WADER MIGRATION SYSTEMS IN SOUTHERN AND EASTERN AFRICA AND WESTERN ASIA

R.W.Summers, L.G.Underhill, D.J.Pearson and D.A.Scott

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In this paper we review information on the status, population size and migrations of waders within southern and eastern Africa, western Asia and the USSR, in an attempt to show where major concentrations occur, and the routes taken to and from their Palearctic breeding grounds. For much of this area, the information is meagre. The best-surveyed areas are Iran, the Nile Delta in Egypt, Kenya, and the coasts of Turkey, Namibia and South Africa. Rough estimates are available also for Sudan and the Gulf coast of Saudi Arabia. Large numbers of wintering waders occur in the Persian Gulf, Nile Delta, White Nile in Sudan, Lake Chad and the Rift Valley lakes of Ethiopia and Kenya. Long-term changes in the seasonal rains of Africa make it difficult to make representative population estimates. Coastal surveys in Kenya, Tanzania, South Africa and Namibia have shown that large numbers of certain species occur on rocky and coral shores, sandy beaches and coastal inlets. Observations and ringing recoveries indicate that there are several routes taken by migrating waders through Africa: along the west coast of southern Africa to the Gulf of Guinea and then across the Sahara to the Mediterranean; along the Rift Valley lakes and the River Nile; and along the east coast of Africa. In view of the large numbers of wintering waders in the Nile Delta and Persian Gulf it is likely that these areas are important stop-over points for migrants, whilst ringing recoveries in the Black Sea and Caspian Sea show that these areas are also used. By highlighting the huge gaps in the knowledge of waders in these parts of the world, we hope to stimulate and direct waderologists to the poorer-known parts of Africa and Asia.

R.W. Summers, Leenane, Gong Lane, Burnham Overy Staithe, Kings Lynn, Norfolk, U.K.
L.G. Underhill, Dept. Mathematical Statistics, Univ. of Cape Town, Rondebosch, Republic of South Africa.
D.J. Pearson, Dept. of Biochemistry, Univ. of Nairobi, PO Box 30197, Nairobi, Kenya.
D.A. Scott, IWRB, The Wildfowl Trust, Slimbridge, Gloucester, U.K.

INTRODUCTION

The routes taken by waders (Charadrii) between southern and eastern parts of Africa and the Middle East to their Siberian breeding grounds are not restricted to a single corridor. Rather, the routes vary according to species and population within a species. The Siberian migrants can be roughly split into two categories, those breeding on the arctic tundra (*Calidris* sandpipers, Turnstone *Arenaria interpres*, Grey Plover *Pluvialis squatarola*, Bar-tailed Godwit *Limosa lapponica*, etc.) and those of the more temperate or taiga regions of Siberia (*Tringa* sandpipers, Ruff *Philomachus pugnax*, Curlew *Numenius arquata*, etc.). These two groups tend also to have differing habitat preferences during the non-breeding season; the arctic waders being more maritime and the temperate ones preferring inland wetlands, though there are notable exceptions, e.g. the Little Stint *Calidris minuta*.

In this paper we describe the studies that have been carried out on the migrant waders, and review what is known of their migrations and winter numbers throughout Africa (apart from the western bulge which is covered by Piersma *et al.* in this volume), the Middle East and western Asia.

The seasonal terms "spring, summer, autumn and winter" refer to the boreal seasons.

METHODS OF FLYWAY STUDY

Moreau (1972) and Curry-Lindahl (1981) describe the climate and habitats of Africa, and provide an overview of migration between Africa and the Palaearctic. Both authors cover waders, but not in any detail.

Southern Africa

Early wader studies involved observations and counts to determine population sizes and/or arrival and departure dates (Broekhuysen and Meiklejohn 1941, 1943, Shewell 1950, Broekhuysen 1948, 1956, 1971, Taylor 1957, Liversidge *et al.* 1958, Winterbottom 1960, Rudebeck 1963, Blaker and Winterbottom 1968, Becker 1974). Middlemiss (1961) was the first to combine trapping and counting in a detailed study of the Little Stint in the southwestern Cape.

Since the 1970's, when the Western Cape Wader Study Group was formed (Underhill 1979), research into Palaearctic waders has been conducted at a higher level of intensity. The group consists of amateur and professional ornithologists and a statistician. The Percy Fitzpatrick Institute of African Ornithology of the University of Cape Town has conducted research in waders, particularly at Langebaan Lagoon and offshore islands, with an emphasis on indigenous species such as the African Black

Oystercatcher *Haematopus moquini* (Summers and Cooper 1977). The Institute has also conducted wader surveys on remote parts of the coastline of Namibia and South Africa. In Namibia, the Department of Nature Conservation and the Bird Group of the SWA Scientific Society have organised and conducted wader surveys.

Monthly surveys to determine population size and seasonality have taken place on the Skeleton Coast, northern Namibia (Tarr and Tarr in press), at Sandwich Harbour (Berry and Berry 1975), at Langebaan Lagoon (Pringle and Cooper 1975), on the coast of the Cape Peninsula (Pringle and Cooper 1977), at the Gamtoos estuary (Shewell 1950), on sandy shores in the eastern Cape (McLachlan *et al.* 1980), at Cape Recife (J.A.Spearpoint *in litt.*), at the Swartkops estuary (Martin and Baird in press), and the Natal coast (Joubert 1981) (Figure 1). Surveys along the coastline have estimated population sizes, and identified the major wetlands for waders: northern Namibia (Ryan *et al.* 1984), central Namibia (Underhill and Whitelaw 1977, Whitelaw *et al.* 1978), southern Namibia and offshore islands (Cooper *et al.* 1980, Hockey 1982, Williams in press a,b, Williams *et al.* in press), the northern Cape (Ryan and Cooper 1985), the southwestern Cape (Summers *et al.* 1976, 1977, Ryan *et al.* in press), eastern Cape (Underhill *et al.* 1980), Transkei (Hockey and Bosman 1986) and Natal (Ryan *et al.* 1986). The census data from all these surveys have been archived in a computer data base (Underhill 1983, Underhill and Cooper 1984a,b,c). Since 1975, there have been summer and winter surveys at Langebaan Lagoon (Summers 1977, Robertson 1981, Underhill 1986, in press b), the main area where several single-species studies have been carried out: on Curlew Sandpiper *Calidris ferruginea* (Elliott *et al.* 1976, Puttick 1978, 1979, 1980), Knot *Calidris canutus* (Dick *et al.* 1976), Terek Sandpiper *Xenus cinereus* (Waltner and Sinclair 1981), Sanderling *Calidris alba* (Summers *et al.* in press) and Turnstone (WCWSG unpubl. data). Since 1983, Walvis Bay Lagoon and Sandwich Harbour have been surveyed in summer and winter (A.J. Williams *in litt.*).

Less is known about waders at inland sites in southern Africa. Rudebeck (1963) reports observations on waders during extensive travels in southern Africa. In the Orange Free State, waders have been counted at dams created by pumping seepage water from goldmines to the surface (Liversidge 1958, Brooke 1960). In the Transvaal, waders have been counted at Bon Accord Dam, near Pretoria (Broekhuyzen 1948), and at Barberspan (Farkas 1962, Milstein 1975, Skead and Dean 1977), where the Little Stint (Dean 1977a) and Curlew Sandpiper (Dean 1977b) have been studied. Ruffs have been studied on the Witwatersrand (Schmitt and Whitehouse 1976). The bird atlases of the Transvaal (Kemp *et al.* 1985) and Natal (Cyrus and Robson 1980) show the monthly distribution of wader records on a quarter degree grid, and are well referenced. Bird atlas projects for South Africa, Namibia, Zambia and Malawi are currently under way. Taylor (1979) has analysed reports of migrant waders in Zambia. In Botswana, waders have been counted at Lake Ngami (Fraser 1971, Tree 1972b, Dawson and Jacka 1975), at several pans in northern Botswana (Stanyard 1978), at the sewage works at Jweneng, a new diamond mining town (Penry 1981), and at Mogobane Dam (Wilson 1981).

Tree (1973, 1974, 1976, 1977a) has studied waders intensively in Zimbabwe (and also in the eastern Cape, South Africa), and has published a series of single species accounts: Greenshank *Tringa nebularia* (Tree 1979a, 1982, 1985b, in press), Ringed Plover *Charadrius hiaticula* (Tree 1977b, 1979b) and Ruff (Tree 1984, 1985a). Other published wader counts at localities in Zimbabwe are by Campbell and Miles (1956) and Macdonald *et al.* (1985). Irwin (1981) and Benson *et al.* (1971) provide good summaries of waders on passage and wintering in Zimbabwe and Zambia respectively.

Very little is known about waders in Mozambique, where vast coastal marshlands are almost inaccessible during the wet season (November to March) (R.K. Brooke pers. comm.). There are some early records by Winterbottom (1936) and Benson (1936). Jenson (1968) gives approximate counts of waders on Inhaca Island, Delagoa Bay, in March and April 1968. Clancey (1971) reviews records of waders, and lists the major distributional literature, for Mozambique south of the Zambezi River. There is little subsequent information, apart from Hanmer (1976), Waltner and Sinclair (1981) and Milstein (1984).

Studies in Malawi have been made by Benson (1946) and Laycock (1965) who reported observations at a series of artificial dams near Blantyre 100 km south of the chain of Rift Valley lakes.

Studies with sub-continental emphasis include Dowsett (1980) (inland records of waders), Siegfried (1981) (waders at estuaries), Underhill (1981) (cluster analysis of coastal localities based on wader counts), Hockey *et al.* (1983) (waders on sandy shores) and Hockey *et al.* (1986) (rare and vagrant waders).

Most of the population surveys by the Western Cape Wader Study Group and the Percy Fitzpatrick Institute of African Ornithology have been carried out by individuals working as part of a larger team surveying a large wetland or section of coast. Most surveys have been carried out on foot, though use has been made of 4-wheel drive vehicles on beaches, or boats on large wetlands. Langebaan Lagoon and other large wetlands are surveyed at high tide when the birds flock onto salt-marsh roost sites (Summers 1977). A comparison of counts on foot and by vehicle on coastlines showed similar numbers of waders of each species (Underhill and Whitelaw 1977).

Trapping of waders has been carried out mainly with mist-nets (Tree 1972a), but cannon-nets have been used since 1974, primarily to catch Sanderlings and Turnstones. Colour-ringing has been used to mark Greenshanks (Tree 1985b) , and dye-marking has been used for Knots, Curlew Sandpipers and Sanderlings (Summers 1978).

Central Africa

Little is known about the migration, distribution and numbers of waders in Central Africa. Bouet (1955) describes wader distribution over most of the region. See also Searle (1955), Traylor (1963), Erard and Etchecopar (1970) and Pinto (1983) for Angola, Chapin (1939) and Lippens and Wille (1976) for Zaire, Christy (1982) and Brosset and Erard (1986) for Gabon, and Searle (1965) and Louette (1981) for Cameroon.

Eastern Africa

Intensive studies have been limited mainly to Kenya. Mist-netting and ringing have been carried out regularly in the Rift Valley by a few people, particularly at Lake Nakuru from 1967 - 1972, and at Lake Magadi from 1972 -

1984. Data on migration timing, on status and age structure, and on moult and weights have been obtained for Ruff and Little Stint in particular (Pearson *et al.* 1970, Pearson 1981, 1984a, in press), but information has also been collected on other inland species such as Marsh Sandpiper *Tringa stagnatilis* and Wood Sandpiper *Tringa glareola* (*e.g.* Pearson 1974), Curlew Sandpiper (Elliott *et al.* 1976) and Common Sandpiper (Pearson 1977). On the coast, a mist-netting and ringing programme at Mida Creek from 1978 - 1985 has provided corresponding data on estuarine species such as Mongolian Plover *Charadrius mongolus*, Greater Sandplover *Charadrius leschenaulti*, Grey Plover and Terek Sandpiper. Frequent, though irregular, counts over the past ten years at four major high tide roosts have established seasonal abundance patterns at the coast, and arrival and departure times (Pearson and Britton 1980). A mid-winter count was made along 50 km of shore south of Mombasa (Pearson 1984b) and at 4 localities (Bryant 1980). Inland, the smaller Rift Valley lakes, from Lake Baringo south to Lake Magadi were surveyed in January 1980 (Pearson and Stevenson 1980) and also during the two following years. Attention has now turned to wader numbers wintering on the much larger Lake Turkana, which had previously received only limited attention (Fry *et al.* 1974).

In Tanzania, regular counts by Harvey (1974) established approximate wintering numbers and seasonal patterns on the coast at Dar-es-Salaam, but no other detailed work on waders has been published. Information from Uganda is limited to largely unpublished local counts from observers resident at Lake Victoria, and in the late 1960s in the Lake Edward area, but important wader sites in Uganda are fairly well known.

Information on the distribution and migration times of waders in Kenya, Uganda and Tanzania have been summarised in Britton (1980).

Ethiopia, Somalia and Djibouti are known mainly from surveys and observations by K.D. Smith (*e.g.* Smith 1957) and J.S. Ash (Ash 1985, Ash ans Miskell 1983). In the Sudan, G. Nikolaus (*in litt.*) has identified important areas and recorded numbers at many inland and coastal sites during surveys between 1977 and 1984, and has made some estimates of wintering numbers for the country as a whole. Nikolaus mist-netted waders on the Sudan coast, along the Nile near Khartoum, Kosti and Juba, and at Aweil in the southwest.

Indian Ocean and sub-Antarctic Islands

There is an extensive literature on birds, including waders, at islands in the western half of the Indian Ocean. Watson *et al.* (1963) provide maps and summarise the waders on each island. Here we cite only recent reviews for each island or group of islands: Chagos Archipelago, Bourne (1971); Diego Garcia, Howells (1983); Danger Island, Baldwin (1975); Seychelles, general review of island groups, Feare and Watson (1984), wader counts in central Seychelles, Feare and High (1977); Aldabra, Penny (1971); Assumption, Prys-Jones *et al.* (1981); Cosmeledo, Benson (1970a); Astove, Benson (1970b); Comoros, Benson (1960), Forbes-Watson (1969); Gloriosa, Benson *et al.* (1975); Agalega, Cheke and Lawley (1983); Tromelin, Staub (1970); Cargados Carajos, