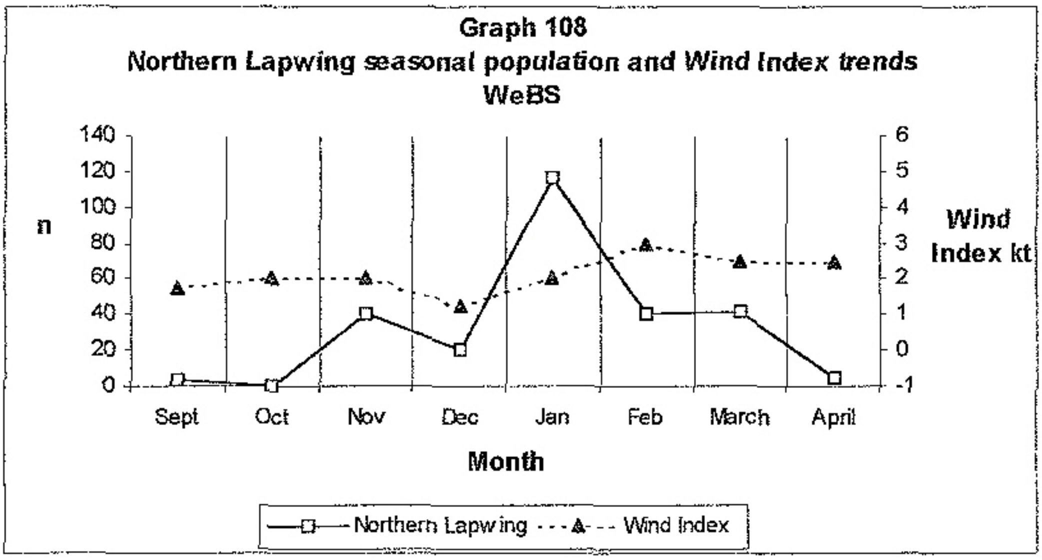
Table 66

Reverse corresponding outliers of Northern Lapwing and Wind Index 1981-1983

Month	Northern Lapwing populations			Wind Index		
	1981	1982	1983	1981	1982	1983
February	_	0 b	1531 a	_	3 m -1	1 2 m -1
March	_	119 b	174 a	_	3 -1	0 -4

WeBS trends were similar during November-January, shown in graphs 107 and 108. Trend populations peaked in January the joint second lowest index term.





Above trend outliers were correspondingly discontinuous, except during September-November 2000, shown on table 67 and similarly in reverse correspondence but sub-trend outliers were sequential in January-March 2000, shown on table 68. Zeros had an asymmetrical distribution during September-January and were equally distributed between corresponding nand reverse corresponding index outliers.

Table 67

Corresponding outliers and median class of Northern Lapwing and Wind Index WeBS

Month	Northern Lapwing abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
September	–	–	–	–	0 b	6 a	–	–	–	–	–	2 -2	3 -1	–
October	–	r	r	r	8 a	9 a	–	–	r	r	r	1 3 m	3 m -1	–
November	–	0 b	0 b	180 a	r	300a	–	–	1 -3	1 1 m -2	3 -1	r	4 m 0	–
December	r	r	r	r	212 a	0 b	–	r	r	r	r	4 0	1 -3	–
January	r	r	0 b	200 a	–	r	0 b	r	r	3 m -1	4 0	–	r	1 1m -2
February	r	650 a	r	r	r	r	r	r	3 -1	r	r	r	r	r
March	157 a	r	r	r	r	r	–	2 -2	r	r	r	r	r	–
April	–	r	15 a	r	3 b	r	–	–	r	3 -1	r	0 -4	r	–

Table 68

Reverse correspondence and median class of Northern Lapwing and Wind Index WeBS

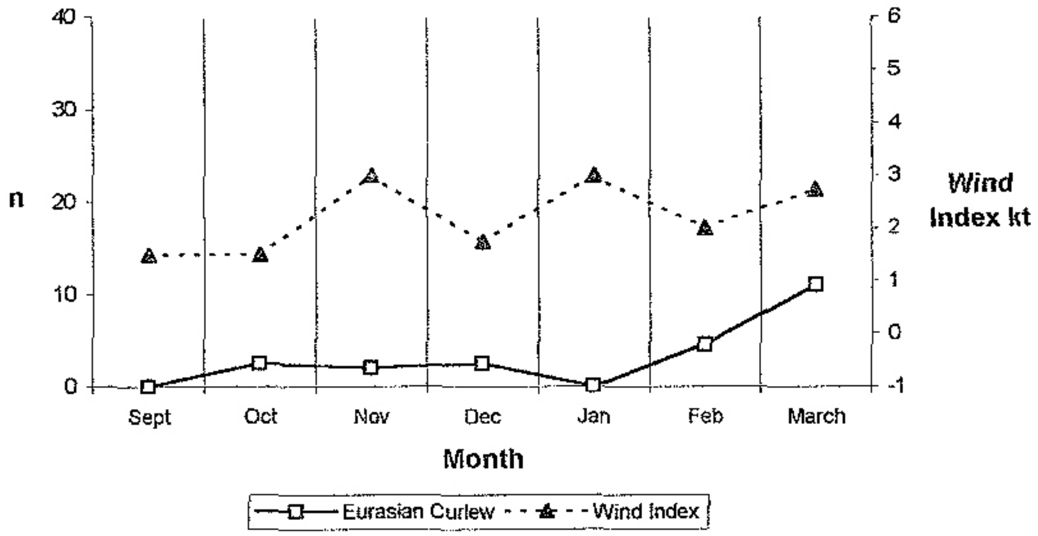
Month	Northern Lapwing abundances							Wind Index						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	_	0 m	0 m	0 m	c	c	_	_	1 2 m -1	1 1 m -2	1 3 m	c	c	_
November	_	c	c	c	40 m	c	_	_				3 1 m	c	_
December	40 a	0 b	130 a	0 b	c	c	_	1 -3	2 -2	1 -3	3 -1	c	c	_
January	785 a	170 a	c	c	_	62 b	c	1 3 m	2 1 m -1	c	c	_	4 m 0	c
February	749 a	c	0 b	40 m	139 a	28 b	6 b	1 m -3	c	4 m 0	2 m -2	1 3 m	2 -2	2 m -2
March	c	7 b	118 a	74 a	8 b	0 b	_	2 -2	2 -2	1 -3	1 -3	3 -1	2 -2	
April	_	2b	c	5 b	c	7 a	_	_	2 -2	c	2 -2	c	0 -4	_

In summary, the greater population range of 1981-1983 were associated with higher indices; the process were opposite during WeBS. In 1981-1983 lower abundances were associated with lower velocities. Over WeBS, November and January, were broadly associated with higher and lower velocities respectively.

Eurasian Curlew *Numenius arquata*

1981-1983 trends were increased during February-March, shown on graph 109. Trend populations peaked in March, the second highest term.

Graph 109
Eurasian Curlew seasonal population and Wind Index trends 1981-1983



Above trend abundance outliers were few, shown on table 69, and were higher and more frequent in reverse correspondence, notably February-March 1983, shown on table 70.

Table 69

Corresponding outliers of Eurasian Curlew and Wind Index 1981-1983

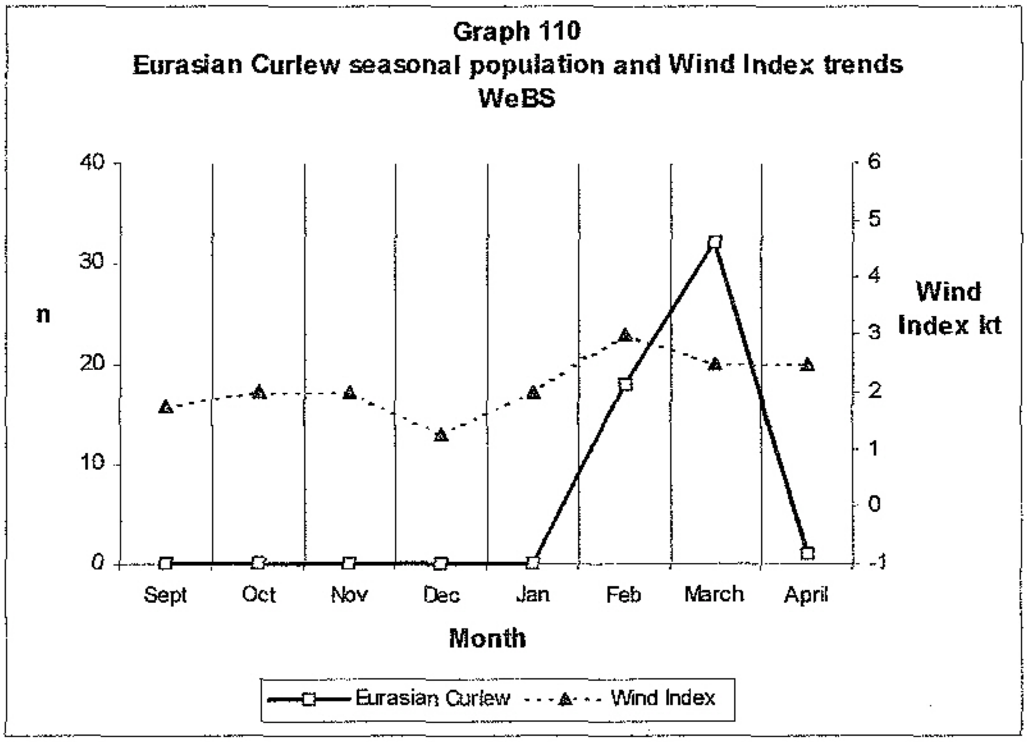
Month	Eurasian Curlew populations			Wind Index		
	1981	1982	1983	1981	1982	1983
November	0 b	4a	_	1 m -3	2 1 m -1	_
December	0 b	5 a	_	1 -3	3 -1	_

Table 70

Reverse corresponding outliers and median class of Eurasian Curlew and Wind Index 1981-1983

Month	*Eurasian Curlew populations*			*Wind Index*		
	1981	1982	1983	1981	1982	1983
October	0 b	5 a	_	2 -2	1 -3	_
February	_	0 b	9 a	_	3 m -1	1 2 m -1
March	_	5 b	17 a	_	3 -1	0 -4

WeBS trends increased during January-February, shown in graphs 110. Trend peaked rapidly to March, the second joint highest index term.



Populations were virtually absent between September and January. Above trend outliers corresponded with indices of medium duration, such as March 1995, shown on table 71 and in reverse correspondence were of shorter duration, such as March 1997, shown on table 72.

Table 71

Corresponding outliers and median class of Eurasian Curlew and Wind Index WeBS

Month	*Eurasian Curlew abundances*							*Wind Index*						
	1995	1996	1997	1998	1999	2000	2001	1995	1996	1997	1998	1999	2000	2001
October	_	r	r	r	1 a	r	_	_	r	r	r	1 3 m	r	_
February	1 b	48 a	r	r	r	35 a	r	1 m -3	3 -1	r	r	r	2 -2	r
March	124 a	52 a	r	23 b	r	r	_	2 -2	2 -2	r	1 -3	r	r	_

Table 72

Reverse corresponding and median class of Eurasian Curlew and Wind Index WeBS

Month	Eurasian Curlew abindances							Wind Index						
	1995	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
October	_	0 m	0 m	0 m	c	0 m	_	_	1 2 m -1	1 1 m -2	1 3 m	c	3 m -1	_
January	0 m	4 a	0 m	0 m	_	0 m	_	1 3 m	2 1 m -1	3 m -1	4 0	_	4 m 0	1 1m -2
February	c	c	*0 b*	*18 m*	*50 a*	c	*0 b*	c	c	4 *m* 0	2 m -2	1 3 m	c	2 m -2
March	c	c	40 a	c	24 b	3 b	_	c	c	1 -3	c	3 -1	2 -2	_
April	_	1 m	1 m	0 b	3 a	2 a	_	_	2 -2	3 -1	2 -2	0 -4	0 -4	_

In summary, surveys' patterns were: (i) numbers peaked latterly in the *seasons; (ii) September-January numbers were low or absent;* (iii) largest increases commenced from February and were mainly associated with lower velocities.

