Wintering waders in coastal Guinea

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Wader counts were carried out along the coast of Guinea, W Africa, over the four winters 1999–2002 at a range of sites, mostly mudflats. From these, estimates were made, by extrapolation based on sediment-type, of the wader populations of the mudflats of the entire Guinean coast. Rougher estimates were also made for the numbers of waders using mangroves and ricefields. Combining these data, we estimate the aggregate number of waders wintering on the coast of Guinea at 540,000 of which 489,000 are found on mudflats.

We evaluate the importance of Guinea for a selection of wader populations based on comparison with existing data on the relevant biogeographic populations or new estimates proposed by us. Guinea is shown to be of major importance for Pied Avocet (16,070 birds or 20% of the flyway population), Great Ringed Plover (71,950; 30%) and Curlew Sandpiper (230,060; 18%). It is probably also of major importance for Whimbrel (35,735), but as there is a lack of clear information on the size of the flyway population, it is not possible to evaluate this fully.

INTRODUCTION

Many of the wader populations that migrate along the East Atlantic Flyway winter in sub-Saharan Africa. However, fieldwork in many parts of Africa is not easy and is beset with logistical problems and difficulties of access. For this reason, two major sites on the African Atlantic Coast – Banc d'Arguin, Mauritania, and the Bijagos archipelago, Guinea-Bissau – have received the most attention, with repeated studies allowing accurate assessments of the size and trends of wintering populations as well as the relative importance of the sites. For the rest of the Atlantic coast of Africa, our knowledge of wader numbers is scanty, but the literature suggests that the coast of Guinea is probably the most important area (Tye 1987, Altenburg & van der Kamp 1991). During five visits to Guinea between 1998 and 2002, the main purpose of which was to train local researchers in waterbird monitoring methods, we made a series of wader surveys designed to assess the importance of various sites and to estimate the total number of waders wintering along the Guinean coast.

STUDY AREA

The coast of Guinea lies NW–SE and stretches over 280 km from Sierra Leone in the south (9° N, 13° W) to Guinea-Bissau in the north (11° N, 15° W). On the coast, the average annual rainfall increases from 2,500 mm in the northwest to >4,000 mm in the region of Conakry, but drops towards the southeast where it is about 3,500 mm. Almost all this rain falls between May and October, with a peak in July and August. Temperatures vary little and stay around an annual average of 26.3°C. In the dry season, winds are mainly less than Beaufort scale force 4. The maximum tidal range is about 4 m.

Between the sea and the foothills of the Fouta-Djallon massif, there is a coastal plain that slopes gently towards the sea, and is only interrupted in the area of Cape Verga and by the Conakry peninsula. It reaches 90 km in width in the north. The lowest parts of this alluvial plain close to the sea were originally covered by *Rhizophora* sp. and *Avicennia africana* mangroves. As a result of clearings and endykements, the mangroves have regressed. Although they still covered 400,000 ha in the 1950s, their surface area is now reduced

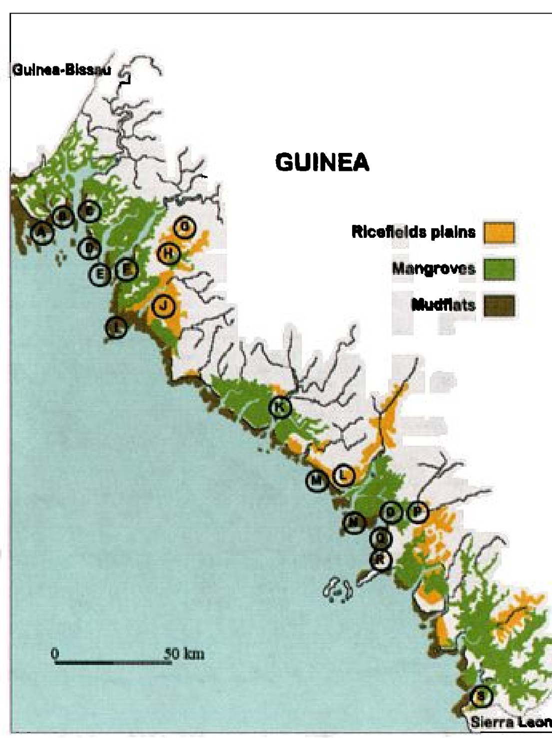

Fig. 1. The coast of Guinea, W Africa; letters identify sites surveyed for waders (after IGN maps, marine charts and SECA 1990).

