Coastal waders in Guinea-Bissau - aerial survey results and seasonal occurrence on selected low water plots

Jacob Christian Salvig, Sten Asbirk, Jørgen Peter Kjeldsen, Palle A.F. Rasmussen, Alqueia Quade, John Frikke & Erik Christophersen

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Previous winter surveys in parts of coastal Guinea-Bissau have suggested that about 1 million waders winter in the area. During January 1994, an aerial survey was carried out which confirmed this. Monthly counts at selected sites in the Bijagós Archipelago provided an indication of the size and composition of wader populations that are present at different times of the year. The wader numbers in coastal Guinea-Bissau are fairly constant during the summer, although the proportion of migrant wader populations varied with species. During autumn, there was an influx of birds of birds in September and another in November. During spring, waders were present until May when most birds left the area. Individual species showed considerable variations in their seasonal patterns of occurrence but, overall, 15% over-summered. From the observed annual occurrence, it can be concluded that coastal Guinea-Bissau is important for waders all year.

J. Salvig, J.P. Kjeldsen, P.A.F. Rasmussen, J. Frikke & E. Christophersen, National Environmental Research Institute, Department of Wildlife Ecology, Grenåvej 12, Kalø, Dk-8410 Rønde; S. Asbirk, National Forest and Nature Agency, Haraldsgade 53, Dk-2100 København; A. Quade, Gabinete de Planificacao Casteira, Apartado 23, Codex 1031-Bissau, Guinea-Bissau.

Correspondence to J.C. Salvig, COWI, Parallelvej 15, Dk-2800 Lyngby, Denmark.

INTRODUCTION

The coast of West Africa has since the 1960s been known to be of international importance for wintering Palearctic waders (Altenburg *et al.* 1982). In terms of numbers, The Banc d'Arguin in Mauritania is known to be the most important wintering site holding two million waders (Smit & Piersma 1990). Coastal Guinea-Bissau is the second-most important wintering area for Palearctic waders in West Africa (Zwarts 1988, Salvig *et al.* 1994a). In Guinea-Bissau, several previous surveys of waders have been carried out: Poorter & Zwarts (1984) surveyed 81 km² of intertidal flats during the 1982/83 winter; Zwarts (1988) surveyed 278 km² during the 1986/87 winter and Salvig *et al.* (1994a) surveyed 602 km² during the 1992/93 winter. On the basis of these surveys it was estimated that about one million waders use the area during winter. These three surveys concentrated on the eastern part of the Bijagós Archipelago, since getting to the western part is not an easy task. In addition, providing good counts along the entire mainland coast is difficult, and only a few counts have been carried out there. Hence, little is known about these huge areas. In order to continue the work of former expeditions, and especially to perform counts in areas which had not yet been visited, an aerial survey of the area was carried out. The aerial survey allowed relatively quick coverage of the entire coastal zone of Guinea-Bissau, although using this method has certain problems, as described below. This paper reports the results of a combined air and ground survey during January - February 1994, covering the entire coastal zone of Guinea-Bissau. This paper also uses the results of monthly counts in the Bijagos Archipelago to present data on the size and composition of wader populations during the migratory seasons and summer. Finally, the importance of coastal Guinea-Bissau is quantified during the entire annual cycle.

SURVEY AREA

Coastal Guinea-Bissau consists of a biological very rich delta region (Figure 1), providing 1,570 km² of intertidal flats within a radius of only c. 220 km (Zwarts 1988). The Bijagos Archipelago is situated just offshore and consists of 48 islands and islets. Between the islands and along the coastline, extensive mudflats are drained by a network

of canals and creeks as the tide recedes. The tidal amplitude in this area varies from about 3 m on neap tides to about 4.5 m on spring tides (Zwarts 1988). This means that large intertidal flats are exposed at low water, which are highly productive in terms of prey items for waders and other waterbirds. Most of the upper intertidal zone in Guinea-Bissau is fringed with mangroves.