Summary

Table 73

Summary table of species and Wind Index trends 1981-1983 and WeBS

	1981-1983				WeBS			
	Predominant Trends				Predominant Trends			
Species	Trend Peak term	Increasing species-wind index corresponding trends	Stationary trends	Decreasing species-wind index corresponding trends	Trend Peak term	Increasing species-wind index corresponding trends	Stationary trends	Decreasing species-wind index corresponding trends
Mute Swan	Sept	Dec-Jan	_	Jan-Feb	Nov	Dec-Jan	Mar-April	Feb-March
Whooper Swan	Dec-Jan	_	_	Jan-Feb	Jan	Dec-Jan	Mar-April	_
Eurasian Wigeon	Mar	Oct-Dec Dec-Jan Feb-Mar	_	Jan-Feb	Mar	Dec-Feb	_	_
Eurasian *Teal*	Mar	Oct-Nov Feb-Mar	_	_	Feb	Dec-Feb	_	Nov-Dec Feb-Mar
Mallard	Dec	Sept-Nov	_	Dec-Feb	Nov	Dec-Feb	_	Nov-Dec Feb-Mar
Northern Pintail	Mar	Feb-Mar	_	_	Jan	Dec-Jan	_	Nov-Dec Feb-Mar
Northern Lapwing	Dec	Oct-Nov	_	Jan-Feb	Jan	Dec-Jan	_	Nov-Dec
Eurasian Curlew	Mar	Feb-Mar	_	_	Mar	Jan-Feb	Oct-Nov	_

Trend analysis conclusions, summarized on table 31, show that: (i) predominant trends were population increases to winter peaks, with exceptions shown on table 31; (ii) overall, above trend outliers corresponded at peak terms, except in 1981-1983 Mute swan and Northern pintail and Eurasian teal and Eurasian curlew were in reverse correspondence and (iv) broadly, associations were greater numbers with higher wind velocities and conversely, except Eurasian teal and Eurasian curlew in 1981-1983.

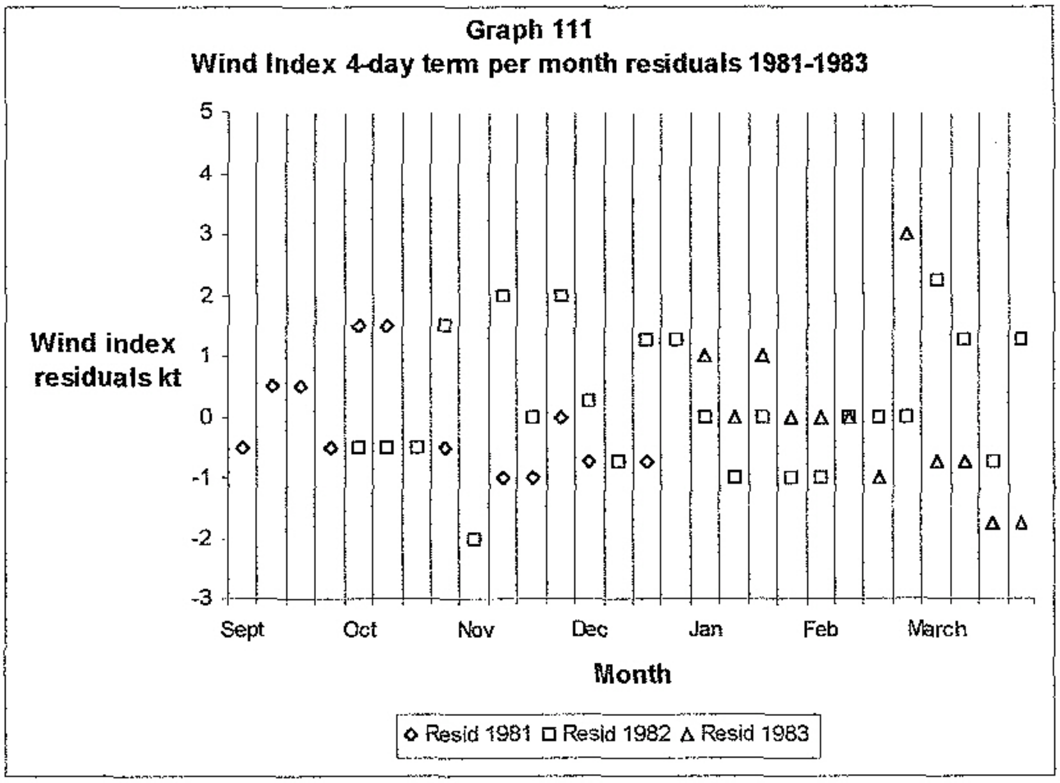
Chapter 12
Statistical analysis of species seasonal population residuals and wind index 4-day term per month residuals

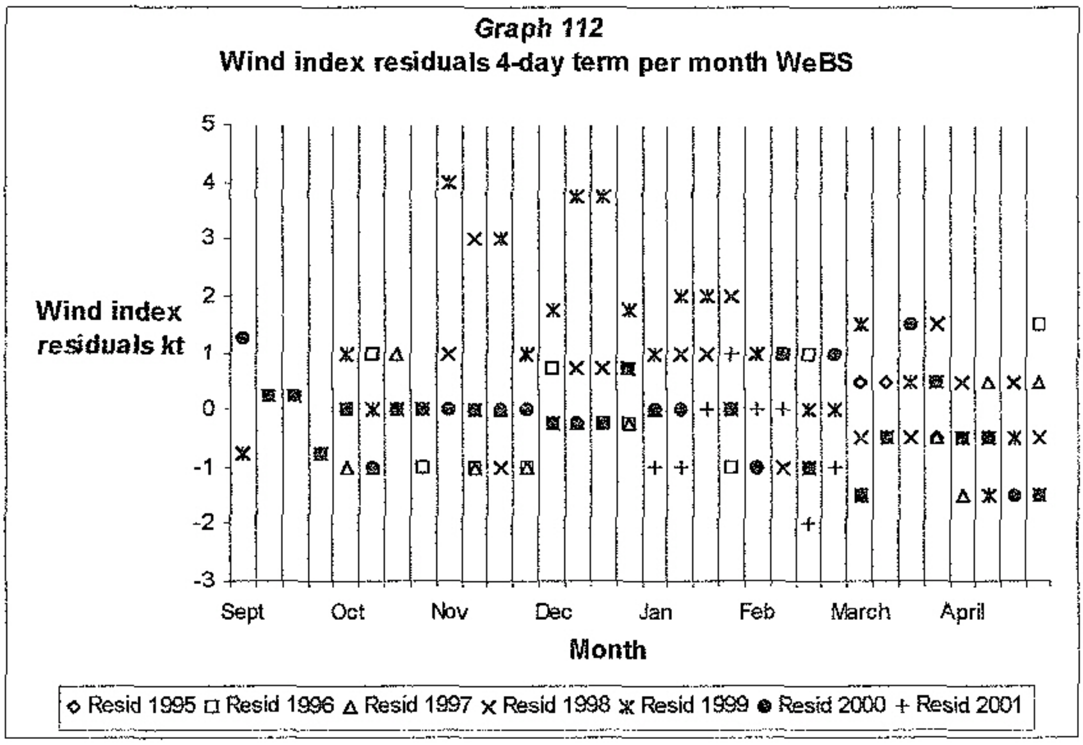
Hypothesis

The null hypothesis: if, on the sites, waterbird abundances were not less during calm weather compared to when the wind was blowing, then the null hypothesis was not rejected. The alternative hypothesis: waterbird abundances were greater during windy periods compared to calm periods, then the null hypothesis was rejected in favour of the alternative hypothesis.

Wind Indices residuals

Graphs 111 and 112 show the 4-day terms wind index residuals for 1981-1983 and WeBS respectively for which the ranges were –2.0 to 2.25 and –1.5 to 4 respectively, shown in appendix 22.





Species Accounts

For both surveys the probability for each day of the 4-day term was non-significant (P> 0.05), thus the null hypothesis was not rejected, with the exception of 1981-1983 Eurasian wigeon on day 3.

Whooper Swan *Cygnus cygnus*

For 1981-1983 on day 3, the probability declined to 0.073, close to significant (P>0.05). The null hypothesis was not rejected.

Eurasian Wigeon *Anas penelope*

For 1981-1983 on day 3, the probability was significant (P<0.05), shown on graph 113; the intercept was non-significant, shown in table 74. The null hypothesis was rejected in favour of the alternative hypothesis.

Graph 113

Regression of Eurasian Wigeon residuals and Wind Index residuals on day 3 of the 4-day term 1981-1983

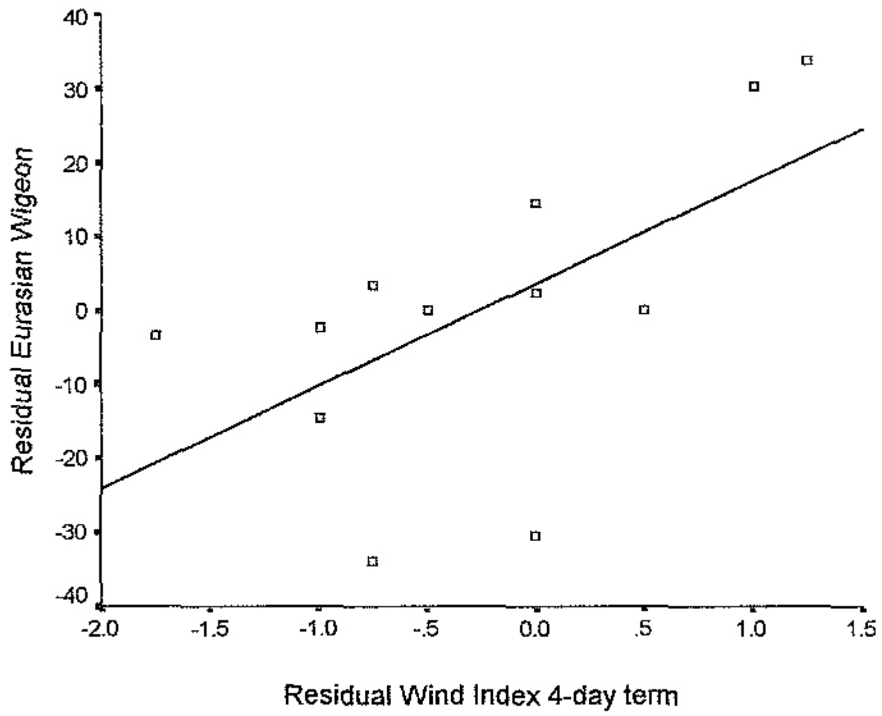


Table 74

Regression results of Eurasian Wigeon residuals and Wind Index residuals on day 3 of the 4-day term 1981-1983

Wind Index day number	AVOVA significance	Slope	*t*-test the slope is zero	Intercept	*t*-test that the intercept is zero	Probability the intercept is zero	r^2	Hypothesis favoured
3	0.031	13.906	2.473	3.744	0.779	0.452	0.357	H_1

Summary

The 1981-1983 and WeBS results are summarised in tables 75 and 76 respectively and are compared in table 77. During 1981-1983 Eurasian wigeon was the only species with a significant relationship. In WeBS all species had a non-significant relationship. Thus there were no statistical relationships between species presence residuals and wind index residuals with the exception of Eurasian wigeon.