to 250,000 ha (Fig. 1). Among the reclaimed mangrove areas are extensive tracts of land intended for use as rice fields that cover 80,000 ha, but only part of them have so far been exploited for this purpose. In the Fouta-Djallon region, the watershed is oriented in a NW–SE direction, parallel to the coast. When the rivers that rapidly descend from Fouta-Djallon arrive in the coastal plain, their flows slow; they become sinuous, and their beds widen. They function like estuaries and split into many branches and channels which often flow between islands along the coast. The total length of the rivers and channels in the mangroves is about 4,200 km (Altenburg & van der Kamp 1991). The banks of the estuaries and channels are tidal mudflats that vary in width between a few metres and tens of meters and are all bordered by mangrove swamps. Their degree of salinity is naturally reduced during the rainy season.

Except for a few rocky outcrops, the coast comprises intertidal mudflats, formed from sediments with very variable grain-size, ranging from almost pure coarse sand to very fine silt. Their extent varies considerably from place to place and they have an aggregate surface area (above chart datum, as with all mudflats areas mentioned in this paper) of about 68,000 ha.

METHODS

Five field expeditions were carried out as follows: 7–21 March 1998; 5–26 January 1999; 7–26 January 2000; 1–21 December 2000, and 3–18 January 2002. In March 1998, we explored the coast and the coastal plains, identified sites where counts should be made, tested the methods, and carried out a few counts. The latter are not discussed here as some species start their spring migration in March and our object is to report on wintering populations. During the following four expeditions, we made 1–4 counts in 11 major sites along the coast (see Fig.1).

So far as possible, each survey site was chosen as a separate ecological entity, with clear boundaries (such as wide channels), supporting discrete wader populations and also being of such a size and with sufficient access as to facilitate accurate counting. According to the attributes of each site, a variety of different counting methods were used:

Sites A, B, C, D, E, F, N, O and Q

These sites are bordered by mangroves or/and are on islands and are not accessible from the mainland. It is impossible to count them at high tide because the mudflats are submerged and the waders take refuge in the mangroves, often perched on trees, or in the coastal plains and cannot be counted accurately. Therefore, all counts had to be made during a brief phase of the tidal cycle defined by two opposing factors: the birds should be feeding and not moving about, but the tide should be high enough that the birds are concentrated into a small enough space where they can be easily counted. Therefore counts were made during rising or falling tide and the choice of counting period for each site was made in relation to tide times, the behaviour of the birds, and the position of the sun. In practice, most counts were made around mid tide and for all of these sites we considered that they are an accurate reflection of the numbers feeding at low tide. Counts were made with binoculars, from a shallow-draught (~40 cm) pirogue with an outboard motor sailing close to the mudflat at 3–8 km/h. The pirogue did not disturb the birds, even when quite close (20–30 m). Although this method was used at site Q, it could not be used efficiently because rough and shallow water prevented us from getting close enough to the mudflats. We therefore supplement the counts from the pirogue with two counts from two fixed points on the mudflat.

Site M

This is a rather linear, 20 km long mudflat, backed by a dyke with a vehicle track protecting the ricefield plain of Koba from the sea. From this track we made counts at regular 1 km intervals.

Site I

This is a very large mudflat and because of the difficulty of navigating in the shallows, it is impossible to count from a pirogue. Two groups of observers were dropped on the shore by the pirogue and walked to the ends of the site, where the waders gathered as the tide rose.

Most counts took 2–3 hours, the shortest only 1¼ hours and the longest 4 hours.

For most sites we present the mean count, but in some cases where conditions led to unusual results, we give a figure based on the count or counts that we consider most accurately reflect the number of waders using the site.

