Trends in wader populations in the East Atlantic flyway as shown by numbers of autumn migrants in W Denmark, 1964–2003

HANS MELTOFTE[1], JAN DURINCK[2], BENT JAKOBSEN[3], CLAUS NORDSTRØM[4] & FRANK F. RIGÈT[1]

[1]*National Environmental Research Institute, Department of Arctic Environment, PO Box 358, DK-4000 Roskilde, Denmark. mel@dmu.dk*
[2]*NEPCon, Svankjærvej 6, DK-7752 Snedsted, Denmark*
[3]*Blåvand Bird Observatory, Fyrvej 81, DK-6857 Blåvand, Denmark*
[4]*Danish Meteorological Institute, Lyngbyvej 100, DK-2100 Copenhagen Ø, Denmark*

Meltofte, H., Durinck, J., Jakobsen, B., Nordstrøm, C. & Rigèt, F.F. 2006. Trends in wader populations in the East Atlantic flyway as shown by numbers of autumn migrants in W Denmark, 1964–2003. *Wader Study Group Bull.* 109: 111–119.

Key words: waders, Charadrii, population trends, migration, East Atlantic flyway, Blåvandshuk

Many wader populations are estimated to be declining. These estimates are mainly based on mid-winter counts, where much bias may occur in the form of varying geographical coverage, varying methods, birds changing wintering sites from year to year or over longer time, and counting error. Other trend estimates derive from breeding area data, which often are very uncertain due to the extreme geographical dispersal of most breeding distributions. Here we present data on 17 wader species passing Blåvandshuk in W Denmark on autumn migration during a 40-year period. Visible migration of birds including waders is highly sensitive to differing weather conditions from year to year, but the data are unaffected by the biases mentioned for mid-winter counts. The populations involved mainly originate from north boreal and arctic breeding sites from Greenland/Canada in the west to central Siberia in the east. One species stands out showing significantly decreasing trends, namely Eurasian Oystercatcher *Haematopus ostralegus*. The Eurasian Oystercatchers passing Blåvandshuk mainly originate from Norwegian breeding grounds, and the decrease corresponds to decreases on the wintering grounds associated with overexploitation of bivalve stocks. Most other species showed relatively stable, fluctuating or increasing trends, and according to our data, most north boreal and arctic wader populations on the East Atlantic flyway seem to have been doing well during the last 40 years.

INTRODUCTION

Many wader populations appear to be declining (Wetlands International 2002). Out of 499 wader populations recognised world-wide, trend estimates exist for 41%, of which 44% appear to be decreasing, 39% to be stable, and 13% to be increasing, while 4% are extinct (Delany 2003). Among declining populations, most are long-distance migrants or sedentary endemics with small populations.

On the East Atlantic flyway, from where we have the best trend data, the conservation status of waders appears to be a bit more favourable than in other flyways, in that 'only' 37% are stated as decreasing out of 47 populations for which we have trend information (International Wader Study Group 2003).

Most population trends from the East Atlantic flyway are based on regular mid-winter censuses from W Europe or counts and estimates from breeding areas, but for several species or populations we only have information from relatively few counts, or counts from relatively few areas (Zöckler *et al.* 2003). We here provide an alternative dataset consisting of the numbers of 17 arctic and north boreal species passing Blåvandshuk, 55°34'N, 08°05'E, the westernmost point of Denmark, during 33 autumn migration seasons over the 40 years 1964–2003.

The advantage of using counts of actively migrating birds is that they are unaffected by changes in local habitat conditions, disturbance from humans and predators, changes in turn-over rates and changes in winter distribution and counting error. The birds simply pass by on their way to wintering grounds, which virtually all are south of Blåvandshuk for the populations involved, and the birds can be counted accurately, as they pass by. The disadvantage is that numbers of actively migrating birds seen at Blåvandshuk and elsewhere are highly sensitive to weather conditions, and no estimate can be made of the proportion flying low enough to be counted. Moreover different populations mix (Meltofte & Rabøl 1977) like they do in many staging and wintering areas.

Most waders passing Blåvandshuk are adults (Meltofte & Rabøl 1977, Meltofte 1993). This is interpreted as a result of adults migrating long non-stop flights during night and day until they reach primary staging areas, while juveniles often migrate shorter stops keeping most migration within the night hours (Meltofte & Rabøl 1977, Meltofte 1988). This means that numbers passing are relatively little affected by annual variability in breeding success.

Fig. 1. Aerial photo of Blåvandshuk taken from SSE showing the sandbars and the lighthouse in the dune landscape. The bird observatory is situated among the houses 200 m to the right (E) of the lighthouse, and most observations took place from the foreshore a little north of the spit. Photo: John Frikke.

METHODS

Blåvandshuk is a sandy spit formed where the almost 200 km long and straight N-S west coast of Denmark bends south-east into the Wadden Sea (Fig. 1). There, Blåvand Bird Observatory was established in 1963 to study and monitor bird migration particularly that of waders, seabirds and passerines. Each morning, for three hours starting about 15 minutes before sunrise, migration is recorded by one or more observers using binoculars and telescopes from the beach or – later in the season – from the outermost dunes. On days with intensive migration, watch has often been kept up for more hours – sometimes the whole day. Most birds pass at low altitude close to the shoreline (Fig. 2), but flocks may also pass over the beach or along the surf on a sandbar a few hundred metres from the shore. This means that most birds pass within a short distance from observers on the shore and can be counted virtually one by one.