Table 75

Summary of regression analysis results of species residuals and Wind Index residuals during the 4-day term per month 1981-1983

Species	*Term day* number	*Residual* removed	ANOVA probability	*Intercept* significance	Hypothesis favoured
Mute Swan	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Whooper Swan	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Eurasian Wigeon	1, 2 and 4	none	P > 0.05	P > 0.05	Ho
Eurasian Wigeon	3	*none*	*P < 0.05*	*P > 0.05*	H_1
Common Teal	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Mallard	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Northern Pintail	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Northern Lapwing	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Eurasian Curlew	1, 2, 3 and 4	none	P > 0.05	P > 0.05	H_0

Table 76

Summary of regression analysis results of species residuals and Wind Index residuals during the 4-day term per month WeBS

Species	Term day number	Residual removed	ANOVA probability	Intercept significance	Hypothesis favoured
Mute Swan	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Whooper Swan	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Eurasian Wigeon	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Common Teal	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Mallard	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Northern Pintail	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Northern Lapwing	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho
Eurasian Curlew	1, 2, 3 and 4	none	P > 0.05	P > 0.05	Ho

Table 77

Summary of the comparative regression analysis results of species residuals and Wind Index residuals during the 4-day term per month 1981-1983 and WeBS

Subject of comparison	1981-1983 Survey			WeBS 1995-2002		
	Species	Nos of species	Nos of guilds	Species	Nos of species	Nos of guilds
P>0.05 for days 1, 2, 3 and 4	Mute Swan Whooper Swan Common Teal Mallard Northern Pintail Northern Lapwing Eurasian Curlew	7	3	Mute Swan Whooper Swan Eurasian Wigeon Common Teal Mallard Northern Pintail Northern Lapwing Eurasian Curlew	8	3
Minimum P < 0.05 on at least one day	Eurasian Wigeon	1	1		0	0

Chapter 13

Time series analysis of species seasonal population trends and water stage height trends

The purpose of time series analysis of species and water stage height datasets, the variables, is to determine the:

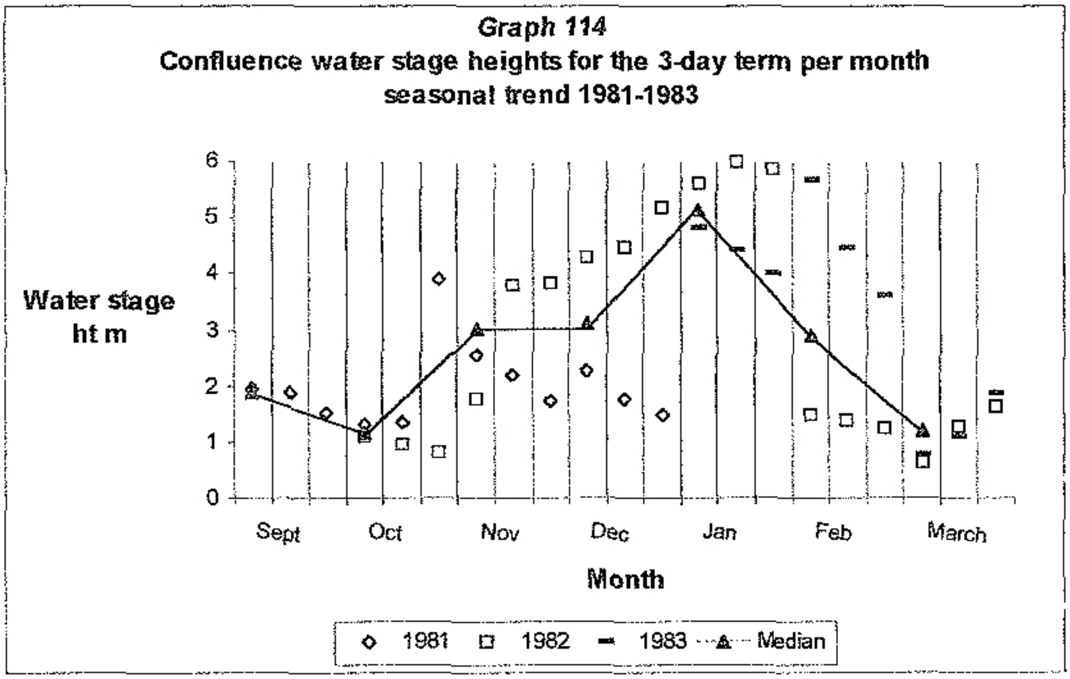
i) *similarity of trend directions of the variables;*

ii) associations between trends of the variables by comparison of above median, median and sub-median species abundances to two water stage *height classifications, non-flood and flood altitudes, shown in table 4* chapter 4, Study Design, during 3-day term per month and

v) detection of noise in datasets of the variables.

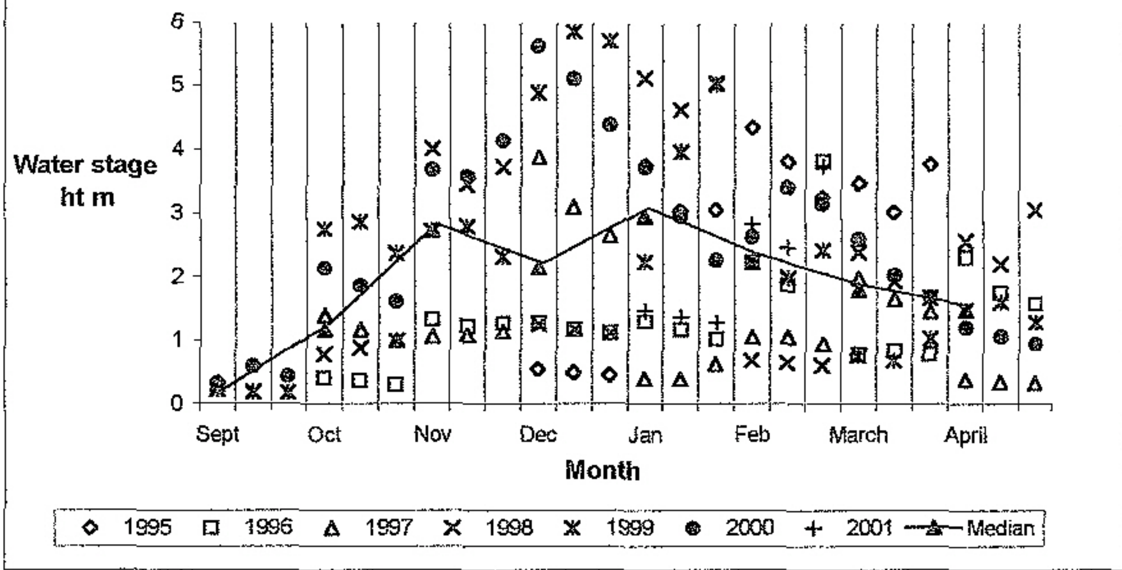
Stage heights

The 1981-1983 water stage height 3-day term trend range was 1.154-5.141 m, as shown *in graph 114 and appendix 24. Altitude trend pattern was: (i)* below bank tops diminution over September-October, increased over to low internal flood altitudes during October-December, rose to high flood altitudes in December-January, declined to *low internal flood altitudes during January-*February and declined below bank tops in February-March and (ii) minimum and maximum trend altitudes were in October and January respectively.



The WeBS water stage height 3-day term trend range was 0.305-2.942 m, shown in graph 115 and appendix 24. Altitude trend patterns: (i) increased from below bank top in September-October to internal low flood altitude during November-February then declining below bank top over February-April and (ii) minimum and maximum altitudes were attained in September and January respectively. Trends during both surveys were similar: to flood during November-February. 1981-1983 trends were greater and more dynamic than WeBS although the former dataset was smaller.

Graph 115
Transect C water stage heights for the 3-day term per month seasonal trend WeBS



Mute Swan Cygnus olor

The 1981-1983 seasonal trends were similar November-March, shown in graph 116. Term associations of variables, shown in table 78, were: (i) above median abundance class was more than four and a half times more probable at flood altitudes and (ii) the median and sub-median abundance classes were at non-flood and equally likely during both altitudes respectively.

Graph 116
Confluence Mute Swan seasonal population and water stage height 3-day term per month trends 1981-1983

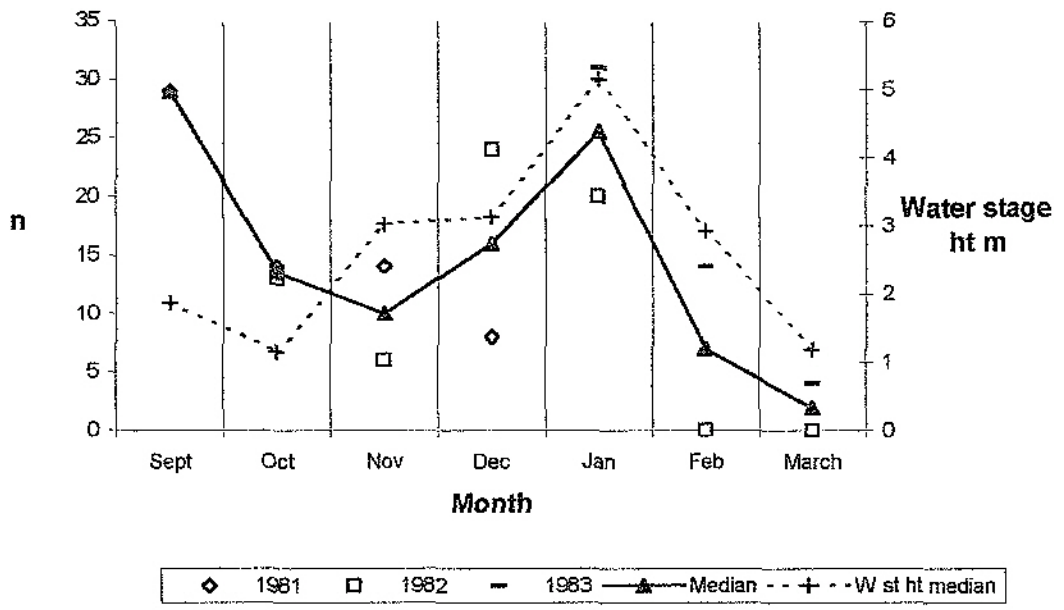


Table 78
Confluence 1981-1983 abundance classes in relation to water stage height classifications

Mute Swan abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	*Over bank top for* all or part of the 3-day term per month
6			1 (17%)	5 (83%)
	1		1 (100%)	0 (0%)
		6	3 (50%)	3 (50%)

The WeBS *seasonal trends were similar during October-March, as shown on* graph 117. Term associations of variables, shown in table 79, were: (i) above median abundance class was twice as probable during flood altitudes and (ii) median and sub-median abundance classes were *twice and one and a half* times respectively more likely at non-flood altitudes