Due to adverse conditions at some sites, such as long distance, we were unable to specifically identify a small proportion of the waders we counted (5.8% overall). These could only be assigned to a group of species, such as 'small *Calidris/Charadrius*'. For each count, the number of unidentified waders was distributed among the species recorded in such groups according to their proportion of the total.

For each mudflat, the surface area (above chart datum) was calculated from 1/50 000 IGN maps and 1/100 000 Soviet marine charts (making allowance for recent changes in geomorphology) and the dominant sediment-type recorded according to the broad categories proposed by Schnell (1950) and followed by Altenburg & van der Kamp (1991): 1 = sand, 2 = muddy sand, 3 = sandy mud and mud, 4 = very soft mud. We then used these data to derive an estimate of the total number of each wader species present on all mudflats along the coast of Guinea. First, we calculated an extrapolation coefficient relating the aggregate area of each sediment-type in our counting sites to the total area of each sediment-type along the Guinean coast as estimated by Altenburg & van der Kamp (1991) (Table 1). For each species and for each sediment-type, we then multiplied our count by the extrapolation coefficient to give an estimate of the numbers of each species on each sediment-type along the entire coast. Finally, for each species, we summed the estimates for each sediment-type to give an estimate of the total population.

In the mangroves, waders were counted along 5 km of the banks of Rio Soumba (Site P) and along 28 km of the banks of Rio Pongo (Site K) (Fig. 1). Although occasional observations were made in several other places, these data are insufficient to allow reliable extrapolation for estimating the wader population of the mangroves. Therefore the data we present for the mangroves should be looked upon as no more than "guesstimates".

The coastal plains of Monchon (Site J), Koba (L), Sonfonia (R), Benty (S) and Bintimodia (G, H) (Fig. 1) were partially covered and all waders seen counted. As these areas were not systematically surveyed and the occurrence of waders was very patchy, the results do not allow reliable extrapolation to estimates of the numbers present in all the coastal plains of Guinea. Therefore the estimates we present are only very rough indications of numbers, taking account of what we know of the surface areas of the plains, the habitats they contain, and the number of waders we were able to count in the parts we investigated.

RESULTS

An aggregate of 140,992 waders were counted at the eleven mudflat sites (Table 2). These data together with the rough

Table 1. The intertidal mudflats of coastal Guinea according to sediment-type and area (after Schnell 1950 and Altenburg & van der Kamp 1991) compared with the areas of the sites counted in this study. Column 6 shows the extrapolation coefficient (column 2 / column 5) used in our calculations to estimate total wader populations (see text).

Sediment type	Total surface area of sediment type in coastal Guinea (ha)	Sites surveyed			Extrapolation coefficient
		Site	Surface area (ha)		
1	11,950	E	1,230	1,230	9.7
2	18,650	A	1,250	4,065	4.6
		C	1,585		
		D	1,230		
3	29,100	B	2,250	7,690	3.8
		F	1,100		
		M	1,670		
		N	2,020		
		O	650		
4	8,600	I	4,200	6,100	1.4
		Q	1,900		
Total	**68,300**			**19,085**	

Table 2. Numbers of waders counted at the eleven mudflat sites shown in Fig. 1 in a variety of counts carried out in December and/or January 1999–2002.

