

Waders (Charadrii) and other coastal birds of the Skeleton Coast, South West Africa

by
P.G. Ryan, J. Cooper

Percy FitzPatrick Institute of African Ornithology,
University of Cape Town,
Rondebosch 7700,
Republic of South Africa

and
C.J. Stutterheim†

Directorate of Nature Conservation,
Private Bag 13306,
Windhoek 9000,
South West Africa/Namibia

Received: 11 April 1983
Accepted: 5 January 1984

†deceased.

ABSTRACT

Counts of waders (Charadrii) and other coastal birds are given for the Skeleton Coast: the northern South West African coast and adjacent wetlands between the Kunene River and Cape Cross. A total of 44 305 birds of 64 species was counted in November-December 1981. 13 880 were waders of which Palaearctic migrants formed 90.5%. Sanderling, *Calidris alba*, Turnstone, *Arenaria interpres*, White-fronted Plover, *Charadrius marginatus*, and Grey Plover, *Pluvialis squatarola*, were the most abundant waders on the coast whilst Little Stint, *Calidris minutus*, and Curlew Sandpiper, *C. ferruginea*, were most abundant at wetlands. Non-waders were mainly Cape Cormorants, *Phalacrocorax capensis*, and Common/Arctic Terns, *Sterna hirundo/paradisaea*. 33 542 (75.7%) birds were within the Skeleton Coast Park. The numbers and breeding localities of the Damara Tern, *Sterna balaenarum*, need to be accurately assessed and colonies within tourist areas protected.

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1 INTRODUCTION

Surveys of coastal birds have been undertaken for large parts of southern Africa (Summers *et al.*, 1977; Underhill and Whitelaw, 1977; Whitelaw *et al.*, 1978; Cooper *et al.*, 1980; Underhill *et al.*, 1980; Hockey, 1982), but much of the South West African coast is unsurveyed. This paper reports on counts of waders (Charadrii) and other coastal birds on the northern South West African coast between the Kunene River mouth (17° 15'S, 11° 45'E) and Cape Cross (21° 47'S, 13° 57'E) made in November-December 1981. This region is known as the Skeleton Coast. The Kunene River forms the international border with Angola and is also a northern boundary of zoogeographical southern Africa.

2 STUDY AREA AND METHODS

The coast of South West Africa/Namibia north of Cape Cross lacks large bays or promontories (Fig. 1). Of the 574 km of coast-line surveyed, 496 km lies within the Skeleton Coast Park. The remainder, between the Ugab River mouth (21° 11'S, 13° 38'E) and Cape Cross, forms part of the National West Coast Tourist Recreation Area. The shore in the north and south (sections 1, 2, 6 and 7, Fig. 1) is largely sandy with scattered rocky outcrops and wavecut platforms, whilst the central area (sections 3, 4 and 5) is more rocky with steep pebble beaches. A few localities have been described (Penrith and Kensley, 1970; Kensley and Penrith, 1980; Penrith, 1982). Wave action is high along the whole coast.

The land bordering the coast is dry and barren, forming part of the Namib Desert. Apart from the Kunene River in the north, all the rivers are episodic and none was flowing during the survey. Seepage pools, either fresh or saline, are the only open water bodies and most are fringed with *Phragmites* reed-beds. All the wetlands are within the Skeleton Coast Park.

All coastal non-passerines and wagtails (Motacillidae) were counted from 24 November to 12 December 1981. Counts were carried out at low tide either from a moving vehicle or on foot, techniques which have been found to give compatible results when counting shorebirds (Underhill and Whitelaw, 1977). Counts at high

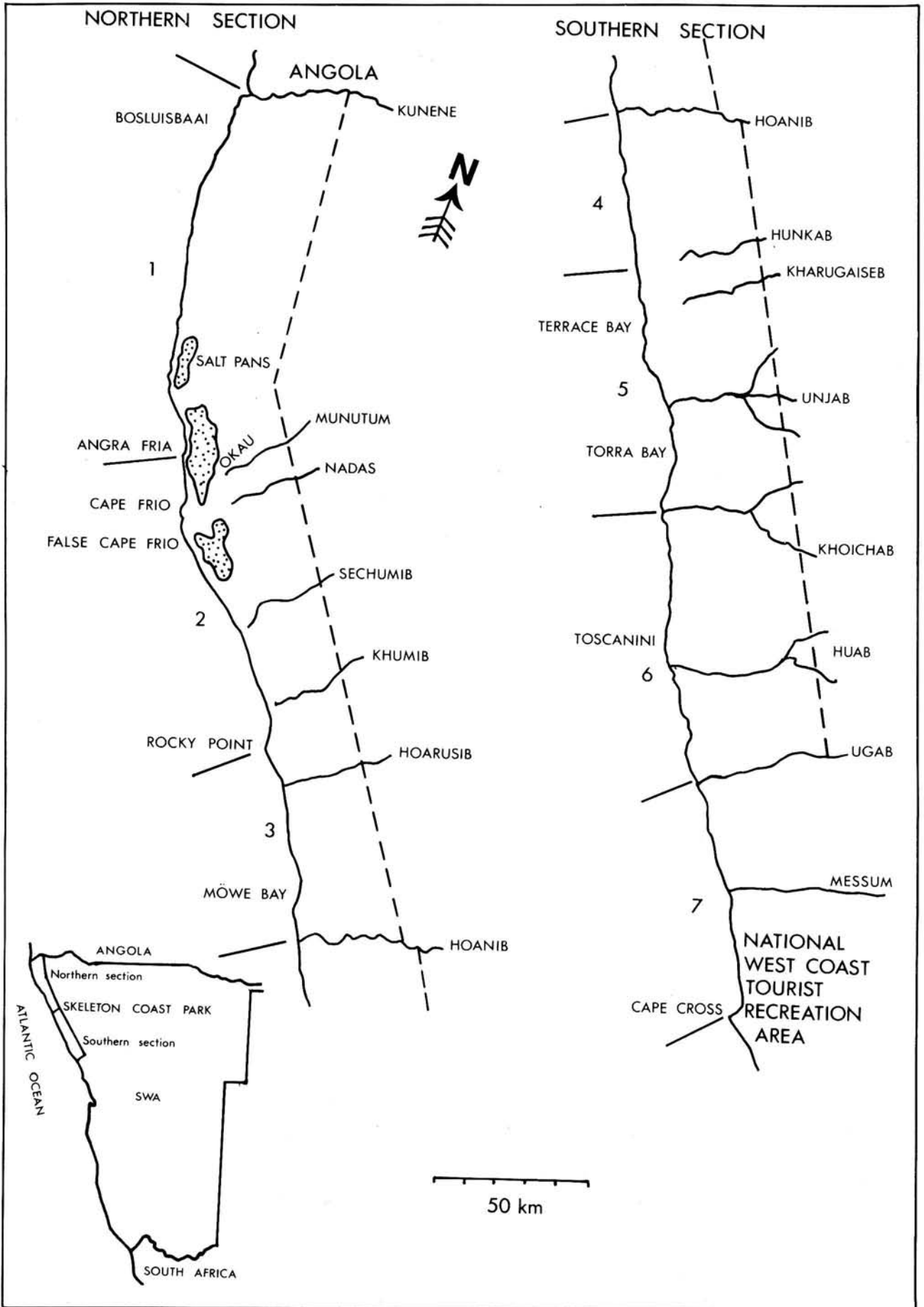


FIGURE 1: Skeleton Coast, South West Africa/Namibia, showing the seven coastal sections referred to in the text.

tide were not feasible due to the large numbers of waders roosting inland during these periods. The entire coast-line and 11 wetlands were surveyed. The north bank of the Kunene River in Angola was not visited, but large birds on it that were visible from the south bank were counted. Most species were probably undercounted since reed-beds obscure much of the north bank. The Kunene River was surveyed inland to a point 1 km east of the Foz do Cunene (17° 16'S, 11° 48'E).

The coast-line has been divided into seven sections (Fig. 1): one (120,0 km) from the Kunene River mouth (17° 15'S, 11° 45'E) to Angra Fria (18° 18'S, 11° 57'E); two (87,4 km) from Angra Fria to Rocky Point (19° 00'S, 12° 29'E); three (65,1 km) from Rocky Point to the Hoanib River mouth (19° 28'S, 12° 45'E); four (49,7 km) from the Hoanib River mouth to the northern boundary of the Terrace Bay angling area (19° 54'S, 12° 49'E); five (78,2 km) from the north bound-

ary of the Terrace Bay angling area to the Koichab River mouth, the south boundary of the Torra Bay angling area (20° 19'S, 13° 16'E); six (95,0 km) from the Koichab River mouth to the Ugab River mouth, the south boundary of the Skeleton Coast Park; seven (78,4 km) from the Ugab River mouth to Cape Cross (21° 47'S, 13° 57'E). Only 7,1 km of section five falls outside (and between) the two tourist angling areas.

Dr C.J. Stutterheim was not able to make his full contribution to this paper owing to his tragic death in a light aircraft crash at Etosha Pan on 1 June 1982.

3 RESULTS

A total of 44 305 birds of 64 species was counted of which 13 880 (31,3 %) were waders (Charadrii). A total of 37 549 birds of 29 species was counted on the coast-line (Table 1) and 6 756 birds of 58 species at

TABLE 1: Counts of waders (Charadrii) and other coastal birds on the Skeleton Coast between the Kunene River Mouth and Cape Cross, November-December 1981.

Section	1. Kunene River to Angra Fria	2. Angra Fria to Rocky Point	3. Rocky Point to Hoanib River	4. Hoanib River to angling area	5. Angling area	6. Angling area to Ugab River	7. Ugab River to Cape Cross	Total
Distance (km)	120,0	87,4	65,1	49,7	78,2	95,0	78,4	573,8
RESIDENT WADERS								
African Black Oystercatcher <i>Haematopus moquini</i>			1					1
White-fronted Plover <i>Charadrius marginatus</i>	15	102	191	113	168	156	328	1 073
Total	15	102	192	113	168	156	328	1 074
PALAEARCTIC WADERS								
Turnstone <i>Arenaria interpres</i>		4	468	238	368	3	1 003	2 084
Ringed Plover <i>C. hiaticula</i>	1	1	5	1	5	4	21	38
Grey Plover <i>Pluvialis squatarola</i>	15	68	200	142	256	93	233	1 007
Lesser Golden Plover <i>P. dominica</i>			1					1
Curlew Sandpiper <i>Calidris ferruginea</i>	1	8	66	10	6	6	211	308
Little Stint <i>C. minuta</i>	2						4	6
Knot <i>C. canutus</i>	17	65	99	45	40	5	93	364
Sanderling <i>C. alba</i>	600	1 591	992	68	365	257	3 671	7 544
Common Sandpiper <i>Tringa hypoleucos</i>			14	9	16	3		42
Greenshank <i>T. nebularia</i>			2	1			1	4
Bar-tailed Godwit <i>Limosa lapponica</i>			5		2			7
Whimbrel <i>Numenius phaeopus</i>			7	3	3	1		15
Total	636	1 737	1 859	517	1 061	372	5 238	11 420
Total no. waders	651	1 839	2 051	630	1 229	528	5 566	12 494
NON-WADERS								
Great White Pelican <i>Pelecanus onocrotalus</i>							1	1
White-breasted Cormorant <i>Phalacrocorax carbo</i>	18	9	139	99	93	222	129	709
Cape Cormorant <i>P. capensis</i>	198	13	2 555	112	225	7 184	1 142	11 429
Reed Cormorant <i>P. africanus</i>	14							14
Grey Heron <i>Ardea cinerea</i>			2					2
Greater Flamingo <i>Phoenicopterus ruber</i>	15							15
Lesser Flamingo <i>P. minor</i>	1							1
Kelp Gull <i>Larus dominicanus</i>	32	25	23	114	230	132	179	735
Grey-headed Gull <i>L. cirrocephalus</i>							1	1
Common/Arctic Tern <i>Sterna hirundo/paradisaea</i>	41	852	1 086	526	325	4 127	3 631	10 588
Sandwich Tern <i>S. sandvicensis</i>	110	174	312	49	115	168	75	1 003
Swift Tern <i>S. bergii</i>							5	5
Damara Tern <i>S. balaenarum</i>	40	179	21	204	52		14	510
Black Tern <i>Chlidonias nigra</i>		2		11		1	20	34
Cape Wagtail <i>Motacilla capensis</i>					6	2		8
Total no. non-waders	469	1 254	4 138	1 115	1 046	11 836	5 197	25 055
Total no. birds	1 120	3 093	6 189	1 745	2 275	12 364	10 763	37 549

wetlands (Table 2). Palaearctic waders made up 90,5% of all waders counted, but this proportion was lower on wetlands (82,3%) than on the coast (91,4%). The most abundant wader species on the coast were Sanderling, *Calidris alba*, (60,4% of waders), Turnstone, *Arenaria interpres*, (16,7%), White-fronted Plover, *Charadrius marginatus*, (8,6%) and Grey Plover, *Pluvialis squatarola*, (8,1%). The mean density of waders on the coast was 21,8 birds km⁻¹; densities were lowest in the north and greatest in the south (Table 3). Waders were most abundant on mixed sandy and rocky shores, especially those with intertidal wavecut platforms. Rocky and sandy shores supported

fewer waders whilst the steep pebble beaches were almost devoid of waders.

The wetlands supported 10% of the wader population. Little Stint, *Calidris minutus*, (32,5% of wetland waders) and Curlew Sandpiper, *C. ferruginea*, (13,6%) were the most abundant species. The Kunene (72,0%), Hoanib (17,5%) and Unjab Rivers (4,8%) were the most important wetlands for waders. The numbers of species of both "resident" (non-Palaearctic) and Palaearctic waders were greater at wetlands than on the coast.

The non-wader population consisted mainly of roosting flocks of cormorants and terns. Cape Cormorant,

TABLE 2: Counts of waders (Charadrii) and other water birds at wetlands on the Skeleton Coast, November-December 1981.

Locality	Kunene River	Okau River	Sechumib River	Khumib River	Hoarusib River	Hoarusib Oasis	Hoanib River	Unjab River	Koichab River	Huab River	Ugab River	Total
RESIDENT WADERS												
White-fronted Plover												
<i>Charadrius marginatus</i>	60				5		5	1				71
Chestnut-banded Plover												
<i>C. pallidus</i>	79						9					88
Kittlitz's Plover												
<i>C. pecuarius</i>	7											7
Three-banded Plover												
<i>C. tricoloris</i>	5	1	5	2		1	12	9		3		38
Blacksmith Plover												
<i>Vanellus armatus</i>	1							10				11
Avocet												
<i>Recurvirostra avosetta</i>	2					5	21					28
Stilt												
<i>Himantopus himantopus</i>							2					2
Total	154	1	5	2	5	6	49	20	0	3	0	245
PALAEARCTIC WADERS												
Turnstone												
<i>Arenaria interpres</i>	3						1					4
Ringed Plover												
<i>C. hiaticula</i>	49				1		6	3				59
Grey Plover												
<i>Pluvialis squatarola</i>	9						1					10
Curlew Sandpiper												
<i>Calidris ferruginea</i>	158		4	2	1	1	63	18		6		253
Broad-billed Sandpiper												
<i>Limicola falcinellus</i>							1					1
White-rumped Sandpiper												
<i>C. fuscicollis</i>							1					1
Little Stint												
<i>C. minuta</i>	463		7	8	8	2	82	20		15		605
Knot												
<i>C. canutus</i>	1						2					3
Sanderling												
<i>C. alba</i>	107						1					108
Ruff												
<i>Philomachus pugnax</i>	27		5	1			14			3		50
Terek Sandpiper												
<i>Xenus cinereus</i>	1											1
Common Sandpiper												
<i>Tringa hypoleucos</i>	11			1						1		13
Marsh Sandpiper												
<i>T. stagnatilis</i>							5					5
Greenshank												
<i>T. nebularia</i>	14						3					17
Wood Sandpiper												
<i>T. glareola</i>							4	5		1		10
Whimbrel												
<i>Numenius phaeopus</i>	1											1
Total	844	0	16	12	10	3	184	46	0	26	0	1 141
Total no. waders	998	1	21	14	15	9	233	66	0	29	0	1 386

													NON-WADERS	
Black-necked Grebe													28	28
<i>Podiceps nigricollis</i>														
Little Grebe													12	19
<i>Tachybaptus ruficollis</i>		2	2										2	1
Great White Pelican														
<i>Pelecanus onocrotalus</i>	64													64
White-breasted Cormorant														
<i>Phalacrocorax carbo</i>	149												83	232
Cape Cormorant														
<i>P. capensis</i>	225												3 300	3 525
Reed Cormorant														
<i>P. africanus</i>	26													26
Darter														
<i>Anhinga melanogaster</i>	3													3
Grey Heron														
<i>Ardea cinerea</i>	5												4	9
Black-headed Heron														
<i>A. melanocephala</i>	2												1	1
Goliath Heron														
<i>A. goliath</i>	1													1
Little Egret														
<i>Egretta garzetta</i>	25													25
Cattle Egret														
<i>Bubulcus ibis</i>														1
Greater Flamingo														
<i>Phoenicopterus ruber</i>	23												52	5
Lesser Flamingo														
<i>P. minor</i>	14												382	18
Egyptian Goose														
<i>Alopochen aegyptiacus</i>	37		2		18								9	2
Cape Shoveler														
<i>Anas smithii</i>													27	17
Red-billed Teal														
<i>A. erythrorhyncha</i>	4												6	2
Cape Teal														
<i>A. capensis</i>	12		13	6		15							47	31
Hottentot Teal														
<i>A. hottentota</i>	2												6	14
Southern Pochard														
<i>Netta erythrophthalma</i>													8	
Maccoa Duck														
<i>Oxyura maccoa</i>				1									40	
Lanner														
<i>Falco biarmicus</i>	1													1
Black Crane														
<i>Amaurornis flavirostris</i>													1	1
Purple Gallinule														
<i>Porphrio porphyrio</i>	1												2	1
Moorhen														
<i>Gallinula chloropus</i>													6	1
Red-knobbed Coot														
<i>Fulica cristata</i>				1									7	2
Kelp Gull														
<i>Larus dominicanus</i>	42				1								9	8
Caspian Tern														
<i>Hydroprogne caspia</i>	1													1
Common/Arctic Tern														
<i>Sterna hirundo/paradisaea</i>	6													6
Sandwich Tern														
<i>S. sandvicensis</i>	269													269
Damara Tern														
<i>S. balaenarum</i>	135													135
White-winged Black Tern														
<i>Chlidonias leucoptera</i>	2													2
Pied Kingfisher														
<i>Ceryle rudis</i>	9													9
Pied Wagtail														
<i>Motacilla aguimp</i>	3		2											5
Cape Wagtail														
<i>M. capensis</i>	15	2	4	4	13	3	29	22			2			94
Total no. non-waders	1 076	2	23	14	32	18	4 059	128	0	18	0			5 370
Total no. birds	2 074	3	44	28	47	27	4 292	194	0	47	0			6 756

TABLE 3: Densities of some wader species (birds km⁻¹) on the coast between the Kunene River mouth and Cape Cross, November-December 1981.

Section	1. Kunene River to Angra Fria	2. Angra Fria to Rocky Point	3. Rocky Point to Hoanib River	4. Hoanib River to angling area	5. Angling area	6. Angling area to Ugab River	7. Ugab River to Cape Cross	Total
Distance (km)	120,0	87,4	65,1	49,7	78,2	95,0	78,4	573,8
White-fronted Plover <i>Charadrius marginatus</i>	0,13	1,17	2,93	2,27	2,15	1,64	4,18	1,87
Turnstone <i>Arenaria interpres</i>		0,05	7,19	4,79	4,71	0,03	12,79	3,63
Grey Plover <i>Pluvialis squatarola</i>	0,13	0,78	3,07	2,86	3,27	0,98	2,97	1,75
Curlew Sandpiper <i>Calidris ferruginea</i>	0,01	0,09	1,01	0,20	0,08	0,06	2,69	0,54
Knot <i>C. canutus</i>	0,14	0,74	1,52	0,91	0,51	0,05	1,19	0,63
Sanderling <i>C. alba</i>	5,00	18,20	15,24	1,37	4,67	2,71	46,82	13,15
Total resident waders	0,13	1,17	2,95	2,27	2,15	1,64	4,18	1,87
Total Palaearctic waders	5,30	19,87	28,56	10,40	13,57	3,92	66,81	19,90
Total waders	5,43	21,04	31,51	12,67	15,72	5,56	70,99	21,77

Phalacrocorax capensis, (49,2% of non-waders) and Common/Arctic Tern, *Sterna hirundo/paradisaea*, (34,8%) were the most abundant species. The density of gulls and terns decreased from south (50,1 birds km⁻¹ in section 7) to north (1,9 birds km⁻¹ in section 1). Cormorants were patchily distributed but the numbers also dropped off markedly north of Cape Cross. Damara Terns, *S. balaenarum*, were present along the whole coast-line. Of the 645 Damara Terns counted, 631 (97,8%) were within the Skeleton Coast Park and only 3,5% of these were in the two tourist angling areas. The Hoanib (75,6% of wetland non-waders) and Kunene Rivers (20,0%) were the most important wetlands for non-waders.

Seventy-six per cent of birds counted were within the Skeleton Coast Park, including all wetland birds and 71,3% of coastal birds. The angling areas contained 2 232 birds (7,8% of the park total) of which 1 223 were waders. 1,2 km of mixed sandy and rocky shore at Cape Cross accounted for 30,5% of birds outside the park.

4 DISCUSSION

The mean density of 21,8 waders km⁻¹ for the Skeleton Coast is less than the density of 91,0 waders km⁻¹ between Cape Cross and Sandwich Harbour (23° 22'S, 14° 20'E) (Underhill and Whitelaw, 1977; Whitelaw *et al.*, 1978). This is largely due to the high concentrations (406,5 waders km⁻¹) on the sheltered coast between Swakopmund and Walvis Bay. The density of waders on the Skeleton Coast is, however, similar to the density in the Lüderitz area (22,8 waders km⁻¹, Hockey, 1982). Comparisons with other parts of southern Africa show the Skeleton Coast to have a lower density of waders than does the west coast of South Africa between the Orange River mouth (28° 38'S, 16° 28'E) and Cape Point (34° 22'S, 18° 30'E) (56,2 waders km⁻¹; FitzPatrick Institute and Western Cape Wader Study Group, unpubl. data); a similar density to the southern Cape coast, South Africa, between Cape Point and the Klein Brak River mouth (34° 06'S, 22° 09'E) (23,2 waders km⁻¹; Western Cape

Wader Study Group, unpubl. data) and a higher density than the eastern Cape (12,4 waders km⁻¹; Underhill *et al.*, 1980) and Natal, South Africa, (4,9 waders km⁻¹; Ryan *et al.*, in press a).

The low density of waders north of Angra Fria (5,4 waders km⁻¹) with only Sanderling occurring in any numbers, is similar to the situation on the Natal coast (Ryan *et al.*, in press a). Both coast-lines are predominantly sandy (Hockey *et al.*, in press) with little washed-up seaweed. The importance of stranded seaweed for waders has been demonstrated in the south-western Cape (Summers *et al.*, 1977; Griffiths *et al.*, in press). Washed-up seaweed is almost absent north of Angra Fria (Kensley and Penrith, 1980; pers. obs.). In addition, ghost crabs *Ocypode africana* and *O. cursor* are found north of Rocky Point and become abundant towards the Kunene River mouth (Penrith and Kensley, 1970; Kensley and Penrith, 1980; pers. obs.). These crabs may compete with the waders for limited food resources by diverting energy away from wader prey species. On the east coast of South Africa, beaches with high densities of ghost crabs have very few scavenging isopods (Dye *et al.*, 1981; Wooldridge *et al.*, 1981) which are preyed upon by waders (FitzPatrick Institute, unpubl. data).

The upwelling of cold, nutrient-rich water also decreases to the north, with very little upwelling occurring north of Angra Fria (Stander, 1964). This is reflected by the low numbers of off-shore feeding cormorants and terns roosting on the coast in this area. The marked change from a nutrient-rich upwelling system south of Angra Fria to a relatively nutrient-deficient oceanic system to the north serves to reduce further the nutrient input to the beaches north of Angra Fria.

The highest density of waders on the Skeleton Coast was in the south (71,0 waders km⁻¹ in section 7). This is greater than the value obtained for a section of this coast-line in 1978 (8,0 waders km⁻¹; Whitelaw *et al.*, 1978). The difference can be partly attributed to the large concentration of waders at Cape Cross which was not included in this section by Whitelaw *et al.*, (1978). However, discounting the waders counted at Cape Cross still leaves a density of 54,5 waders km⁻¹.

This discrepancy cannot be related to variations in migratory species alone, since the density of the resident White-fronted Plover was also greater in 1981 (Table 1). One likely explanation is that the 1978 survey was conducted in early January when tourist numbers are at their highest, whereas the present survey was completed before the tourist season started.

On the coast, the White-fronted Plover is the only true resident wader. The African Black Oystercatcher, *Haematopus moquini*, only occurs infrequently (Hockey, 1983; Ryan *et al.*, in press b) and other non-Palaeartic waders are restricted to the wetlands. The large numbers of Sanderling, Turnstone and Grey Plover found on the Skeleton Coast make the area an important wintering area for these species. The Skeleton Coast also provides roost sites for large numbers of cormorants and Palaeartic terns. White-breasted Cormorants, *Phalacrocorax carbo*, breed on wrecks and towers along the coast and at the Kunene River and Hoanib Oasis (Brooke *et al.*, 1982). Cape Cormorants breed on one wreck and inland at the Hoanib Oasis (Cooper *et al.*, 1982). The wrecks are suitable for breeding for only a fairly short period since they are eventually broken up by wave action (Brooke *et al.*, 1982). The only other coastal bird found breeding was the White-fronted Plover (Ryan *et al.*, in press b), although Kelp Gulls, *Larus dominicanus*, are now known to breed in the area (Bridgeford, 1982).

The Damara Tern has been recorded breeding in the area (Clinning, 1978). This species is considered rare and vulnerable (Siegfried *et al.*, 1976) and the number counted (645) indicates the importance of the Skeleton Coast to the species. It breeds on gravel flats on the mainland where it is susceptible to disturbance by coastal development and human recreational activities (Frost and Shaughnessy, 1976). This survey was carried out before the Damara Tern had commenced breeding in the area, but birds were found in small flocks (30 to 70) on gravel plains up to 2 km inland where they breed later in the season (R. Loutit, pers. obs.). Many such groups were presumably overlooked since most time was spent on the shore-line and so the true population is probably larger than the number counted.