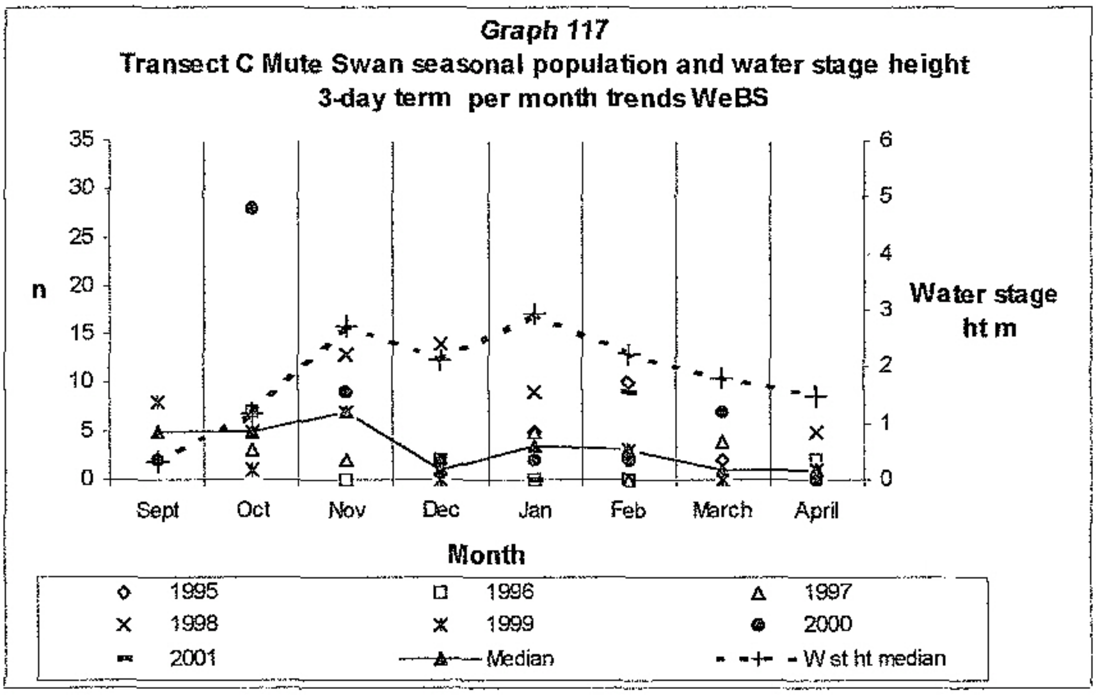


Table 79

Transect C WeBS Swan abundance classes in relation to water stage height classifications

Mute Swan abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
18			6 (33%)	12 (67%)
	6		4 (67%)	2 (33%)
		18	11 (61%)	7 (39%)

Whooper Swan *Cygnus cygnus*

1981-1983 seasonal trends were similar during November-December and January-February, as shown on graph 118. Term associations of variables, shown on table 80, were: (i) above and sub-median abundance classes occurred exclusively at flood altitudes and (ii) median abundance class was more probable during non-flood altitudes. However, the dataset contained 11 zero counts; nine were medians.

Graph 118

Confluence Whooper Swan seasonal population and water stage height 3-day per month trends 1981-1983

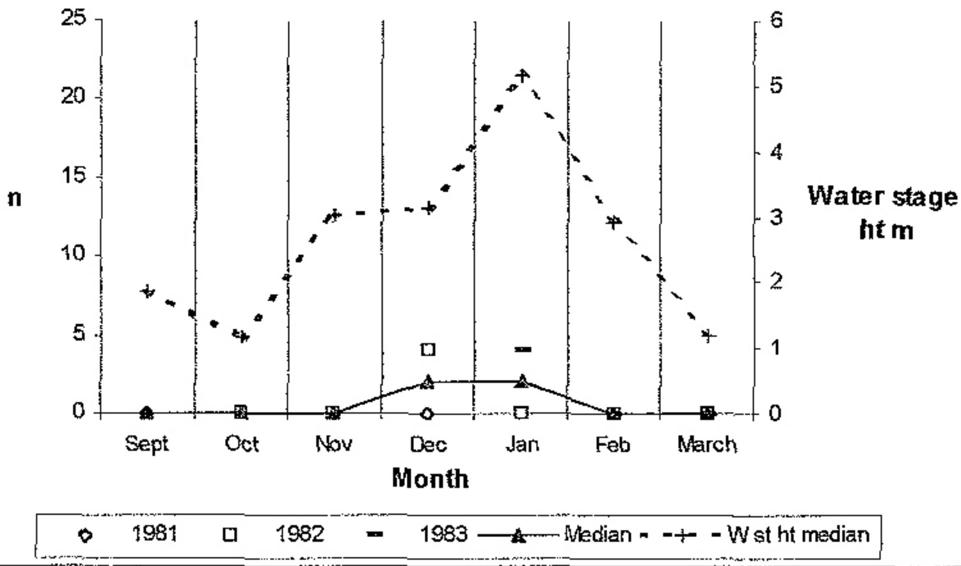


Table 80

Confluence 1981-1983 abundance classes of Whooper Swan in relation to water stage height classifications

Whooper Swan abundances			Water stage height classification	
Above median	Median	Sub-median	Below bank top *for all of the* 3-day term per month	Over bank top for *all or part of the* 3-day term per month
2			0 (0%)	2 (100%)
	9		5 (56%)	4 (44%)
		2	0 (0%)	2 (100%)

WeBS seasonal trends were similar during December-February, shown in graph 119. Term associations of variables, shown on table 81, were: (i) above trend abundance class was four times more probable during flood altitudes and (i) median and sub-median abundance classes were more probable during non-flood altitudes. The data set contains 32 zero counts, 29 were medians and all sub-medians. For both surveys whooper swan abundances have to be interpreted cautiously due to the high frequency of zero counts. Recurrent zeros in both surveys indicate irregularity of occurrence rather than water stage height preference.

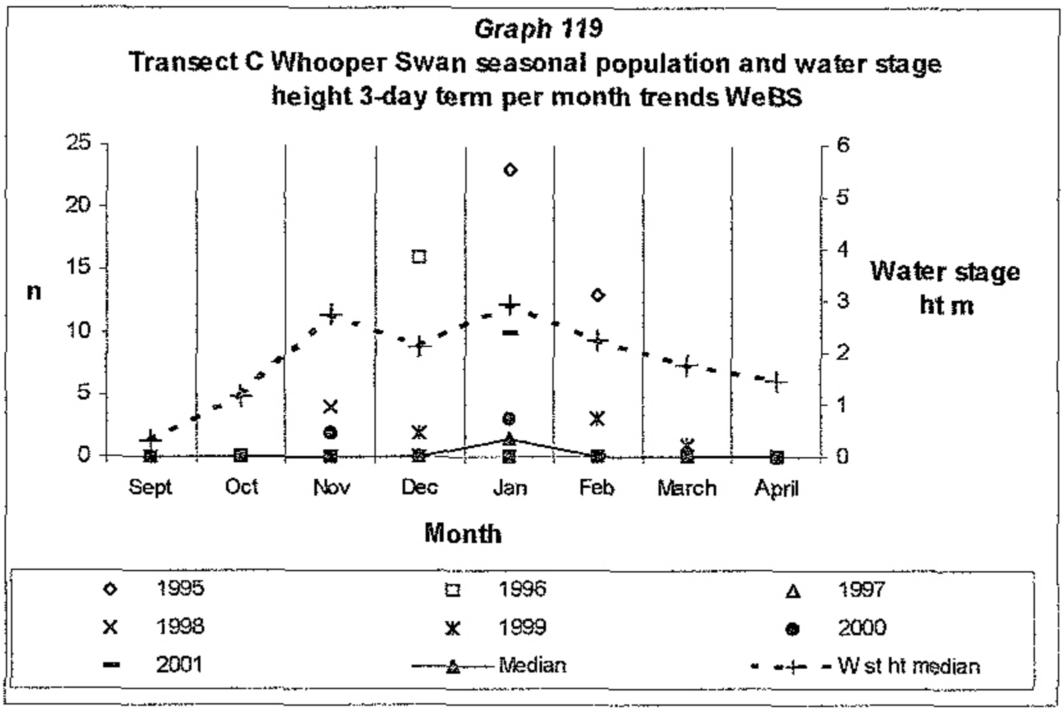


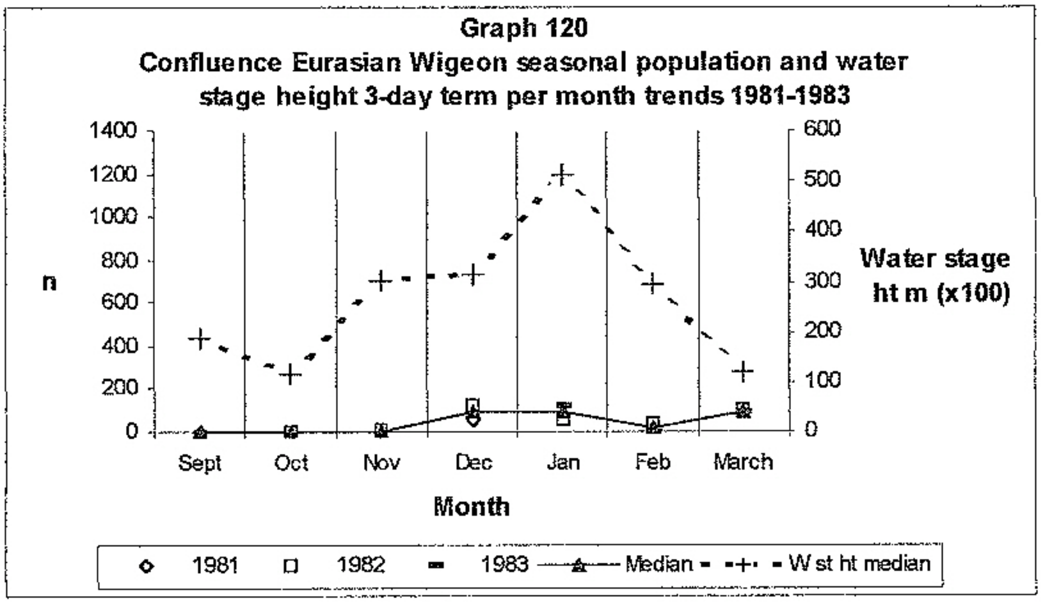
Table 81

Transect C: WeBS abundance classes of Whooper Swan in relation to water stage height classifications.

Whooper Swan abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for *all* of the 3-day term per month	Over bank top for *all or part of the* 3-day term per month
10			2 (20%)	8 (80%)
	29		16 (55%)	13 (45%)
		3	2 (67%)	1 (33%)

Eurasian Wigeon *Anas penelope*

1981-1983 seasonal trends were similar during October-February, shown on graphs 120 and 121. Term associations of variables, shown in table 82, were: (i) above median and sub-median abundance classes were one and a half and four times more probable during flood altitudes and (ii) medians were twice as likely at non-flood altitudes.



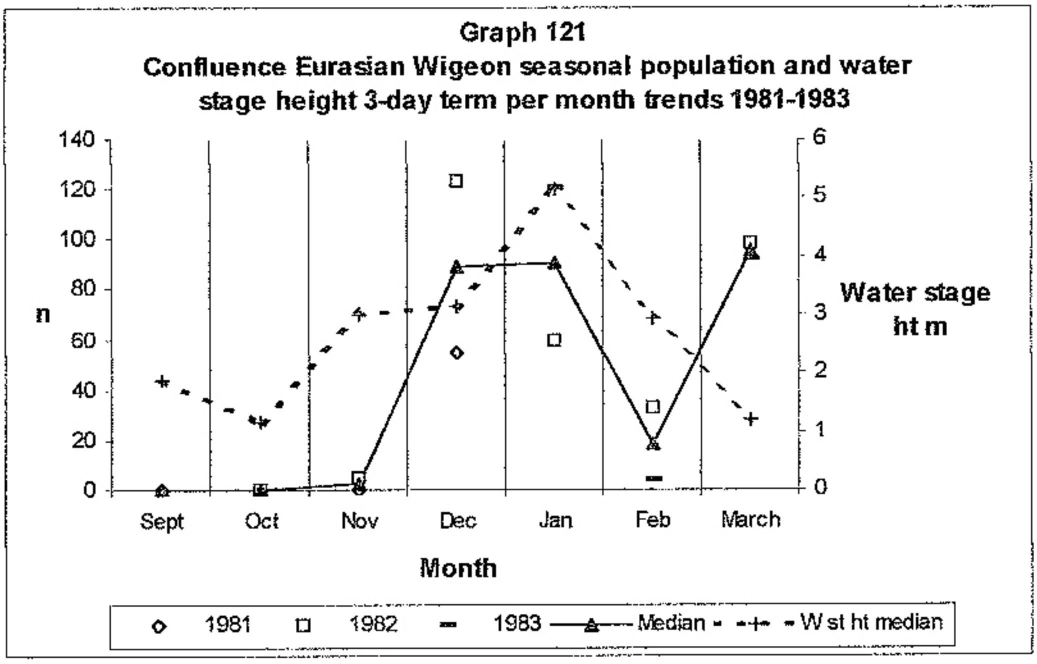


Table 82

Confluence 1981-1983 abundance classes of Eurasian wigeon in relation to water stage height classifications.

Eurasian Wigeon abundances			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
5			2 (40%)	3 (60%)
	3		2 (67%)	1 (33%)
		5	1 (20%)	4 (80%)

WeBS seasonal trends were similar during December-January and March-April, shown on graph 122. Term associations of variables, shown in table 83, were: (i) above abundance class was four times more probable during flood altitudes and (ii) median and sub-median abundance classes were twice as likely during non-flood altitudes.

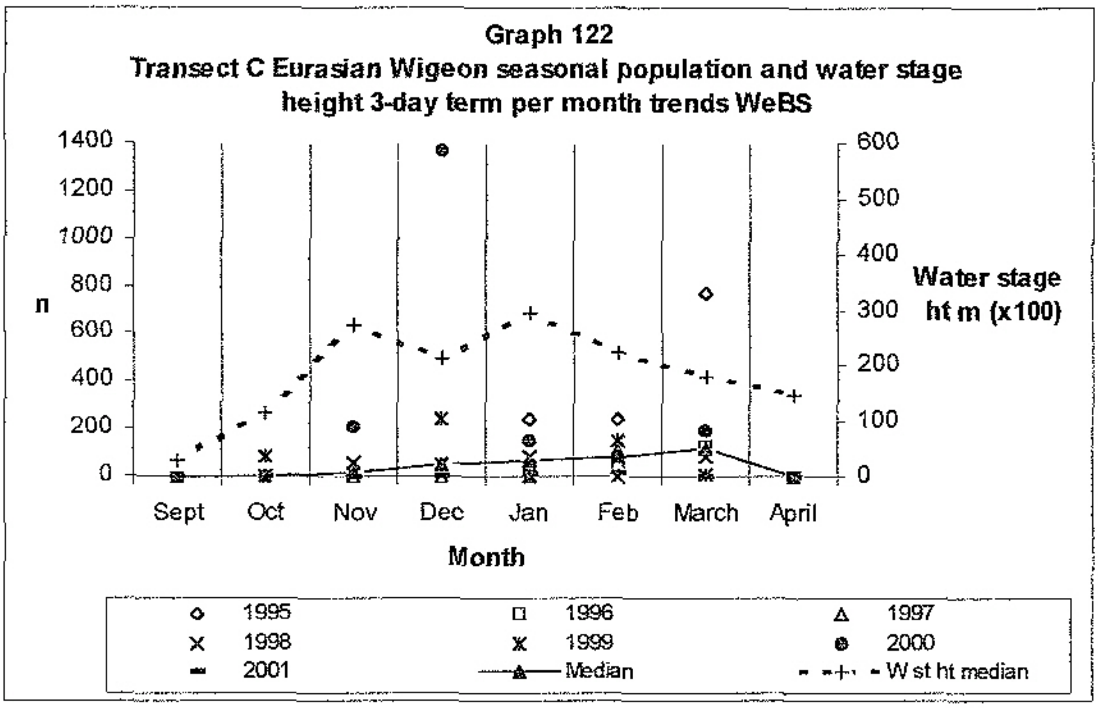


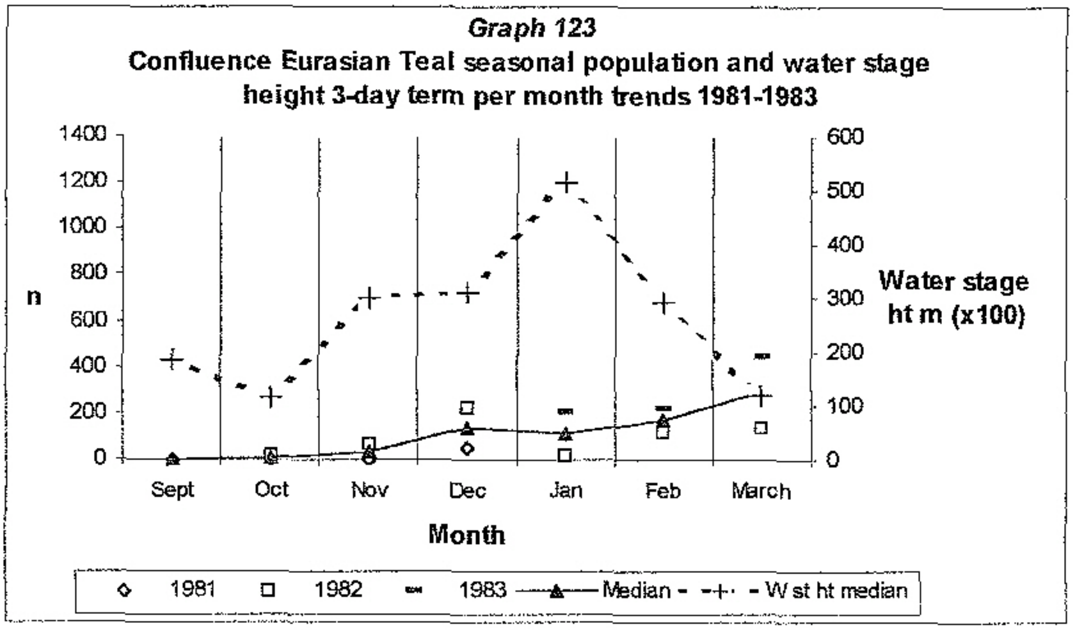
Table 83

Transect C: WeBS abundance classes of Eurasian Wigeon relation to stage height classifications

Eurasian Wigeon abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
16			3 (19%)	13 (81%)
	12		8 (67%)	4 (33%)
		14	10 (71%)	4 (29%)

Common Teal *Anas crecca*

1981-1983 water stage height trends increased during October-January and populations trend rose almost continuously to March, shown on graphs 123 and 124. Term associations of variables, shown in table 84, were: (i) above and sub-median abundance classes were twice as probable at flood altitudes and (ii) median abundances only occurred at non-flood altitudes.



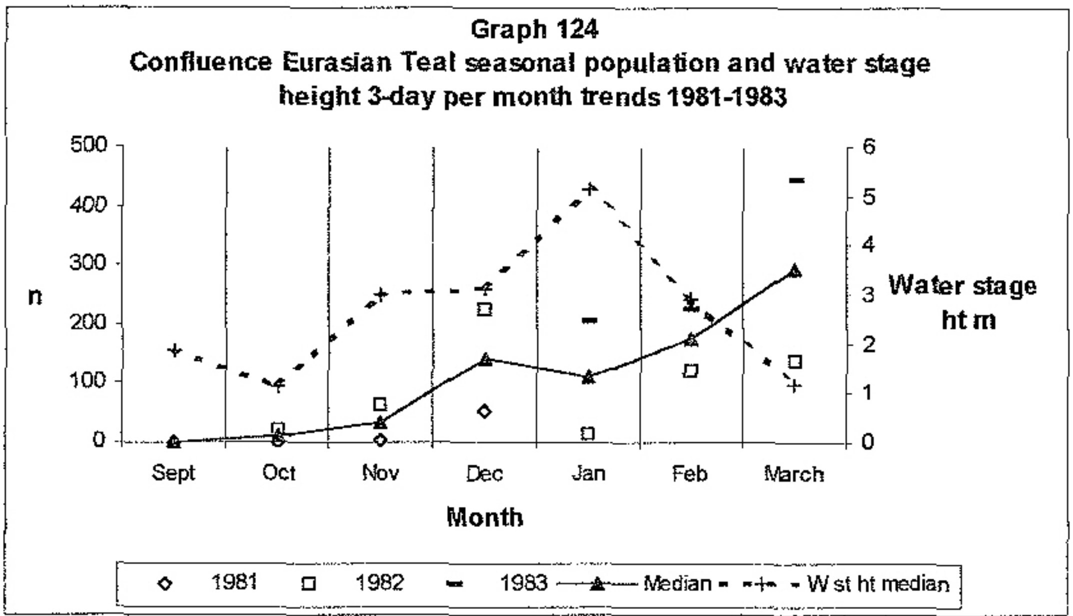


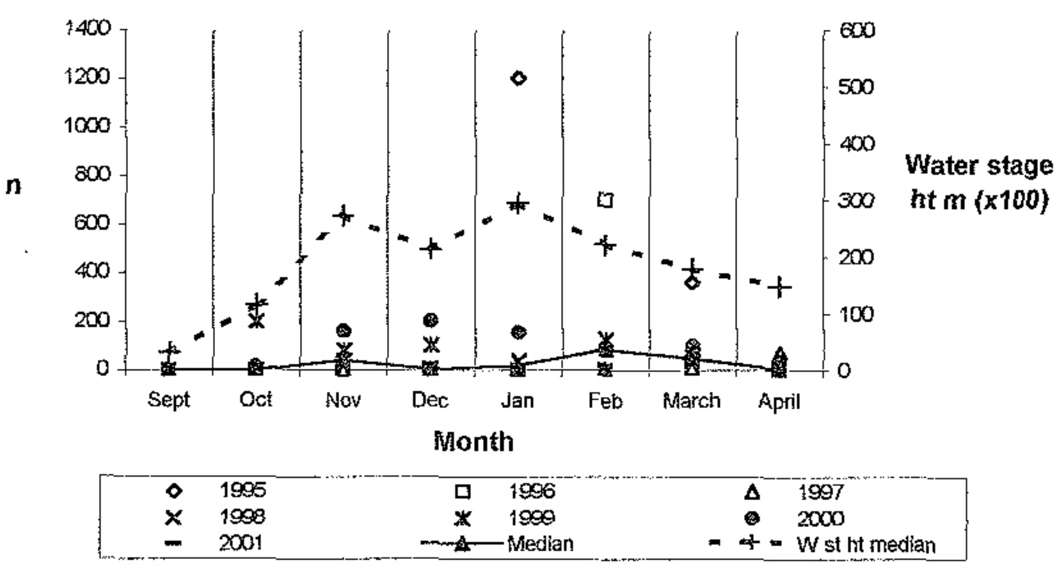
Table 84

Confluence 1981-1983 abundance classes of Eurasian Teal in relation to water stage height classifications.