In total, 11,650 hours of observation – with no significant trend in coverage during the study years, nor any systematic change in numbers of observers – were available from the main autumn migration period of waders from 30 June until 28 Sept 1964–2003. Over this period an aggregate total of 1,236,748 individuals of the 17 wader species dealt with here was recorded. The migration of most species peaks from late July until mid Aug, and seven years with no coverage of parts of this peak period have been omitted from the analyses. Otherwise, values for outlying periods with no coverage have been interpolated using means for the same 5-day-period from two adjacent years. Such interpolated data make up only 3.3% of the material. A number of species occur in very low numbers, and we have chosen to exclude species with sam-

Fig. 2. Eurasian Oystercatchers passing Blåvandshuk along the shoreline. Photo: John Frikke.

ples of less than 1,000 individuals. Sample sizes are shown on the individual graphs for each species (Fig. 4).

To some extent, the numbers of each wader species observed at Blåvandshuk are associated with different wind directions, and it is assumed that this is the result of migrants being displaced by side wind together with changing elevation to maximise flying efficiency. Thus with the wind in a certain direction they may fly lower and be observed more readily than in other conditions when they fly at a greater elevation. Many species are seen in high numbers at Blåvandshuk in E to S winds, which appear primarily to comprise birds flying over southern Scandinavia and the Baltic driven out to the west coast of Denmark, which they then follow at low altitude southward to the Wadden Sea. Similarly, birds flying over the North Sea are forced east towards the Danish west coast in westerly winds (Meltofte & Rabøl 1977).

To test for the effects of variable wind direction, the 17 species analysed here were separated into three groups in relation to the characteristic wind conditions in which each is recorded most commonly; i.e. based on Meltofte & Rabøl (1977) and our own observations. Seven species, Common Ringed Plover *Charadrius hiaticula*, European Golden Plover *Pluvialis apricaria*, Grey Plover *P. squatarola*, Curlew Sandpiper *Calidris ferruginea*, Redshank *Tringa totanus*, Common Greenshank *T. nebularia* and Common Sandpiper *T. hypoleucos* are predominantly seen at Blåvandshuk in winds between east and south. Eight species, Red Knot *Calidris canutus*, Sanderling *C. alba*, Little Stint *C. minuta*, Dunlin *C. alpina*, Common Snipe *Gallinago gallinago*, Bar-tailed Godwit *Limosa lapponica*, Whimbrel *Numenius phaeopus* and Ruddy Turnstone *Arenaria interpress* are predominantly seen in southerly winds, while one species, the Eurasian Oystercatcher *Haematopus ostralegus* predominantly is seen in westerly winds, and another species, the Eurasian Curlew *Numenius arquata* occur in almost any wind direction.

For tests on wind influence on the annual numbers of passing birds, wind data from Thyborøn, situated on the coast about 125 km north of Blåvandshuk, were used for July–Aug of the same years, for which we have bird data. Overall trends in the percentage of winds in the 90°–<180°, 90°–<270° and 180°–<360° sectors in relation to all winds were tested by a third order polynomial regression analysis (year, year^2, year^3). The first order year term in the regression model is equivalent to a linear relationship, the second order to a quadratic and the third to a cubic relationship. Terms were removed from the polynomial regression models one by one applying a significance level of 10% starting with the highest order. No lower order terms were removed, if a higher order term was significant. For the percentage of winds in the 90°–<180° sector in relation to all winds, the final polynomial regression model was a second order regression showing a concave pattern (Fig. 3). Winds from the sector 90°–<270° showed no trend, while westerly winds (180°–<360°) showed a convex pattern opposite to south-easterly winds (Fig. 3). Since Shapiro Wilk tests for normality showed that the percentage of winds from the 90°–<270° and 180°–<360° sectors did not differ significantly from normality ($p = 0.368$), and that winds from the 90°–<180° sector only differed slightly from normality ($p = 0.036$), we decided not to arcsine transform the data.

The influence of weather is not restricted to the wind, but it is a highly variable combination of wind direction, wind force, temperature, precipitation and visibility together with cloud cover and height not only at Blåvandshuk, but hundreds of kilometres in different directions from Blåvandshuk, which determine the intensity of the migration on a particular day (Meltofte & Rabøl 1977). Furthermore, two days with exactly the same weather patterns may produce many birds as well as few, depending on the number of birds in the staging areas contributing to the migration at Blåvandshuk. If there were massive movements one or a few days before, then the area from which the birds came can be empty and no or only few birds will show up. Therefore, full correction for weather would involve corrections for the individual day in relation to phenology of migration, which changes from year to year due to variation in breeding success, weather etc. As this is impossible, we have supplemented the statistical tests based on pure trends in migration intensity with tests based on 'wind-adjusted' migration intensities, where the species-specifically relevant wind ratio represents the wind. In this way we have controlled for the main factor, apart from population change, thought to affect the number of each species recorded from year to year. It is