METHODS

Aerial surveys

During the 1994 winter, coastal Guinea-Bissau was surveyed from the air using a small twin-engined, high-winged aircraft (Partinavia Observer). Two observers, one each side of the aircraft, performed the observations, which were recorded on dictaphones. Both observers were experienced in carrying out aerial surveys of Danish coastal waters, and the observer in front (beside the pilot) was familiar with the area. All counts were performed at low water: at high water huge numbers of waders roosted in the mangroves, where they were impossible to see from the air. The entire coastal zone was surveyed during eight flights lasting 3 - 3½ hours each. In order to plot the distribution of the birds, the area surveyed was divided into 31 sub-areas (Figure 1). Due to economic constraints, only one riverside was counted. The plane flew a survey route which enabled a full count of all wader species present in the survey area. Waders were recorded from the aircraft at a height of 50 - 100 metres, and at a speed of 150 kilometres per hour following the methods described by Pihl & Frikke (1992).

Since aerial counts do not give accurate results, ground counts were made to calibrate the aerial surveys. Unfortunately, simultaneous air and ground counts were not possible due to practical constraints. Consequently, ground counts were performed in selected areas of the archipelago after the aerial surveys were completed. The aerial surveys were performed during the period 21 - 27 January 1994, whereas the ground counts, in six parts of the Bijagos Archipelago, were performed during the period 31 January - 12 February 1994.