Eurasian Teal abundances			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
6			2 (33%)	4 (67%)
	1		1 (100%)	0 (0%)
		6	2 (33%)	4 (67%)

WeBS seasonal trends were similar during October-January and February-April, shown on graphs 125 and 126. Term associations of variables, shown in table 85, were: (i) above median abundance class was three and a half times more probable at flood altitudes and (ii) median and sub-median abundance classes were one and a half and three times respectively more likely at non-flood altitudes.

Graph 125
Transcect C Eurasian Teal seasonal population and water stage height 3-day per month trends WeBS



Graph 126
Transect C Eurasian Teal seasonal population and water stage height 3-day per month trends WeBS

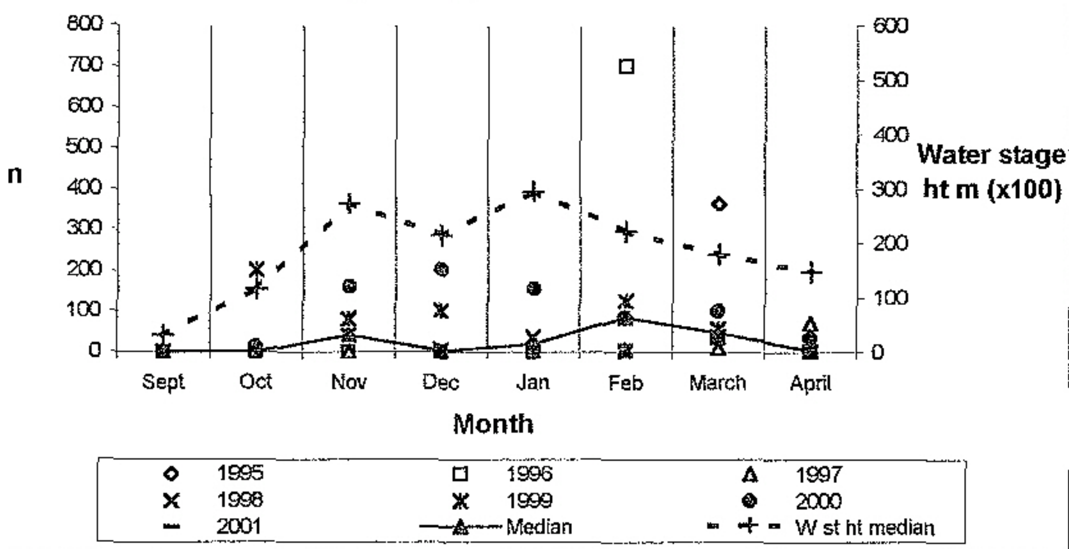


Table 85

Transect C WeBS abundance classes of Eurasian teal in relation to water stage height classifications

Eurasian Teal abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
18			4 (22%)	14 (78%)
	8		5 (63%)	3 (37%)
		16	12 (75%)	4 (25%)

Mallard *Anas platyrhynchos*

1981-1983 seasonal trends were similar during October-December and January-March, shown on graph 127. Term associations of variables, shown in table 86, were: (i) above median abundance class was four and a half times more probable at flood altitudes; (ii) median abundance class was exclusive at non-flood altitudes and (iii) sub-median abundance class was equally likely at each altitude.

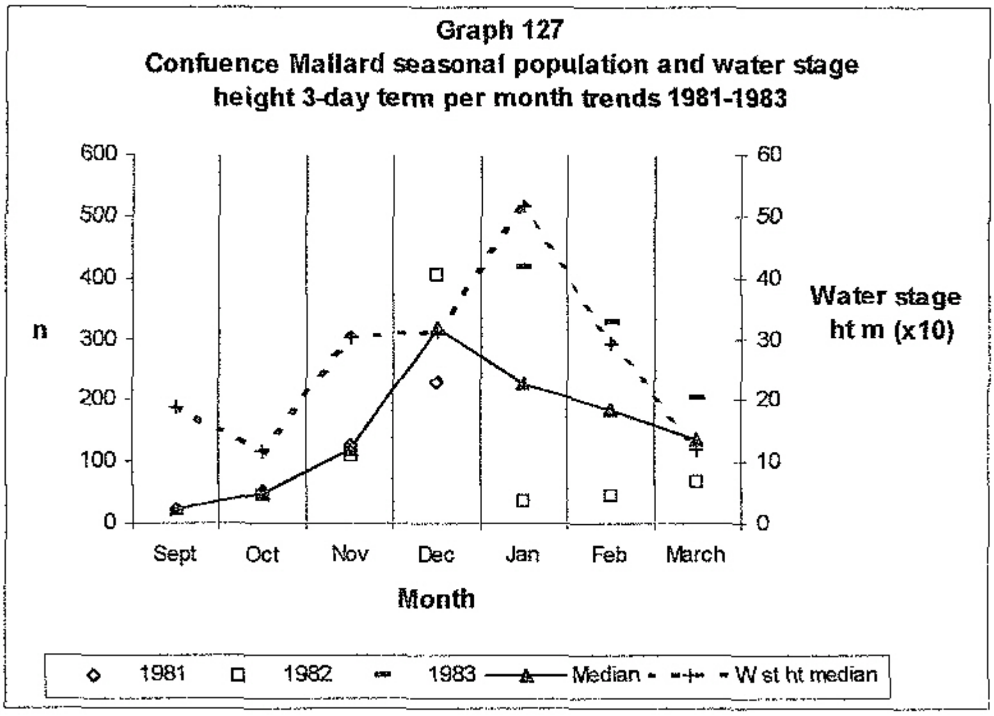


Table 86

Confluence 1981-1983 abundance classes of Mallard in relation to two stage height classifications

Mallard abundances			*Water stage height classification*	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
6			1 (17%)	5 (83%)
	1		1 (100%)	0 (0%)
		6	3 (50%)	3 (50%)

WeBS seasonal trends were similar during September-January and February-April, shown on graph 128. Term associations of variables, shown in table 87, were: (i) above median and median abundance classes were twice and three times more probable at flood altitudes and (ii) sub-median abundance class was three times more likely during non-flood altitudes.

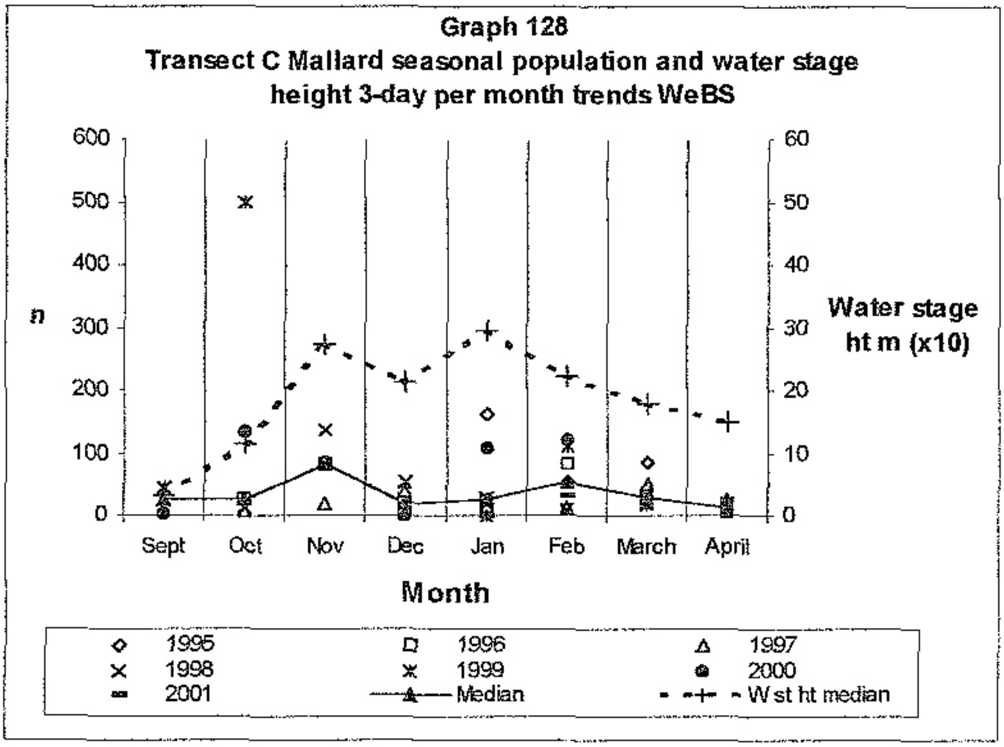


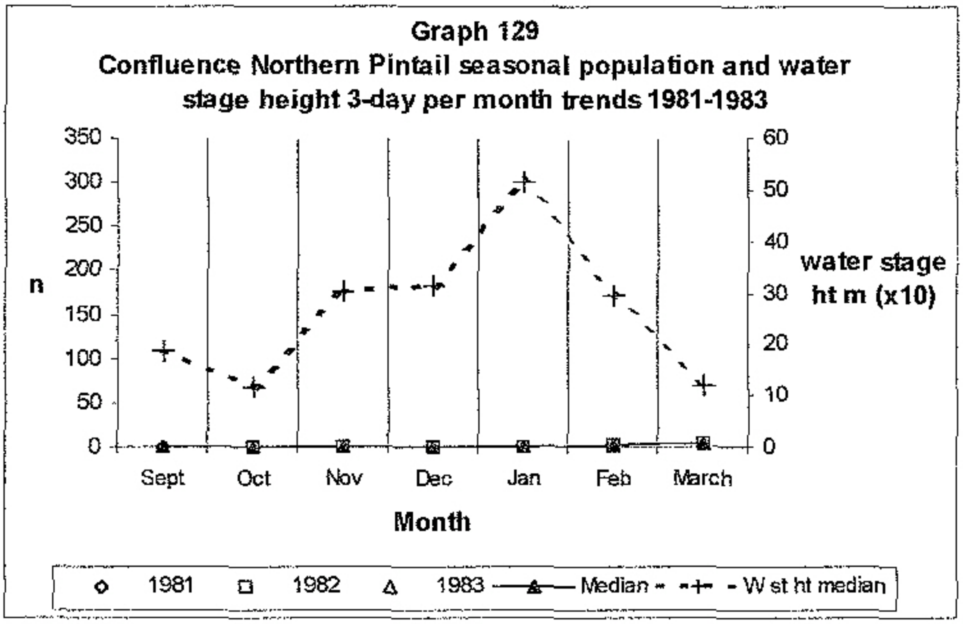
Table 87

Transect C: WeBS abundance classes of Mallard in relation to water stage height classifications.

Mallard abundance classes			*Water stage height classification*	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
19			6 (32%)	13 (68%)
	4		1 (25%)	3 (75%)
		19	14 (74%)	5 (26%)

Northern Pintail *Anas acuta*

1981-1983 seasonal trends were dissimilar, shown on graphs 129 and 130. A term association of variables, shown in table 88, illustrates that median abundances were one and a half times more probable at flood altitudes. The dataset contained nine zeros and five medians were zeros, thus interpretation must be cautious.