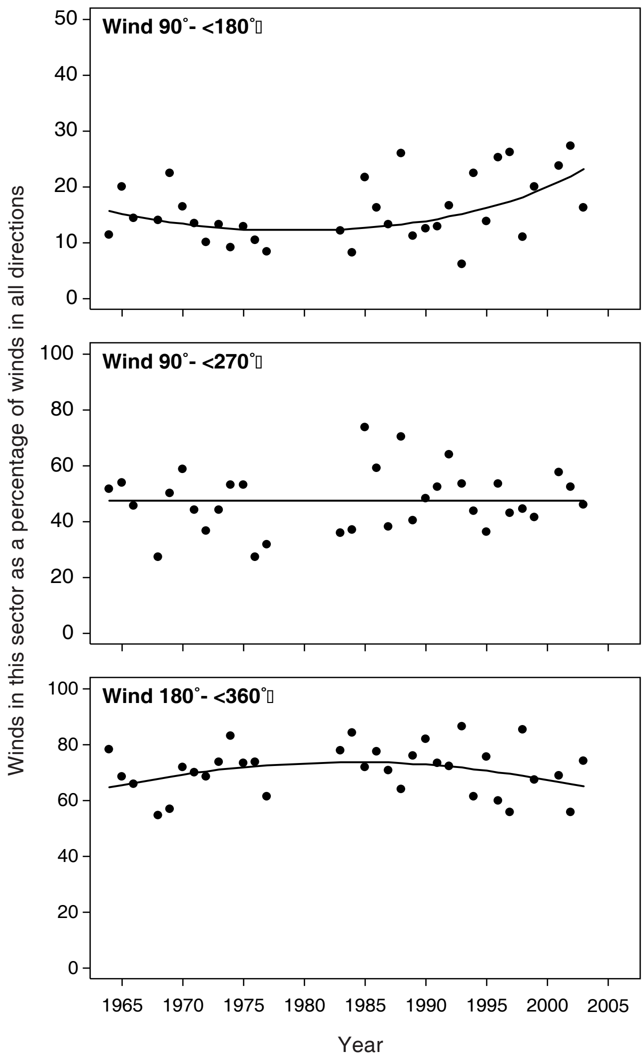


Fig. 3. Annual variation in winds from three different sectors as a percentage of winds from all directions at Thyborøn on the Danish west coast during 1964–2003, with polynomial regression lines (see Methods).

therefore an assumption of this analysis that no other factor affecting numbers seen has changed in a systematic way over the 40 years of observations.

For each year, an index of the abundance of each species was calculated based on the aggregate of the average number of passing birds per hour for each 5-day-period. Overall trends in the period were tested by multiple regressions on this index which showed a positive skew and was therefore log transformed. In the first analysis we included the polynomial variables year, year^2 and year^3 (Table 1). Terms were removed from the multiple regression models one by one starting with the highest order term and applying a significance level of 10%. In the second analysis we included the wind ratio (sector depending on the bird species; see above) together with the polynomial year terms using the same variable removing procedure. This was done in order to compare the overall trends with and without adjustment for wind ratio.

Statistical analyses were carried out using the free software R version 2.1.0. For statements on statistical significance of population trends, the conventional 5% limit is used.

RESULTS AND EVALUATION OF INDIVIDUAL SPECIES' TRENDS

The results of the multiple regression analyses for the individual wader species present a diverse picture (Fig. 4, Table 1). Much variation is probably 'random', but for several species there are clear patterns, which may be significant. These are discussed below.

With a sample of almost 670,000 individuals, the Eurasian Oystercatcher is by far the most numerous wader species passing Blåvandshuk on autumn migration. It showed relatively stable numbers until the early 1990s, followed by a steady and significant decreasing trend during the last decade (Fig. 4a, Table 1). Oystercatchers primarily appear at Blåvandshuk in westerly winds (180°–360°; Meltofte & Rabøl 1977), but the variation between years in wind frequency in this sector had no significant effect on Oystercatcher numbers. The decrease at Blåvandshuk during the last decade may reflect the decrease particularly in the Dutch and the Wash wintering populations during recent years following overexploitation of bivalve stocks (Piersma *et al.* 2001, Atkinson *et al.* 2003, van Roomen *et al.* 2004, 2005, Blew & Südbeck 2005). The vast majority of Eurasian Oystercatchers passing Blåvandshuk belong to the Norwegian breeding population (Meltofte 1993). This suggests that even this population may be decreasing substantially, which is inconsistent with statements by Stroud *et al.* (2004).

Common Ringed Plovers passing Blåvandshuk are assumed to originate mainly from northern *tundrae* and *psammodroma* breeding populations (Meltofte 1993), for which a considerable decrease has been reported from the West African wintering grounds (Stroud *et al.* 2004). The records from Blåvandshuk do not support this, not even when adjusted values for a significant effect of frequencies of south-easterly winds are included (Fig. 4a, Table 1).

The long-term unchanged counts of Eurasian Golden Plovers at Blåvandshuk (Fig. 4a, Table 1) fit well with other reports that N European *altifrons* populations are relatively stable (Stroud *et al.* 2004). However, the effect of varying frequencies of winds in the 90°–180° sector, which favour the observation of this species at Blåvandshuk (Meltofte & Rabøl 1977), changes this stable pattern somewhat in the direction of a non-significant increase followed by a decrease (Fig. 4a, Table 1).

Numbers of Grey Plovers varied during the study period, but with no significant wind effect on the annual numbers, nor any significant trend in the pattern found (Fig. 4a, Table 1). Excluding two years with high numbers at the beginning of the study period, there may have been higher numbers in the second half of the period than in the first. If so, this is in accordance with a marked increase in wintering numbers reported for W Europe. However, much of this increase may have been due to a northward shift in the winter distribution of these birds (Stroud *et al.* 2004).

The Red Knots passing Blåvandshuk are assumed to origi-

Table 1. Results of the multiple regression analyses. P-values are given for the final model after removing non-significant factors at the 10% level (see Methods). The annual index of the abundance of each species (see Methods) was log transformed. Results are given both with wind ratio included and not included in the first model. Only p-values below 0.10 are presented.

Species	Wind-adjustment not included in the first model			Wind-adjustment included in the first model			
	Year	Year^2	Year^3	Year	Year^2	Year^3	Wind ratio
Eurasian Oystercatcher *Haematopus ostralegus*	0.031	0.014	0.005	0.031	0.014	0.005	
Common Ringed Plover *Charadrius hiaticula*							0.009
Eurasian Golden Plover *Pluvialis apricaria*				0.081	0.084		0.099
Grey Plover *Pluvialis squatarola*	0.042	0.046	0.061	0.042	0.046	0.061	
Red Knot *Calidris canutus*							<0.001
Sanderling *Calidris alba*	0.015	0.029		0.008	0.013		0.006
Little Stint *Calidris minuta*	0.009			0.014			0.045
Curlew Sandpiper *Calidris ferruginea*		0.088	0.062		0.088	0.062	
Dunlin *Calidris alpina*							0.011
Common Snipe *Gallinago gallinago*	<0.001			<0.001			
Bar-tailed Godwit *Limosa lapponica*	0.031			0.048			0.022
Whimbrel *Numenius phaeopus*							0.058
Curlew *Numenius arquata*	0.075	0.044	0.044	0.075	0.044	0.044	
Redshank *Tringa totanus*	0.032			0.060	0.076	0.089	<0.001
Greenshank *Tringa nebularia*	0.005			0.054			<0.001
Common Sandpiper *Tringa hypoleucos*							0.004
Ruddy Turnstone *Arenaria interpres*				0.037	0.016		0.006

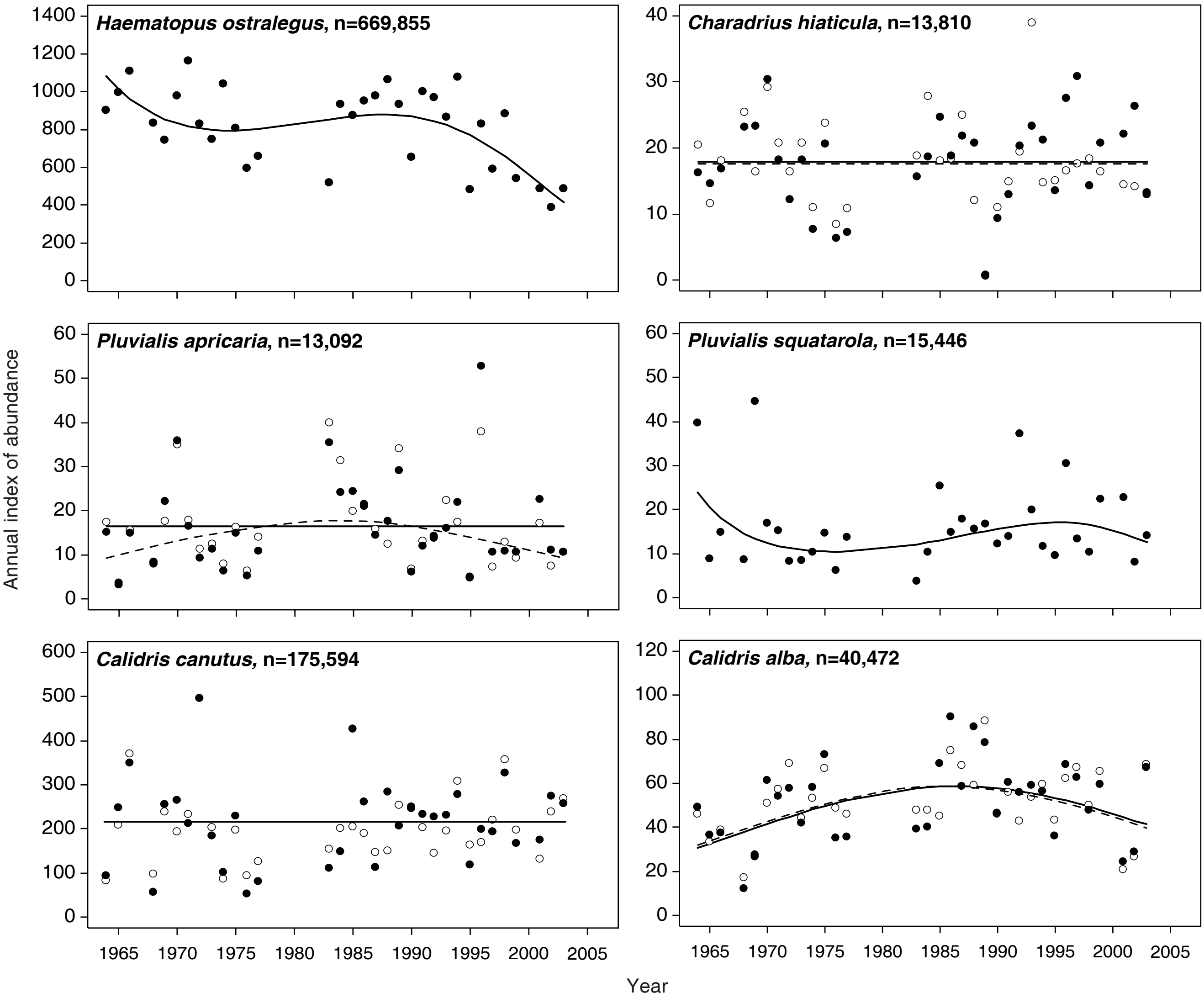


Fig. 4a. Annual indices of abundance (with polynomial regression lines) for Eurasian Oystercatcher *Haematopus ostralegus*, Common Ringed Plover *Charadrius hiaticula*, Eurasian Golden Plover *Pluvialis apricaria*, Grey Plover *P. squatarola*, Red Knot *Calidris canutus* and Sanderling *C. alba* on autumn passage at Blåvandshuk, westernmost Denmark, 1964–2003. Filled dots depict true indices of abundance calculated as described in Methods, and solid lines are the corresponding polynomial regression lines. Open dots and broken lines depict wind-adjusted indices and corresponding polynomial regression lines. The latter are only given for species where the wind frequencies from the relevant wind sector had a statistically significant effect on annual bird indices at the 10% level (see Methods). The wind direction for which adjustment is made is identified in the section headed Results and Evaluation of Individual Species' Trends. Horizontal lines (overall mean of the whole period) are given when no significant trend was found.

nate from both Nearctic *islandica* and Palearctic *canutus* populations (Meltofte 1993). The Nearctic population went through a marked decrease during the 1970s, followed by an increase in the 1980s and a more stable level thereafter (Pollitt *et al.* 2003, Stroud *et al.* 2004). The Palearctic population is thought to have undergone a substantial decline on the W African wintering grounds during the last decade (Stroud *et al.* 2004). These changes are not reflected in the Blåvandshuk data, neither with nor without the highly significant wind effect (Fig. 4a, Table 1). Neither is any noticeable effect seen of recent declines in the Wadden Sea and Wash wintering populations due to overexploitation of bivalve stocks, which is thought to have resulted in the birds moving to other sites (Atkinson *et al.* 2003, Stroud *et al.* 2004).

Sanderlings passing Blåvandshuk also originate from both Nearctic and Palearctic breeding grounds (Meltofte 1993). Based on both wind adjusted and unadjusted annual indices, there appears to have been a substantial increase during the first two decades, while numbers seem to have dropped a little since then (Fig. 4a, Table 1). Mid-winter counts in W Europe are contradictory, partly because many Sanderlings winter on poorly covered non-estuary coasts. Annually counted numbers in Britain have been relatively unchanged during the last 33 years, whereas other data from W Europe suggest an increase of more than 50% during the 1980s and early 1990s (Pollitt *et al.* 2003, Stroud *et al.* 2004) parallel to the increase at Blåvandshuk. Similarly, numbers counted in W Africa, where the bulk of Nearctic birds are thought to winter (Lyngs 2003), almost doubled between the early 1980s and the mid 1990s, even though improved coverage probably played an important part in this (Stroud *et al.* 2004).

The statistically significantly increasing trend in Little

Stint numbers at Blåvandshuk both using wind adjusted and unadjusted annual indices (Fig. 4b, Table 1) may at least partly be due to improved observer optics enabling identification of the few birds mixed with passing flocks of other waders. After wind adjustment, the increase was 3.1% per year. There is no good trend information on Little Stint from elsewhere in the flyway (Stroud *et al.* 2004).

Curlew Sandpipers appear to have increased significantly in the W Palearctic and on the East Atlantic flyway (Stroud *et al.* 2004). At Blåvandshuk, numbers increased – non-significantly – until the mid 1990s, but subsequently dropped (Fig. 4b, Table 1). Observer efficiency is not thought to have influenced this, since Curlew Sandpipers are easy to identify.

Numbers of Dunlin passing Blåvandshuk have remained relatively unchanged during the study years, even when adjusted for a significant effect of wind frequencies (Fig. 4, Table 1). On the East Atlantic wintering grounds of these *alpina* birds, numbers decreased from the mid 1970s to the mid 1980s, whereupon they increased during the 1990s (Pollitt *et al.* 2003, Stroud *et al.* 2004).

Common Snipe shows a highly significant increase averaging 5.0% per year during the study period, but numbers are very low (Fig. 4b, Table 1). The observed increase may to some extent be the result of increased observer focus on 'inland' migrating waders (birds migrating over the dunes instead of along the shore, of which Common Snipe is the only regular species), and it is in conflict with negative breeding population trends published for several N European countries (Stroud *et al.* 2004).

Bar-tailed Godwit shows significantly increasing trends during the study period, both in real numbers and adjusted for a significant effect of frequency of winds from southerly directions (Fig. 4b, Table 1). For wind adjusted annual indices the average increase is of 1.9% per year. The European breeding and wintering *lapponica* population is reported to be quite stable, while the Siberian breeding and African wintering *taimyrensis* population appears to have declined on the wintering grounds (Stroud *et al.* 2004). The origin of the birds passing Blåvandshuk is uncertain; they may originate from the European and/or the Siberian populations (Meltofte 1993).

The relatively stable numbers of Whimbrels passing

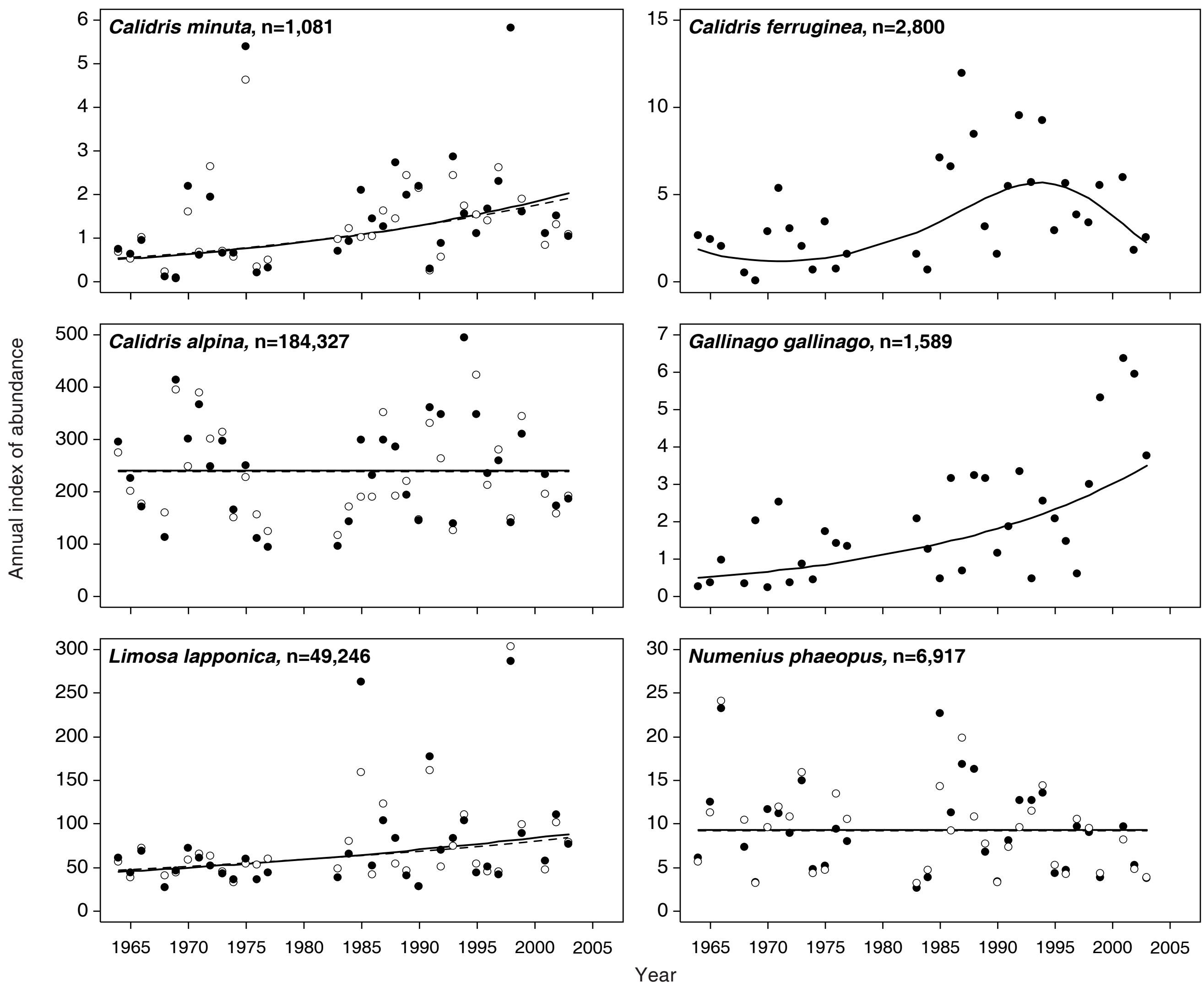


Fig. 4b. Annual indices of abundance (with polynomial regression lines) for Little Stint *Calidris minuta*, Curlew Sandpiper *C. ferruginea*, Dunlin *C. alpina*, Common Snipe *Gallinago gallinago*, Bartailed Godwit *Limosa lapponica* and Whimbrel *Numenius phaeopus* on autumn passage at Blåvandshuk, westernmost Denmark, 1964–2003. (For details see caption to Fig. 4a.)

Blåvandshuk (Fig. 4b) are consistent with the lack of marked populations trends found elsewhere. However, good trend data are lacking (Stroud *et al.* 2004). Only a non-significant effect of wind frequencies was found (Table 1).

If anything, there seems to have been a positive trend in the number of Eurasian Curlews passing Blåvandshuk (Fig. 4c, Table 1). Other trend information is conflicting, but numbers may have been increasing during the 1990s following widespread declines during much of the 20th century (Stroud *et al.* 2004, Laursen 2005). Curlews pass Blåvandshuk in almost any wind direction (Meltofte & Rabøl 1977), and no adjustment for wind frequencies has been attempted.

Common Redshanks passing Blåvandshuk show a statistically significant increasing trend, but adjusted for a highly significant effect of frequency of winds from south-easterly directions, the significance falls below 5% (Fig. 4c, Table 1). The Redshanks at Blåvandshuk predominantly belong to the alpine and sub-arctic breeding population of Scandinavia (Meltofte 1993), for which we have no other trend data (Stroud *et al.* 2004), but counts on the wintering grounds of these birds in Banc d'Arguin in Mauritania indicate a strong increase during recent decades (Hagemeijer *et al.* 2004, C. Smit in litt.).

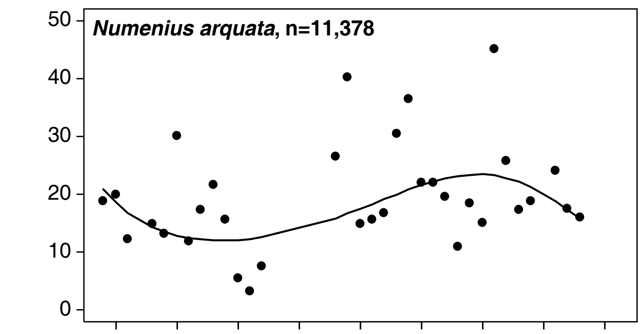
Common Greenshanks also show a statistically significant positive trend during our study period, but significance falls slightly below 5% when adjusted for frequencies of south-easterly winds (Fig. 4c, Table 1). After this adjustment, the increase averages 7.6% per year. The origin of these birds is the boreal zone, from where we have no other trend data (Stroud *et al.* 2004).

Numbers of Common Sandpipers seen at Blåvandshuk show no marked trend neither with nor without adjustment for a significant wind effect (Fig. 4c, Table 1), and N European populations are thought to be stable (Stroud *et al.* 2004).

Ruddy Turnstones passing Blåvandshuk are assumed to originate from breeding grounds both in northernmost Europe and in the NE Nearctic (Meltofte 1993). The latter population, which winters in W Europe, is thought to have increased from the 1960s to the 1980s, followed by a decline (Pollitt *et al.* 2003, Stroud *et al.* 2004). The N European breeding population is considered stable (Stroud *et al.* 2004), which also is the case for unadjusted data from Blåvandshuk (Fig. 4c, Table 1). However, adjusted for a significant effect of frequency of southerly winds, data show an increase during the 1970s followed by a decrease since the 1980s, like the European wintering birds.

DISCUSSION

Wader migration recorded at Blåvandshuk is highly sensitive to weather variables with most birds passing at low height and thereby visible to the observers in side- to head-wind, cloudy sky and reduced visibility (Meltofte & Rabøl 1977). This



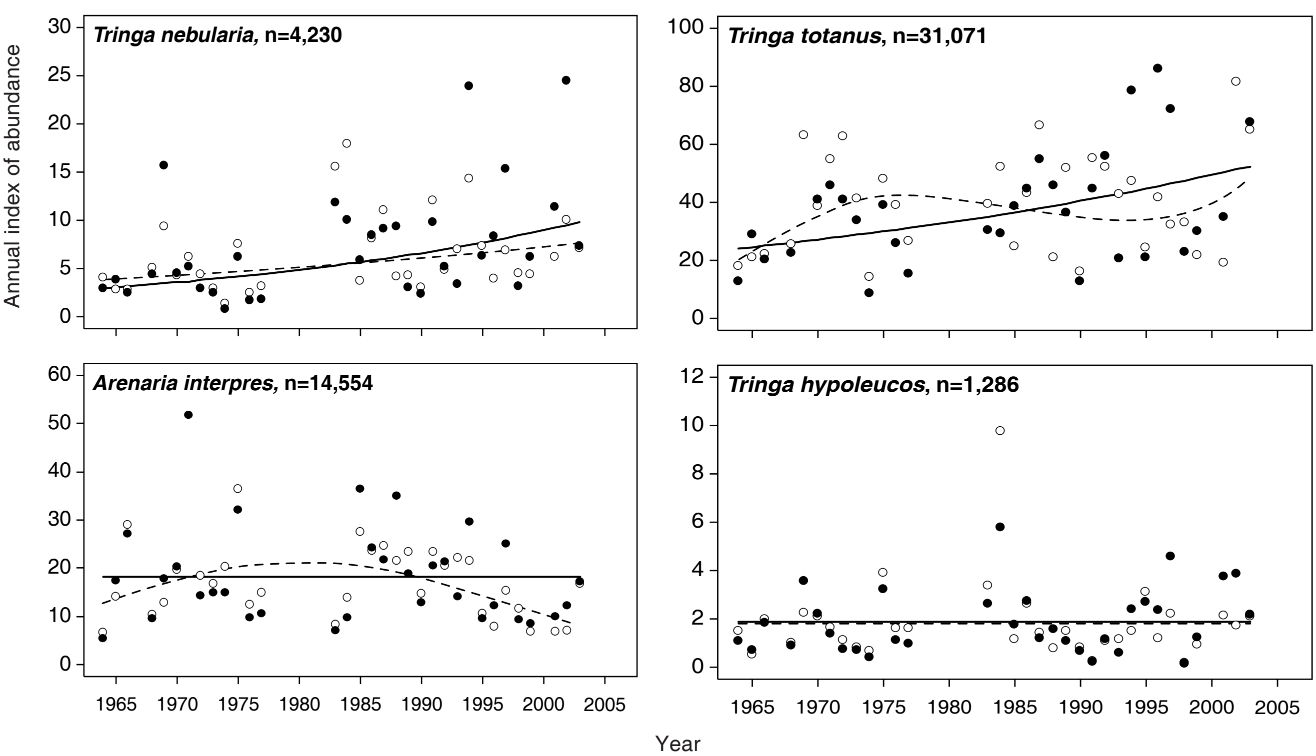


Fig. 4c. Annual indices of abundance (with polynomial regression lines) for Eurasian Curlew *Numenius arquata*, Greenshank *Tringa nebularia,* Common Redshank *T. totanus*, Ruddy Turnstone *Arenaria interpres* and Common Sandpiper *Tringa hypoleucos* on autumn passage at Blåvandshuk, westernmost Denmark, 1964–2003. (For details see caption to Fig. 4a.)

kind of weather is assumed to bring the high-altitude migration down close to the ground and sea, where the birds will follow geographical features such as coasts.

Much of the annual migration often passes during a few days of 'optimal' weather, and on such days the migration continues with high intensity during most of the day (Meltofte 1988). The resulting high variability in numbers observed at Blåvandshuk means that population changes need to be considerable before they are clearly reflected in the data.

Most wader species are recorded in greatest numbers at Blåvandshuk in winds between E and WSW (the 90°–<270° sector; see Methods), in which no trend is seen in frequencies (Fig. 3). Hence, wind frequencies alone should have had little effect on long-term trends in the numbers of these species recorded. By contrast, other species are more narrowly associated with winds between east and south (the 90°–<180° sector), in which a concave pattern of frequency is seen (Fig. 3). None of these species show a similar concave trend in numbers, but the increase in winds from this sector during recent years causes the otherwise significant increases in Common Redshanks and Common Greenshanks seen at Blåvandshuk to fall below the 5% level of statistical significance when adjusted for such winds.

The majority of the birds recorded at Blåvandshuk pass within a relatively short distance from the observers, and hence improved optics is only thought to have increased numbers recorded of a species like Little Stint, which often appear singly in flocks of other species, such as Dunlin. It is also likely that observers have paid more attention to recording overland migrating Common Snipes in recent years, and that this has contributed to the increase in the number observed, but an increase in northern populations can not be ruled out.

Most species passing Blåvandshuk on autumn migration show no long-term change in numbers or somewhat varying or increasing numbers. This is more or less in accordance with records from breeding and wintering areas of the same species and populations, e.g. the apparent increase in Curlew Sandpipers. Exceptions are Common Ringed Plover, Red Knot and Bar-tailed Godwit, in which African wintering birds apparently show marked declines, in contrast to stable or increasing numbers passing Blåvandshuk. Conversely, reports of increasing numbers of Grey Plovers wintering in W Europe are only partly supported by numbers passing Blåvandshuk. For Common Redshank and Common Greenshank, apparently increasing numbers at Blåvandshuk may reflect increasing northern populations, for which we have limited data from elsewhere. Similarly, the relevant populations of Sanderling and Ruddy Turnstone may have been increasing both at Blåvandshuk and on the wintering grounds during the first decades of the study period, followed by a decline.

In marked contrast, numbers of Eurasian Oystercatchers, the most numerous species passing Blåvandshuk, have been decreasing significantly during recent years, most likely as a result of overexploitation of bivalve stocks at their main wintering grounds (Piersma *et al.* 2001, Atkinson *et al.* 2003, van Roomen *et al.* 2004, 2005, Blew & Südbeck 2005). This is the first evidence that even Norwegian Oystercatchers are affected by this overexploitation, and the figures suggest a halving of this population.

Few temperate farmland species are involved, and the data presented here most likely represent birds almost entirely from north boreal and arctic breeding areas with limited human influence (Meltofte & Rabøl 1977, Meltofte 1993). The only common north boreal and arctic wader species of the East Atlantic flyway that we do not see in appreciable numbers at Blåvandshuk, are Temminck's Stint *Calidris temminckii*, Purple Sandpiper *C. maritima*, Jack Snipe *Lymnocryptes minimus*, Ruff *Philomachus pugnax*, Spotted Redshank *Tringa erythropus*, Green Sandpiper *T. ochropus* and Wood Sandpiper *T. glareola*. Largely, it is species that winter in coastal and intertidal habitats that are most common at Blåvandshuk. That we find few declines among these northern species and populations may have a parallel in European boreal passerines, in which 21 years of data from Christiansø Bird Observatory in the Baltic showed few significant negative or positive trends in spring and autumn staging numbers of 29 species (Rabøl & Rahbek 2002). This is in marked contrast to widespread declines among European farmland birds – waders and passerines alike (Hagemeijer & Blair 1997, International Wader Study Group 2003, Stroud *et al.* 2004, Thorup 2005).

In summary, our data indicate that it is mainly the Eurasian Oystercatcher that has suffered significant decline, and that the majority of the arctic and north boreal wader populations on the East Atlantic flyway have maintained stable, fluctuating or increasing population trends during the last 40 years. If this is true, it may be the result of earlier snowmelt and milder summers following warming of the Arctic during recent decades. In fact, improving conditions for arctic waders is considered the most likely initial scenario for these wader populations under predicted climate change – until the arctic habitats change and sea levels rise on staging and wintering grounds in the longer term (Meltofte *et al.* submitted).

This paper demonstrates that monitoring actively migrating waders may be an important contribution to flyway population monitoring.

ACKNOWLEDGEMENTS

The Danish Ornithological Society/BirdLife Denmark generously made all the data available for this analysis. Especially, we want to thank Mikkel Lausten and Per Baden for digitising and organising much of the data set. Simon Delany, Cor Smit and Jouke Prop kindly commented on an earlier draft of the paper and made valuable comments. Also, two anonymous referees and Humphrey Sitters contributed significantly to the quality of the paper.

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Since 1963, 12,000 hours of observation of autumn migrating waders have been carried out at Blåvandshuk.
Photo: Lars Maltha Rasmussen.