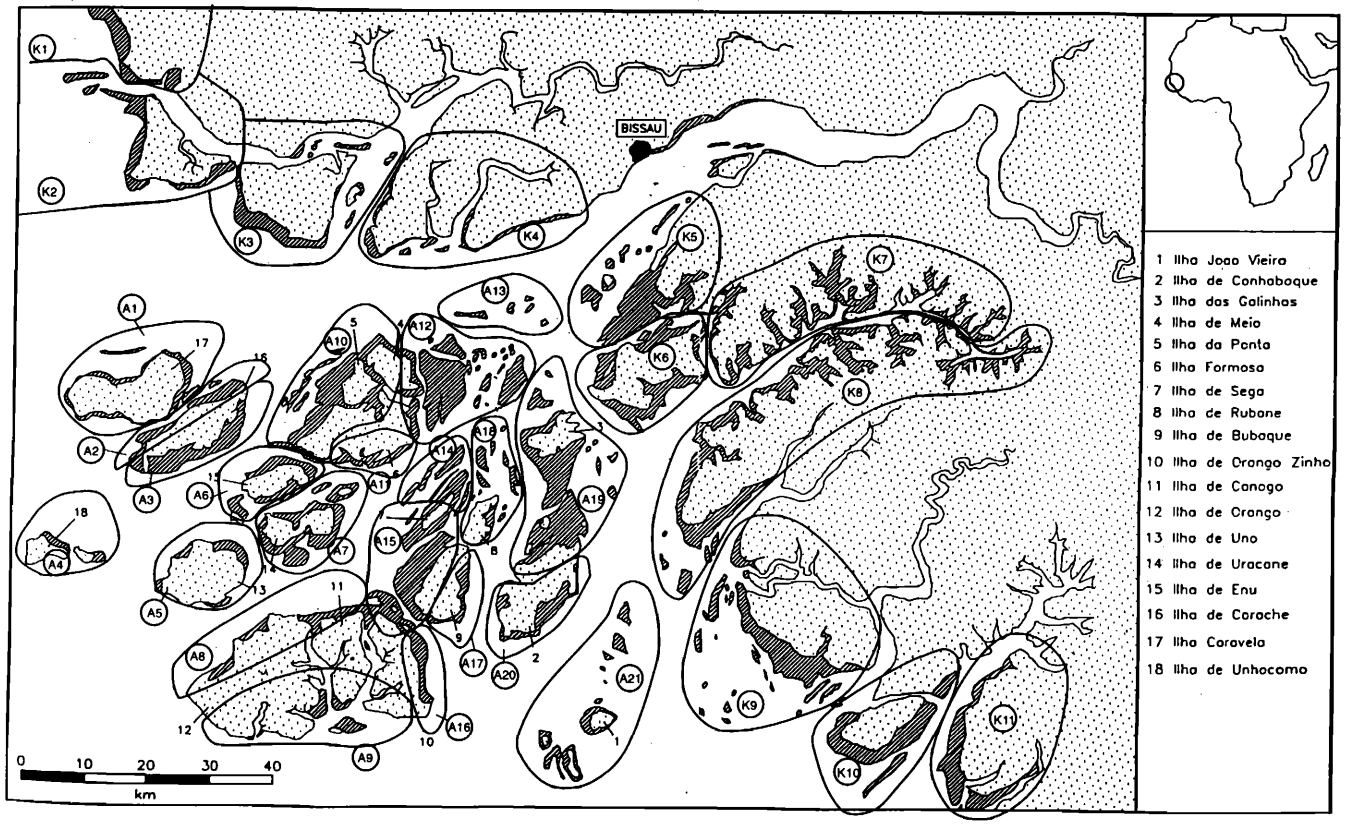

Figure 1 Map of Guinea-Bissau showing the count areas used.

Monthly counts

During the survey in 1992/93, we discovered the tidal flats west of Bubaque and east of Soga to be an area where huge numbers of waders occur during low water. We selected this tidal area for monthly counts: ground counts of waders at ten areas of 14 hectares each were performed once a month during low water as close to the highest spring tide as possible from February to December 1994. The count areas are shown in Figure 1. All counts were made by two observers, travelling by dinghy between the tidal flats, and using binoculars, telescopes and handcounters. No December counts were performed in 1994 due to transport restrictions in Guinea-Bissau.

RESULTS

Wintering numbers

During the aerial survey, a total of 427,354 waders were counted on the tidal flats of the Bijagos Archipelago, and 131,478 on the mainland coast. The air and ground counts carried out within a few days of each other in restricted areas of the Bijagos Archipelago gave a detection rate for the aerial survey of 57%. The ground surveys covering the tidal flats west of Bubaque and south-east of Soga (sub-area A15, Figure 1) counted 105,000 waders, whereas 59,000 were counted in the same area from the air.

Given a 57% detection rate, an estimated 750,000 waders were present on the intertidal flats of the Bijagos Archipelago. This is very much the same as estimated during the surveys in 1986/87 (699,120 individuals, Zwarts 1988) and 1992/93 (710,120 ind., Salvig *et al.* 1994a). On the mainland coast, an estimated 230,000 waders were present in the 1994 winter.

On the basis of one survey along one of the rivers entering the Rio Grande de Buba, it was estimated that 25,000 waders were present. This compares favourably with the results of the ground surveys carried out by Zwarts (1988), who covered 42.7% of the tidal flats of the Rio Grande de Buba and estimated that 30,940 waders were present.

It is not possible to extrapolate the counts in the Rio Grande de Buba to other rivers in Guinea-Bissau, since the Buba river consists of stone flats, while the Geba river is soft mud, and the rivers in the south of Guinea-Bissau have a mixture of sand and mud (Zwarts pers. comm.).

In total, we estimate that about 980,000 waders were wintering in the archipelago and along the mainland coast. Taking into account the estimated 25,000 waders along the Rio Grande de Buba (this study) and the extra tens of thousands along the other rivers, we estimate that between 1 and 1.1 million waders wintered in coastal Guinea-Bissau in 1994.

The species composition of both the aerial and the ground counts in 1994 are shown in Table 1; 59.4% of the waders counted from the aircraft in the Bijagos Archipelago were identified. Kentish Plover *Charadrius alexandrinus*, Common Sandpiper *Actitis hypoleucos* and Dunlin *Calidris alpina* were not detected from the air, while Ringed Plover *Charadrius hiaticula*, Turnstone *Arenaria interpres*, Redshank *Tringa totanus* and Grey Plover *Pluvialis squatarola* were only poorly recorded, assuming that the ground counts were random samples.