The status of the Damara Tern north of Mõwe Bay was previously unknown (Clinning, 1978) although breeding has been recorded near Angra Fria (E.W. Karlowa, pers. comm.). We counted 375 Damara terns north of Mõwe Bay, including a flock of 135 at the Kunene River mouth. The bird probably breeds all along the Skeleton Coast and further north in southern Angola (Brooke, 1981).

The wetlands support a greater number of species than does the coast. However, the area of wetland habitat is small and subject to great temporal variations in water level. Most species occur in low numbers and breed infrequently, whilst populations of other species are maintained solely by immigration from elsewhere. As a result, nomadic species (e.g. flaming-

oes, *Phoenicopterus* spp. and Cape Teal, *Anas capensis*) predominate. The structure of the avifauna is also affected by the nature of the wetlands; piscivores are scarce away from the Kunene River since the other water bodies are presumably too ephemeral or saline to support fish.

The Kunene, Hoanib and Unjab Rivers are the most important wetlands, but the other rivers can support large numbers of birds (e.g. flamingoes) when conditions are favourable, generally just after flooding when a lagoon forms at the mouth. Although the wetlands did not support a high proportion of the birds counted, they provide refuges for many species not found elsewhere in the area and may be important staging posts for certain migratory species (e.g. European Swallows *Hirundo rustica*) (Ryan *et al.*, in press b).

Most of the area surveyed falls within the Skeleton Coast Park. Human disturbance is minimal and restricted to the two tourist angling areas (section 5) where four-wheel drive vehicles are allowed on the beach (Clinning, 1978; Penrith and Loutit, 1982). The 71,1 km of angling area (14,4% of the park coast-line) supported only 7,8% of the park's total bird population but 17,7% of the park's waders. This difference, caused by the relatively low numbers of roosting cormorants and terns, may be due to human disturbance. A diamond mining operation at Mõwe Bay has severely disturbed 3 km of shore-line and further mining activities within the park should not be allowed. The wetlands in the park are undisturbed although water is collected from the Hoarusib River to supply Mõwe Bay and the mining operation.

South of the park, disturbance by four-wheel drive vehicles travelling along the beach to and from angling spots is intense, particularly in mid-summer. This is the period when the largest number of birds are present and breeding is at its peak (Clinning, 1978; Whitelaw *et al.*, 1978). The consequences of disturbance of coastal birds by beach vehicles is not known, but could be severe if the frequency of disturbance is sufficiently high. Heavy tourist traffic on the beaches in December and January may account for the differences between the 1978 and 1981 surveys of the coast between the Skeleton Coast Park and Cape Cross. It is recommended that the number of vehicles allowed on the beach be limited or that certain stretches be protected as refuges by the total prohibition of beach driving. This could be compensated for by the creation of more access roads to fishing spots (Whitelaw *et al.*, 1978).

Breeding colonies of Damara Terns are particularly vulnerable to human disturbance and their protection is considered a conservation priority (Siegfried *et al.*, 1976). The location and size of all Damara Tern colonies on the Skeleton Coast need to be determined by a survey later in the season when they are breeding. Colonies within tourist areas should be clearly sign-posted or fenced off (Buckley and Buckley, 1976) and

access roads to the beach should be routed well away from the colonies. Indiscriminate off-road driving away from the coast should not be allowed since it causes unsightly and long-lasting tracks (Seely and Hamilton, 1978).

5 ACKNOWLEDGEMENTS

Our trip to the Skeleton Coast was supported financially by the South African Nature Foundation (P.G.R. and J.C.) and by the Directorate of Nature Conservation, South West Africa/Namibia. Rudi Loutit provided invaluable assistance with logistics and through his thorough knowledge of the area. We thank Peter and Marilyn Bridgeford and Blythe Loutit for their kind hospitality. P.A.R. Hockey, L.G. Underhill and A.J. Williams commented on drafts of this paper.

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