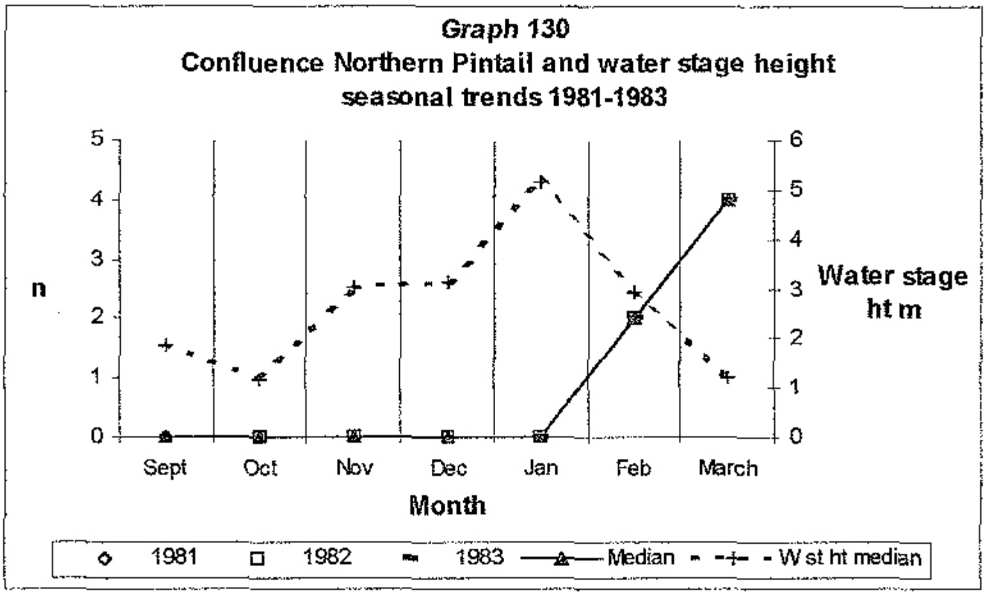


Table 88

Confluence 1981-1983 abundance classes of Northern Pintail in relation to water stage height classifications

Northern Pintail abundances			*Water stage height classification*	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
0			0 (0%)	0 (0%)
	13		5 (38%)	8 (62%)
		0	0 (0%)	0 (0%)

WeBS seasonal trends were similar during October-April, shown on graph 131. Term associations of variables, shown in table 89, were: (i) above median abundance class was exclusively at flood altitudes and (ii) median and sub-median abundance classes were twice and over five times respectively more likely at non-flood altitudes. The increased amount of data for WeBS permits better interpretation compared to 1981-1983.

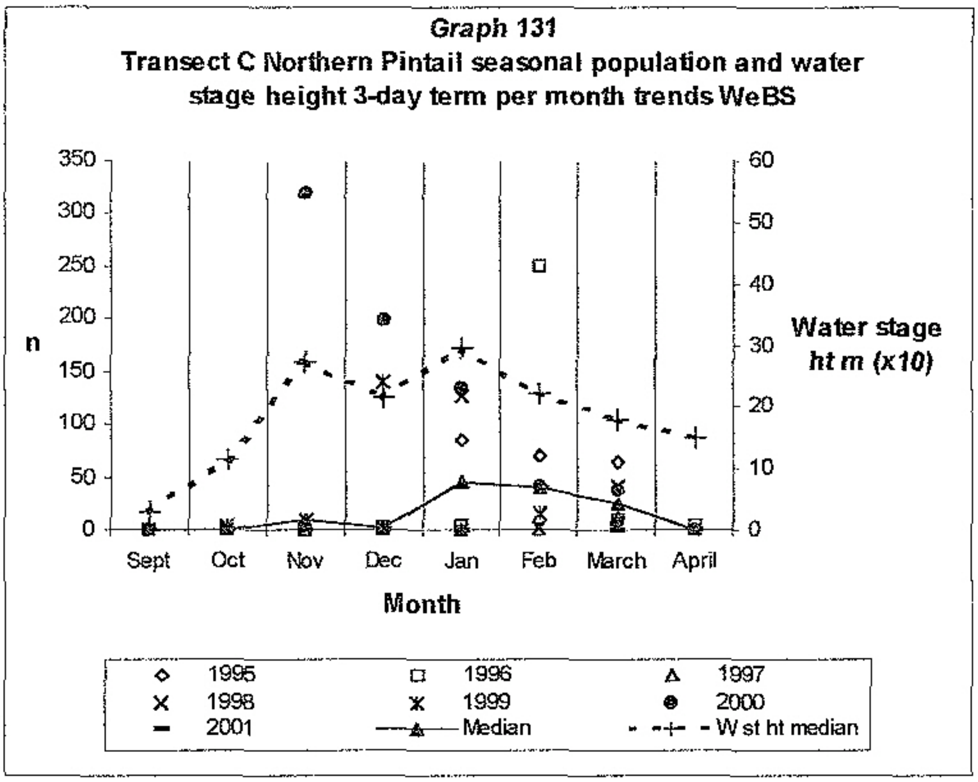


Table 89

Transect C: WeBS abundance classes of Northern Pintail in relation to stage height classifications

Northern Pintail abundance classes			*Water stage height classification*	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
14			0 (0%)	14 (100%)
	15		10 (67%)	5 (33%)
		13	11 (85%)	2 (15%)

Northern Lapwing ***Vanellus vanellus***

1981-1983 seasonal trends were similar during October-December and January-March, shown on graph 132. Term associations of variables, shown in table 90, were: (i) above median abundance class was over four and a half times more probable at flood altitudes; (ii) median abundance class occurred at non-flood altitudes and (iii) sub-median abundance class was equally likely at both altitudes.

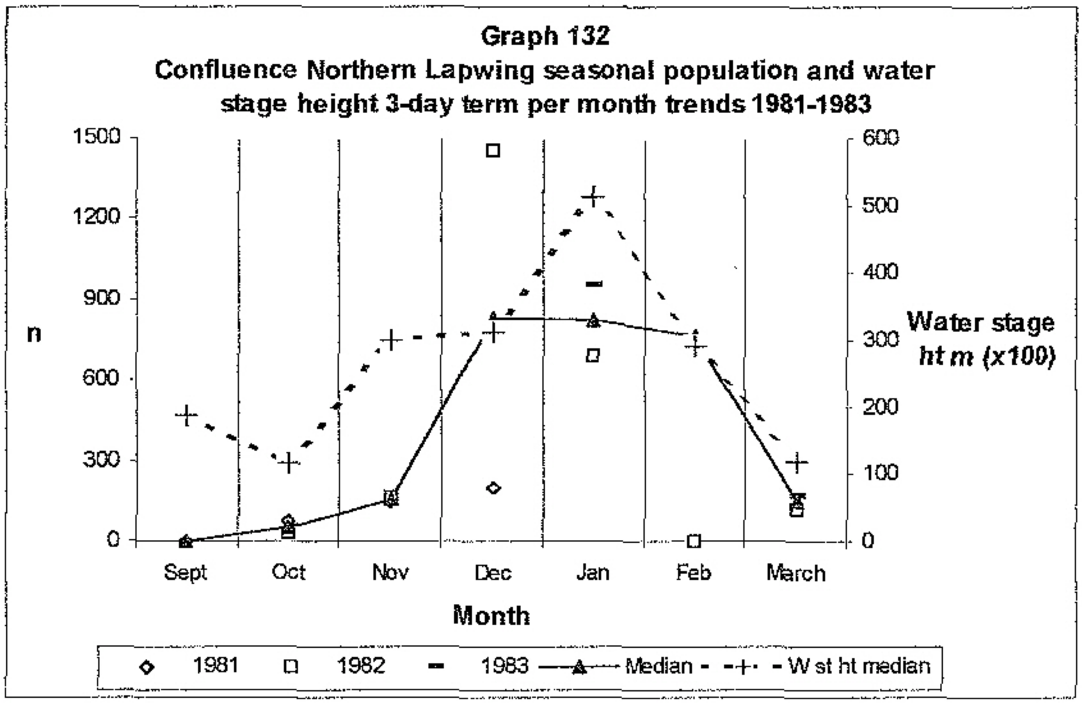
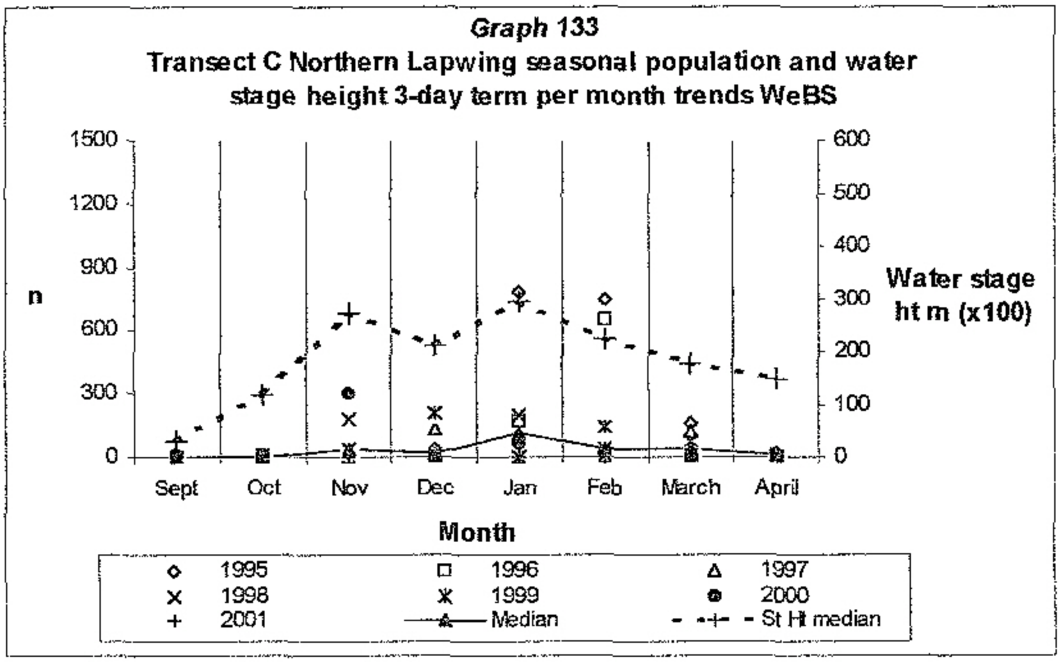


Table 90

Confluence 1981-1983 Northern Lapwing abundance classes in relation to water stage height classifications

Northern Lapwing abundances			Water stage height classification	
Above median	Median	Sub-median	Below bank top *for all of the* 3-day term per month	Over bank top for *all or part of the* 3-day term per month
6			1 (17%)	5 (83%)
	1		1 (100%)	0 (0%)
		6	3 (50%)	3 (50%)

WeBS seasonal trends were similar during October-April, shown on graphs 133 and 134. Term associations of variables, shown in table 91, were: (i) above abundance class was twice as probable at flood altitudes and (ii) median and sub-median abundance classes were approximately twice as likely at non-flood altitudes.



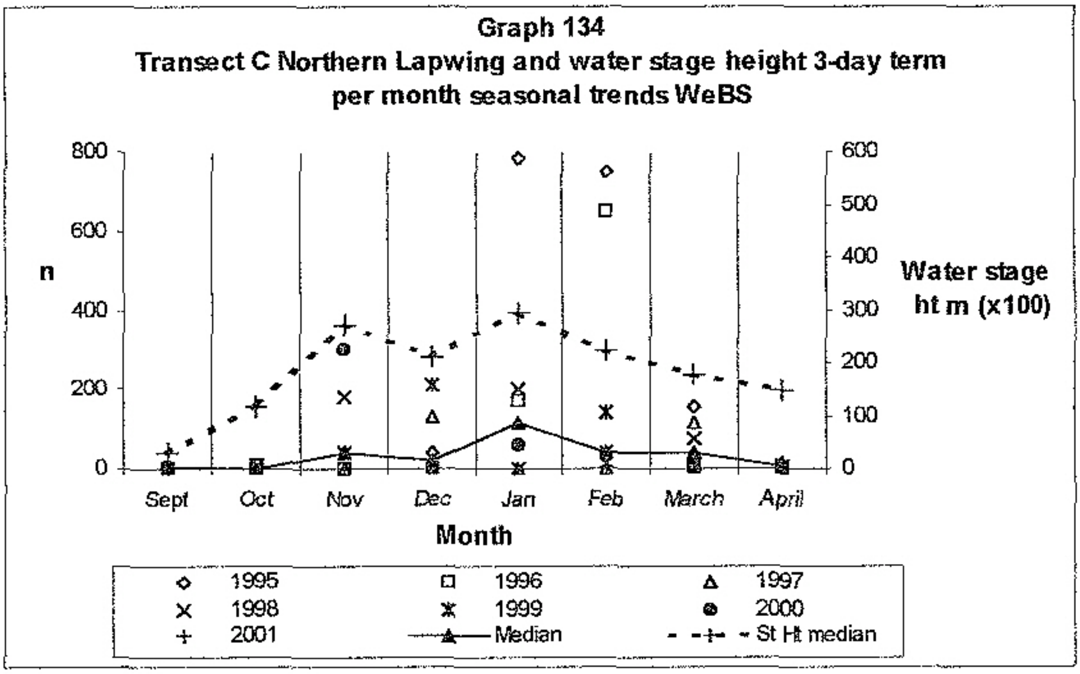


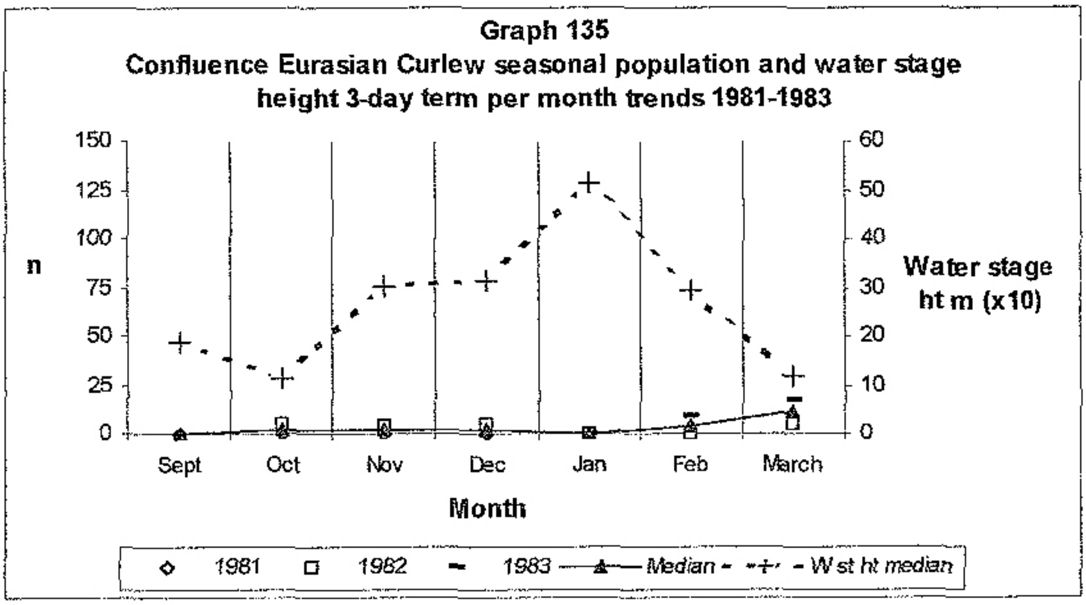
Table 91

Transect C: WeBS Northern Lapwing abundance classes in relation to water stage height classifications

Northern Lapwing abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
19			6 (32%)	13 (68%)
	6		4 (67%)	2 (33%)
		17	11 (65%)	6 (35%)

Eurasian Curlew ***Numenius arquata***

1981-1983 seasonal trends were not similar with water stage heights peaking in January and curlew populations rising in February-March, shown on graphs 135 and 136. Term associations of variables, shown in table 92, were (i) above and sub-median abundance classes were one and a half times more probable at flood altitudes and (ii) median abundance class was twice as likely at flood altitudes. Seven zeros were in the dataset, thus results must be interpreted with caution.



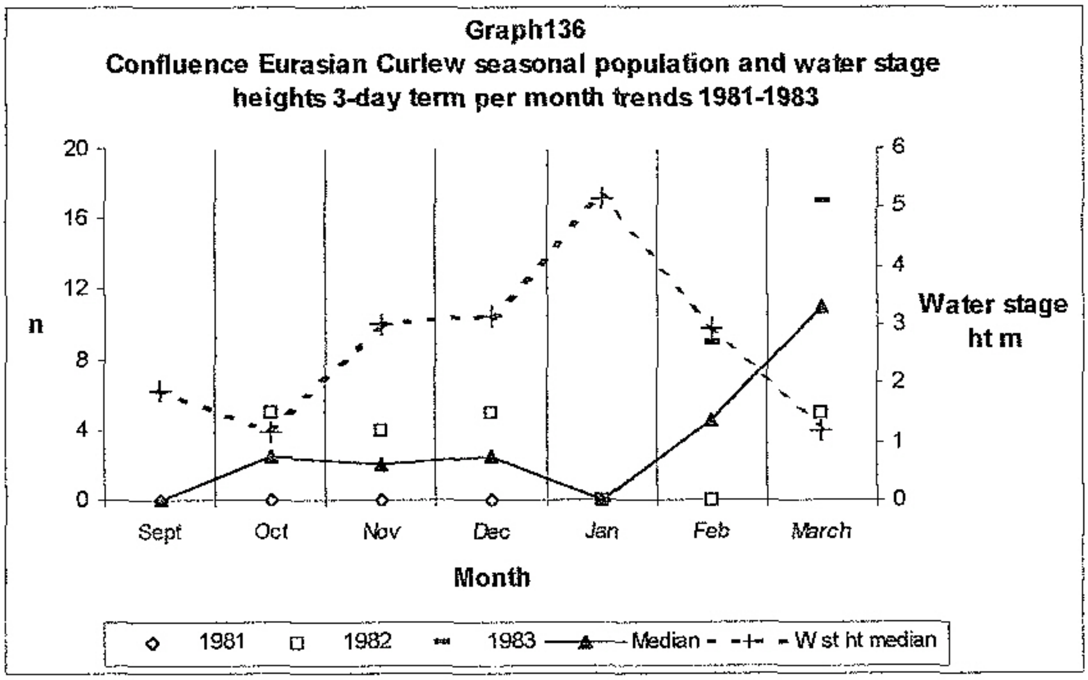


Table 92

Confluence 1981-1983 Eurasian Curlew abundance classes in relation to water stage height classifications

Eurasian Curlew abundances			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
5			2 (40%)	3 (60%)
	3		1 (33)	2 (67%)
		5	2 (40%)	3 (60%)

WeBS seasonal trends were dissimilar: water stage heights peaked at low flood altitudes in January and curlew populations increased during February-March, shown on graph 137, as in 1981-1983. Term associations of variables, shown in table 93, were: (i) above abundance class was equally probable between the two altitudes; (ii) median abundance class was marginally more likely at non-flood altitudes and (iii) sub-median abundance class was twice as probable at flood altitudes.

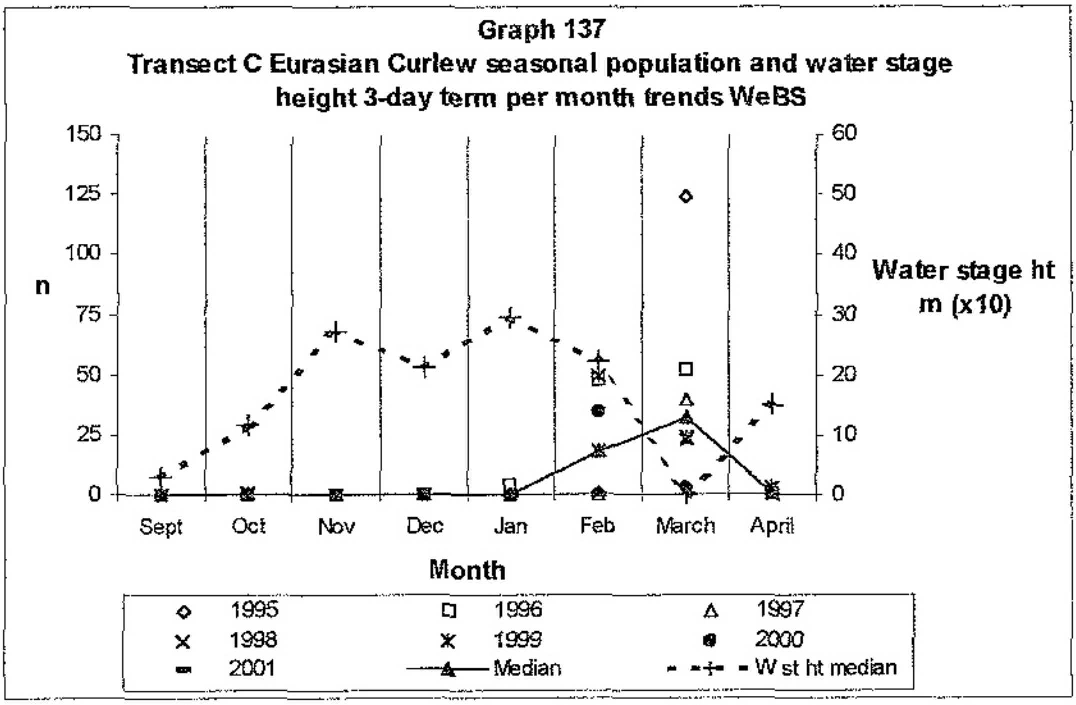


Table 93

Confluence WeBS Eurasian Curlew abundance classes in relation to water stage height classifications

Eurasian Curlew abundance classes			Water stage height classification	
Above median	Median	Sub-median	Below bank top for all of the 3-day term per month	Over bank top for all or part of the 3-day term per month
10			5 (50%)	5 (50%)
	26		14 (54%)	12 (46%)
		6	2 (33%)	4 (67%)

Summary

Above median abundance class of *all* species, except for *Northern pintail in* 1981-1983 and Eurasian curlew during WeBS, were associated with flood altitudes, shown on table 94. Median abundance class of five and seven species during 1981-1983 and WeBS respectively were associated with *non*-flood altitudes as was the sub-median abundance class of seven species during WeBS. During 1981-1983 Whooper swan and Northern pintail datasets contained a high proportion of zeros, therefore results *must* be interpreted cautiously.

Table 94

Summary of 1981-1983 and WeBS associations of species abundance classes and water stage height classifications

Species	1981-1983			WeBS		
	Above median	*Median*	*Sub-median*	*Above median*	Median	Sub-median
Mute Swan	F	N	F/N	F	N	N
Whooper Swan	F	F	F	F	N	N
Eurasian Wigeon	F	N	F	F	N	N
Eurasian Teal	F	N	F	F	N	N
Mallard	F	N	F/N	F	F	N
Northern Pintail	O	F	O	F	N	N
Northern Lapwing	F	N	F/N	F	N	N
Eurasian Curlew	F	F	F	F/N	N	F

F: *Flood*, N: *Non-flood*, O: *all zeros*