Table 2 presents the estimated number of wintering waders in the Bijagos Archipelago during the three surveys. In all three surveys, Curlew Sandpiper *Calidris ferruginea* occurred in by far the highest numbers. Kentish Plover, Bar-tailed Godwit *Limosa lapponica* and Little Stint *Calidris minuta* had all decreased in numbers since the first survey; only the Curlew Sandpiper had increased in numbers. Whimbrel *Numenius phaeopus*, Turnstone, Grey Plover, Ringed Plover, Common Sandpiper and Dunlin showed rather consistent numbers during the three surveys, whereas Sanderling *Calidris alba*, Knot *Calidris canutus*, Redshank, Oystercatcher *Haematopus ostralegus* and Curlew *Numenius arquata* all showed highly fluctuating numbers.

The spatial distribution at low water showed that waders were present all over the tidal flat zones in coastal Guinea-Bissau; 80% of the birds were recorded in the archipelago and 20% along the mainland coast. Half the birds in the archipelago were recorded in four subareas (A7, A8, A12 and A15), whereas half the birds along the mainland coast were recorded in two subareas (K6 and K11).

Seasonal variations in wader numbers in coastal Guinea-Bissau

The monthly counts of total numbers of waders at ten feeding areas in 1994 are presented in Figure 2. Two influxes were recorded in autumn: one in September and one in November. Numbers peaked in November suggesting high numbers during all winter months (November - January). Numbers were fairly constant during spring until May. Overall, the species composition in summer and winter in the coastal zone of Guinea-Bissau, appears to be roughly the same. Curlew Sandpiper is by far the most numerous wader species in both summer and winter, followed by Bar-tailed Godwit. Little Stint is the exception, with a low ratio of summering to wintering numbers. Comparing the total number of waders in summer and winter, approximately 15% of the winter population is still present in the northern summer. Table 3 presents the proportion of the most abundant wader populations remaining in the Bijagos Archipelago during the arctic summer months.

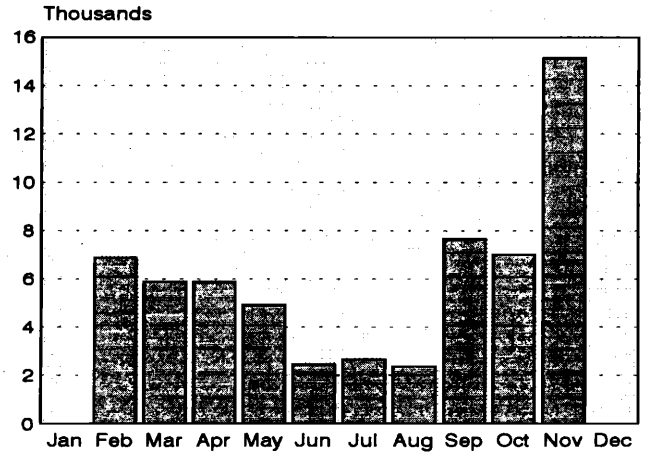

Figure 2 Seasonal changes in numbers of total waders recorded at ten feeding plots west of Bubaque, Guinea-Bissau

DISCUSSION

Winter numbers

The aerial survey in coastal Guinea-Bissau confirms that this coastal wintering site holds about 1 million waders. However, the use of aerial surveys for the assessment of bird numbers presents a number of methodological problems, since aerial surveys do not reflect accurate numbers. Birds can be overlooked, and flock size can be over- and underestimated by observers because of the high speed of the aircraft and the short observation times involved. Waders are generally difficult to survey from an aircraft; only the larger species, e.g. Oystercatcher and Bar-tailed Godwit, are easy to see because these large species are more conspicuous from the air and more readily detected, even when they occur in small flocks (Salvig *et al.* 1994b). In the coastal zone of Guinea-Bissau, the surveys had to be carried out at low water, when the waders were dispersed over the intertidal flats and, consequently, rather hard to survey.

The discrepancies in numbers for the Bijagos Archipelago (Table 2) for most of the wader species recorded between the three surveys may result from i) differences in the coverage of the area during the three surveys; ii) considerable count errors; iii) a shift in the distribution of the birds; and iv) an actual change in population numbers. Given the similarity of the overall numbers of waders counted during each survey, it looks, as if the deviations in numbers for Curlew Sandpiper, Little Stint and Bar-tailed Godwit (and perhaps also Kentish Plover) reflect real changes in numbers between the surveys. The deviations in numbers for these species seem to confirm the theory that numbers of waders breeding in tundra areas seem to vary more, due to high annual breeding success, than those of waders breeding in temperate zone (Salvig *et al.* 1994a).

Seasonal pattern

From the observed annual occurrence, it is obvious that coastal Guinea-Bissau is important for waders all year round. Individual species showed considerable variations in the pattern of seasonal distribution. Most waders arrived in September, only Ringed Plover arrived in November. Several species showed very similar seasonal distribution patterns: Curlew Sandpiper, Sanderling, Grey Plover, Bar-tailed Godwit and Redshank showed an autumn increase followed by fluctuations throughout winter and spring until May. This pattern suggests that most of the birds that arrive in autumn remain in the area during winter, although probably moving around within the coastal zone of Guinea-Bissau. The seasonal patterns of Whimbrel, Turnstone, Knot and Little Stint showed peak numbers in autumn with the bulk of the populations leaving the area in February. This would suggest that these birds exploited more than one habitat during winter and spring before their return migration to the breeding grounds. This phenomenon has been recognised by other authors at other wintering sites along the East Atlantic Flyway, e.g. Ntiamoa-Baidu (1991) and Salvig (1995). A shift in the use of the coastal zone by Knot from autumn to spring has also been recorded in Ghana (Ntiamoa-Baidu 1993).

Status of summering waders

The overall percentage of waders summering in the coastal zone of Guinea-Bissau corresponds reasonably well with reports from other African wetlands (cf. Table 3). However, the median percentage of waders present in the boreal summer at Langebaan Lagoon in South Africa during the period 1975 - 1986 was 11%, but varied between 2.5% and 31% (Underhill 1987). These fluctuations are thought to be due to yearly differences in the production of young (Prokosch 1988). As the monthly counts at Bubaque are continuing, the extent of these fluctuations will be investigated in the coming years. The oversummering birds are presumed to be immature birds. The ratio of number of summering to number of wintering waders in coastal Guinea-Bissau varied from species to species, but the percentages are within the ranges of what has been recorded elsewhere e.g. on Banc D'Arguin in Mauritania and in the coastal wetlands of Ghana (Van Dijk *et al.* 1990, Ntiamoa-Baidu 1991).

The numbers of waders present during summer varied from species to species (cf. Table 3). On the Banc D'Arguin in Mauritania, fluctuations in the numbers of migrant waders recorded in June have also been reported (Van Dijk *et al.* 1990): in some species, e.g. Knot and Bar-tailed Godwit, substantial numbers remained in some years while in other years all the birds departed. Small numbers of Little Stint remaining in summer have also been recorded in other African countries, e.g. on Banc D'Arguin in Mauritania and in Egypt (Van Dijk *et al.* 1990, Goodman & Meininger 1989). Van Dijk *et al.* (1990) suggested that this was because, unlike most other species, Little Stint starts breeding in its first summer.

Conservation aspects

It is clear that the coastal zone of Guinea-Bissau is an international important wetland on the East Atlantic Flyway during both winter and summer and during migration. At least 14 wader species not only fulfill the 1% criterion for international importance, but considerably exceed it. Furthermore, the value of the area is further enhanced by the numbers of other waterbirds, e.g. terns (Salvig *et al.* in press).

In order to safeguard the wader populations occurring in coastal Guinea-Bissau and to secure effective protection for this important area, conservation strategies have to take into account the increasing pressure on the area. In the past few decades, mangroves in the coastal zone of Guinea-Bissau have been cleared for rice growing, and tourism and fisheries are under development. In April 1996, the Bijagos Archipelago was accepted by UNESCO as a Man and Biosphere Reserve.

In order to strengthen the conservation status of the area and to safeguard the wader populations, the Wadden Sea States and Guinea-Bissau have established a co-operation program to support the conservation of the tidal areas of Guinea-Bissau (and of the Wadden Sea), with the long-term aim of establishing comprehensive protection of these areas.

As part of this co-operation program, a team of Guinean technicians has been educated and trained in order to continue the monitoring activities of waterbirds in Guinea-Bissau. A database for counts of waterbirds have been set up for the area. Total winter counts will be carried out every 3 or 5 years in the coastal zone of Guinea-Bissau, the next one being in 1999. These counts will be co-ordinated with similar counts in Mauritania (Banc D'Arguin) and other West-African countries by Wetlands International. The monthly counts performed on the tidal flats west of Bubaque and east of Soga are continuing.

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Table 1. The percentages of waders specified during counts in the Bijagos Archipelago from aircraft and ground. The aerial counts represent birds specified in the entire archipelago, whereas the ground counts represent birds specified on ten feeding areas in the archipelago.

Species	aircraft (%)	ground (%)
Sanderling *Calidris alba*	0.9	1.8
Dunlin *Calidris alpina*	0	0.1
Ringed Plover Charadrius hiaticula	0.2	4.4
Kentish Plover Charadrius alexandrinus	0	0.5
Grey Plover Pluvialis squatarola	2.4	4.7
Curlew Sandpiper Calidris ferruginea	58.5	54.4
Little Stint Calidris minuta	10.0	5.4
Knot Calidris canutus	12.1	5.8
Turnstone Arenaria interpres	0.1	1.0
Common Sandpiper Actitis hypoleucos	0	0.3
Redshank Tringa totanus	1.5	7.1
Oystercatcher Haematopus ostralegus	1.2	1.1
Greenshank Tringa nebularia	0.1	0.3
Bar-tailed Godwit Limosa lapponica	10.7	10.0
Curlew Numenius arquata	1.1	0.5
Whimbrel Numenius phaeopus	1.2	2.6
	100.0	100.0
	N= 253,412	N= 25,595

Table 2. Estimated number of wintering waders in the Bijagos Archipelago during three surveys.

Species	1986/87*	1992/93**	1994
Sanderling	8,500	24,300	13,500
Dunlin	400	710	800
Ringed Plover	30,400	26,300	33,000
Kentish Plover	9,100	5,000	3,750
Grey Plover	36,500	39,100	35,250
Curlew Sandpiper	196,600	326,500	408,000
Little Stint	102,000	59,700	40,500
Knot	90,000	31,300	43,500
Turnstone	10,800	7,900	7,500
Common Sandpiper	2,100	2,900	2,200
Redshank	70,400	38,400	53,250
Oystercatcher	1,600	7,100	8,250
Greenshank	2,920	1,400	2,250
Bar-tailed Godwit	115,800	108,700	75,000
Curlew	3,900	9,300	3,750
Whimbrel	18,100	22,000	19,500
Total	699,120	710,610	750,000

*: Zwarts (1988), **: Salvig *et al.* (1994).

Table 3. The ratio of number summering to number wintering of waders counted at ten feeding areas in the Bijagos Archipelago in 1994 (this study) presented as percentages. The corresponding percentages are shown as well for the Banc D'Arguin in Mauritania.

Species	Banc D'Arguin %	This study %
Sanderling	24	16
Ringed Plover	13	35
Grey Plover	45	19
Curlew Sandpiper	9	22
Little Stint	1	6
Knot	7	3
Turnstone	15	19
Redshank	36	11
Bar-tailed Godwit	6	18
Whimbrel	47	33
Total	13	15

*: Van Dijk *et al.* (1990).