Species	Sites											Total
	A	B	C	D	E	F	I	M	N	O	Q	
Eurasian Oystercatcher	5	15	10	70	110	10	105	2	12			339
Black-winged Stilt							1	60			1	62
Pied Avocet							1,050	2,050	1,220	20	1,500	5,840
Grey plover	100	110	460	460	270	670	450	90	530	320	2,600	6,060
Great Ringed Plover	490	370	305	1,730	920	3,700	3,150	1,630	2,920	1,500	5,600	22,315
Little Ringed Plover								1			2	3
Kittlitz's Plover				1			1				1	3
Kentish Plover	2	1	7	2	4	7	25		3	2		53
White-fronted Plover	11	4	5	150	60	15	95	1	75	12		428
Black-tailed Godwit		15		2	3	25	15	60	3	1	25	149
Bar-tailed Godwit	990	2,355	2,880	1,600	1,450	895	2,570	75	1,150	350	175	14,490
Whimbrel	135	650	185	35	230	760	2,600	330	1,065	545	360	6,900
Eurasian Curlew	6	140	130	165	60	70	180	2	120	115	15	1,003
Spotted Redshank						1						1
Common Redshank	277	450	110	10	200	565	400	1 850	495	500	450	5,000
Marsh Sandpiper							3	3		1	3	10
Common Greenshank	7	8	1	1	20	35	115	60	45	52	150	494
Wood Sandpiper											1	1
Common Sandpiper	47	85	235	300	300	110	10		250	370	75	1,782
Ruddy Turnstone	25	45	15	20	70	20	115	5	30	5	15	365
Red Knot	780	10	5	100		2	100	5	1	10	175	1,188
Sanderling	200	120	580	550	710	60	220	20	315		10	2,785
Little Stint	12	5	11	12	150	20	3,700	270	40	90	340	4,650
Dunlin	6	15	10		3	10	90	15	25	40		214
Curlew Sandpiper	2,900	6,800	4,000	2,150	3,140	7,750	17,500	4,815	10,450	4,000	3,050	66,555
Total	**5,993**	**11,198**	**8,949**	**7,358**	**7,700**	**14,725**	**32,495**	**11,344**	**18,749**	**7,933**	**14,548**	**140,992**

counts of waders in the mangroves and on the coastal plains were then used to calculate the population estimates for the entire coast of Guinea set out in Table 3. For mudflats, these give an average density of 7.2 waders^{-ha}. Scientific names of all wader species mentioned in this paper are given in Table 3.

DISCUSSION

Only seldom have waders been counted from a moving boat. However, at sites where the mudflats are relatively narrow, it is very efficient and the birds can be counted easily and precisely. Where mudflats are large, counting becomes more difficult. Results are less accurate because it is less easy to see and identify all the birds for reasons of distance, topography of the mud, heat haze, and the boat's instability. But even at the most difficult sites in Guinea, we consider this method to be definitely more satisfactory than trying to count from the land for the following reasons:

- Counting from the land leads to bias in the selection of sites to be surveyed. They have to be accessible which often means that they are backed by sandy beaches and/or ricefields. Therefore mudflats bordered by mangroves, which may be different in terms of habitat, trophic richness and wader populations, are neglected.
- Counting from a boat usually means that a site can be counted completely whereas counts from the land can often only be carried out from a limited number of access points so coverage is reduced and estimated have to be made by extrapolation. For example, Altenburg & van der Kamp (1991) considered that from a fixed point two observers can only count a maximum of 150–200 ha. This represents only a small proportion of most of the sites we counted in Guinea.
- It is very difficult to estimate the extent of the area counted from a fixed point and this is likely to vary with species and the distance at which it is possible to identify them. Therefore extrapolations become even more uncertain.

The division of mudflats into the four sediment-type categories could only be done on the basis of brief inspections without systematic measurement of grain-size. Therefore these categorisations are probably subject to some error. Nevertheless we consider that extrapolation based on sediment-type is likely to lead to better population estimates than if we had used simple area of mudflat. As it happens, if we had done this, the estimate of the total number of waders on the coastal mudflats would have been 504,600 instead of 488,760 birds – not so very different. However, this hides differences in estimates between species. We therefore consider that distinguishing between habitats improves our estimates, especially for those species with more specialised requirements.

The extrapolations from the areas we counted to give global population estimates for the entire coast of Guinea

Table 3. Estimates of the numbers of waders wintering on the coast of Guinea, W Africa, during 1999–2002. See text for details of how these estimates were derived.

Species		Coastal mudflats	Mangroves	Coastal plains	Total
Eurasian Oystercatcher	*Haematopus ostralegus*	1,760	0	0	1,760
Black-winged Stilt	*Himantopus himantopus*	200	0	3,000	3,200
Pied Avocet	*Recurvirostra avosetta*	16,070	0	0	16,070
Grey Plover	*Pluvialis squatarola*	18,120	3,000	0	21,120
Great Ringed Plover	*Charadrius hiaticula*	71,250	700	0	71,950
Little Ringed Plover	*Charadrius dubius*	10	0	400	410
Kittlitz's Plover	*Charadrius pecuarius*	10	0	0	10
Kentish Plover	*Charadrius alexandrinus*	500	0	0	500
White-fronted Plover	*Charadrius marginatus*	1,890	0	0	1,890
African Wattled Lapwing	*Vanellus senegallus*	0	0	800	800
Spur-winged Lapwing	*Vanellus spinosus*	0	0	300	300
Common Snipe	*Gallinago gallinago*	0	0	100	100
Black-tailed Godwit	*Limosa limosa*	480	0	1,000	1,480
Bar-tailed Godwit	*Limosa lapponica*	63,820	700	0	64,520
Whimbrel	*Numenius phaeopus*	20,735	15,000	0	35,735
Eurasian Curlew	*Numenius arquata*	3,940	0	0	3,940
Spotted Redshank	*Tringa erythropus*	10	0	30	40
Common Redshank	*Tringa totanus*	19,770	4,000	500	24,270
Marsh Sandpiper	*Tringa stagnatilis*	50		500	550
Common Greenshank	*Tringa nebularia*	1,365	2,000	300	3,665
Green Sandpiper	*Tringa ochropus*	0	0	100	100
Wood Sandpiper	*Tringa glareola*	2	0	1,000	1,000
Common Sandpiper	*Actitis hypoleucos*	8,330	15,000	400	23,730
Ruddy Turnstone	*Arenaria interpres*	1,540	0	0	1,540
Red Knot	*Calidris canutus*	4,560	0	0	4,560
Sanderling	*Calidris alba*	15,300	0	0	15,300
Little Stint	*Calidris minuta*	9,060	0	300	9,360
Dunlin	*Calidris alpina*	630	0	0	630
Curlew Sandpiper	*Calidris ferruginea*	229,360	700	0	230,060
Ruff	*Philomachus pugnax*	0	0	100	100
Total		**488,760**	**41,100**	**8,830**	**538,690**

Table 4. Biogeographic population estimates of some waders and the proportion wintering in Guinea.

Area (sources)	Population							
	Pied Avocet (W Europe & W Africa)	Grey Plover (W Europe & W Africa)	Great Ringed Plover (W & S Africa)	Bar-tailed Godwit (W & SW Africa)	Common Redshank (S of Britain to W Africa)	Red Knot (W & S Africa)*	Sanderling (W Europe, W & S Africa)	Curlew Sandpiper (W Africa)
Mauritania (1)	8,900	18,100	60,550	377,900	130,900	290,000	21,340	200,400
Senegal (2)	5,300	4,790	8,180	4,235	2,690	2,690	2,870	17,250
Gambia (3)	25	340	480	95	65	0	1,340	185
Guinea-Bissau: Bijagos (4)	0	23,500	16,000	97,000	28,000	133,000	11,400	505,000
Mainland coast (5)	0	20,200	27,000	39,800	12,200	53,800	2,290	52,700
Guinea (6)	16,070	21,120	71,950	64,520	24,270	4,560	15,300	230,060
Sierra-Leone (7)	0	5,800	14,600	3,500	18,000	1,700	3,100	26,100
Liberia (8, 9)	0	300	750	50	950	100	300	650
Ghana (3, 10, 11)	5,310	2,030	15,330	330	350	2,075	6,160	35,700
Benin (3, 11, 12)	120	110	450	0	40	0	35	25
Gabon (13)	0	7,175	2,190	5,090	525	365	1,170	14,110
Known total for W Africa#	35,725	103,465	217,480	592,520	217,990	488,290	65,305	1,082,180
Wetland International's current estimate of the relevant biogeographic population (14)	73,000	247,000	190,000	520,000	250,000	340,000	123,000	740,000
Our estimate of the relevant biogeographic population	83,000	247,000	240,000	700,000	250,000	500,000	123,000	1,300,000
% of our estimate of the biogeographic population in Guinea	19.4	8.5	30.0	9.2	9.7	0.9	12.4	17.7

Sources

1. The mean of the numbers estimated in 1997 by Zwarts *et al.* (1998a) and those presented by Dodman & Diagana (2003) for 2000 and 2001 (1999–2001 for Pied Avocet), added to the numbers counted by Zwarts *et al.* (1998b).
2. The mean of the numbers counted in 1997, 1998 and 1999 (Dodman *et al.* 1997 & 1999, Dodman & Diagana 2003), added to the numbers estimated in Casamance by Meininger (1989).
3. Dodman *et al.* (1999)
4. Frikke *et al.* (2002)
5. Zwarts (1988)
6. This study (Table 3)
7. Tye and Tye (1987)
8. Gatter (1988)
9. Gatter (1997)
10. Ntiamoa-Baidu & Grieve (1987), Ntiamoa-Baidu *et al.* (2001)
11. Dodman *et al.* (1997)
12. Dodman *et al.* (1996)
13. Schepers & Marteijn (1993)
14. Wetlands International (2002)

* Wetlands International (2002) considers that the birds wintering in Sri Lanka are part of this same population which corresponds to the nominate subspecies, but Balachandran (1998) showed that the Sri Lankan birds are probably *C. c. rogersi.*

\# This is the sum of the preceding rows in the table and therefore does not include countries, such as the Ivory Coast, Nigeria and Togo, for which little data are available.

assume that, in each habitat, waders are distributed homogeneously *i.e.* their densities are the same in the areas surveyed and in the areas not surveyed. This is definitely not true (because, for many species, there is only a poor correlation between the area of our sites and the numbers of birds) and is a source of bias. However, bias from extrapolations should decline as the scale of the extrapolation declines and the geographical spread increases. Our surveys not only had good geographical spread (Fig. 1) but they also covered no less than 28% of the entire mudflat area of Guinea (with an average extrapolation coefficient of only 3.5). Therefore, although we cannot claim that our estimates are precise, we are confident that for each population they are an accurate assessment of its order of magnitude.

From a smaller sample of mudflats (9%) surveyed by a different method, Altenburg & van der Kamp (1991) estimated the total wader population of the Guinea coast at 370,300 birds. In relation to their estimates, ours are lower for Common Redshank, Common Sandpiper, Ruddy Turnstone and especially for Black-tailed Godwit (480 instead of 17,400 birds). The Black-tailed Godwits we saw feeding on the mudflats were rather dispersed and we do not think we significantly underestimated their numbers. On 9 January 2000, we saw a group of 950 Black-tailed Godwits at a freshwater marsh on the Koba plain very close to the coast. It is quite possible that these birds also frequented the nearby mudflats. However, we found that this species was scarce in all four winters of our study so it seems very likely that there has been a major decline in numbers since the early 1990s. For most other species, our estimates are higher than those of Altenburg & van der Kamp, especially for Curlew Sandpiper (230,000 compared with 94,000). It is very probable that this reflects a real increase in the numbers of this species.

In the East Atlantic Flyway, Guinea is more or less the southern limit of the normal range of some species that are not very abundant there (Eurasian Oystercatcher, Black-tailed Godwit, Dunlin and Ruff). For other species, the Guinean coast is of greater importance. Therefore, in order to evaluate the relative importance of the Guinea populations, we compared our estimates with estimates of the size of the relevant biogeographic populations as recorded by Wetlands International (2002). In a few cases we propose new biogeographic population estimates, as shown in Table 4. These are based on counts or estimates from the wintering area of the population concerned but increased to take account of areas that had not been covered.

Many of the estimates presented in Table 4 are extrapolated from actual counts in a substantial proportion of available habitat. However, for several other countries or regions mentioned, the estimates are based on incomplete data, are often very old and do not cover all areas of suitable habitat. In other countries not mentioned, like Nigeria, the Ivory Coast and Togo, it is not possible to make even a rough assessment of coastal wintering populations because count data are almost totally lacking. This means that the estimates for populations that wholly or largely winter on the Atlantic coast of W Africa can only be very rough.

The Whimbrel population poses a particular problem. First, there are two sub-species *N. p. phaeopus* and *N. p. islandicus* that both winter on the west coast of Africa but cannot be separated in the field. Secondly, there are considerable differences between population estimates based on figures for breeding populations and estimates of the number of wintering birds based on winter counts. This problem is discussed by Trolliet (2004). In terms of known numbers of wintering Whimbrel, it appears that Guinea, like Guinea-Bissau, is of major importance for this species. This arises because of the huge areas of suitable habitat in the form of coastal mudflats and mangroves and the abundance of the fiddler crab *Uca tangeri.*

Table 5. Coastal sites in Guinea that are of international importance according to criterion 6 of the Ramsar Convention as supporting >1% of the relevant biogeographic population of one or more wader species.

Species	Site				
	F	I	M	N	Q
Pied Avocet		+	+	+	+
Grey Plover					+
Great Ringed plover	+	+		+	+
Curlew Sandpiper		+			

Like France, Guinea is a most important country for wintering Pied Avocets, supporting almost 20% of the flyway population. This is surprising when it is considered that Guinea is at the southernmost limit of the flyway population's distribution. Moreover the species is apparently absent from Guinea-Bissau. Probably the reason is the lack of very soft mud in Guinea-Bissau compared with Guinea. Similarly, Red Knots are probably scarce in Guinea compared with Guinea-Bissau because of differences in the sediments.

Guinea supports about 10% of the relevant biogeographic populations of Grey Plovers, Bar-tailed Godwits, Common Redshanks, Sanderlings and White-fronted Plovers *Charadrius marginatus*. The latter is the only endemic African wader present on the mudflats and we repeatedly found it nesting at Khonibenki (Site I).

Guinea is also of major importance for wintering Curlew Sandpipers (17.7% of the flyway population) and even more so for Great Ringed Plovers (30%).

Table 5 lists the sites that support >1% of one or more biogeographic wader populations and which may therefore be considered to be of international importance according to criterion 6 of the Ramsar Convention.

The most important site for waders, as well as for all waterbirds, on the coast of Guinea is Khonibenki-Yongo Salé (Site I). In January 2002, we counted 63,300 waterbirds of 48 species there, including 13,000 Lesser Flamingos *Phoeniconaias minor* for which it is one of only two regularly-used known staging sites in West Africa (Trolliet & Fouquet 2001). This site is now part of the Ramsar site known as 'Rio Kapatchez'. Another site, Khonibombé (Site N), is also part of the Ramsar site covering the whole of the Konkouré river delta.

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REFERENCES

Altenburg, W. & van der Kamp, J. 1991. *Ornithological importance of coastal wetlands in Guinea.* Study Report 47, International Council for Bird Preservation, Cambridge, 63 pp.

Balachandran, S. 1998. Population, status, moult, measurements, and subspecies of Knot *Calidris canutus* wintering in south India. *Wader Study Group Bull.* 86: 44–47.

Dodman, T. & Taylor, V. 1996. *African waterfowl census 1996.* Wetlands International, Wageningen.

Dodman, T., de Vaan, C., Hubert, E. & Nivet, C. 1997. *African waterfowl census 1997.* Wetlands International, Wageningen.

Dodman, T., Béibro, H.Y., Hubert, E. & Williams, E. 1999. *African waterfowl census 1998.* Wetlands International, Dakar.

Dodman, T. & Diagana, C.H. 2003. African Waterbird Census / Les Dénombrements d'Oiseaux d'eau en Afrique 1999, 2000 & 2001. *Wetlands International Global Series* no. 16. Wageningen.

Frikke, J., Pihl, S. & Asbirk, S. 2002. Wadden Sea Waders in West Africa. A survey of waterbirds in the Bijagos Archipelago in Guinea-Bissau in January/February 2001. *Wadden Sea Newsletter* 2002: 15–17.

Gatter, W. 1988. *The coastal wetlands of Liberia : their importance for wintering waterbirds.* Study Report no. 26. I.C.B.P. 45 p.

Gatter, W. 1997. *Birds of Liberia.* Pica Press, Sussex.

Meininger, P. 1989. Palearctic coastal waders wintering in Senegal. *Wader Study Group Bull.* 55: 18–19.

Ntiamoa-Baidu, Y. & Grieve, A. 1987. Palearctic waders in coastal Ghana in 1985/86. *Wader Study Group Bull.* 49, *Suppl./IWRB Special Publ.* 7: 76–78.

Ntiamoa-Baidu, Y., Owusu, E.H., Daramani, D.T. & Nuoh, A.A. 2001. Ghana. In Fishpool, L.D.C. & Evans, M.I., eds. *Important Bird Areas in Africa and associated islands: Priority sites for conservation.* BirdLife Conservation Series No. 11. pp. 367–389. Pisces publications and BirdLife International, Newbury and Cambridge.

Schepers, F.J. & Marteijn, E.C.L. 1993. *Coastal waterbirds in Gabon, winter 1992.* WIWO Report 41, Zeist.

Schnell, R. 1950. Contribution préliminaire à l'étude botanique de la Basse-Guinée française. *Etudes guinéennes* 6: 29–72.

S.E.C.A. 1990. *Etude et élaboration du Schéma Directeur d'Aménagement de la mangrove guinéenne (SDAM).* Rapport, Montpellier.

Trolliet, B. 2004. Enigmas about the Whimbrel in the East Atlantic Flyway. Abstracts of the Waterbirds Around the World Conference, Edinburgh, April 2004. p. 300–301.

Trolliet, B. & Fouquet, M. 2001. La population ouest-africaine du Flamant nain *Phoeniconaias minor*: effectifs, répartition et isolement. *Malimbus* 23: 87–92.

Tye, A. 1987. Identifying major wintering grounds of Palearctic waders along the Atlantic coast of Africa from marine charts. *Wader Study Group Bull.* 49: 20–27.

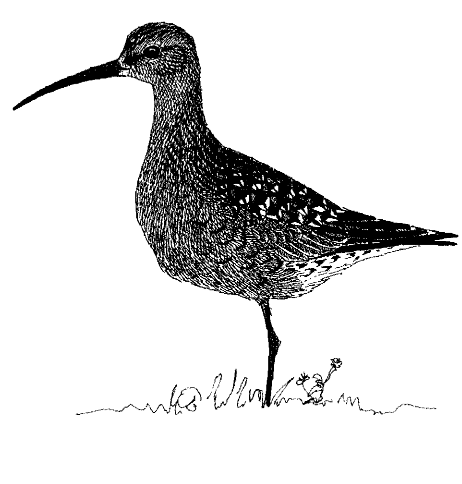
Tye, A. & Tye, H. 1987. The importance of Sierra Leone to waders. *Wader Study Group Bull.* 49, *Suppl./IWRB Special Publ.* 7: 71–75.

Wetlands International. 2002. *Waterbird Population Estimates – Third Edition.* Wetlands International Global Series No. 12, Wageningen.

Zwarts, L. 1988. Numbers and distribution of coastal waders in Guinea-Bissau. *Ardea* 76: 42–55.

Zwarts, L., van der Kamp, J., Overdijk, O., van Spanje, T., Veldkamp, R., West, R. & Wright, M. 1998a. Wader count of the Banc d'Arguin, Mauritania, in January/February 1997. *Wader Study Group Bull.* 86: 53–69.

Zwarts, L., van der Kamp, J., Overdijk, O., van Spanje, T.M., Veldkamp, R., West, R. & Wright, M. 1998b. Wader count of the Baie d'Arguin, Mauritania, in February 1997. *Wader Study Group Bull.* 86: 70–73.



Curlew Sandpiper by Hans Schekkerman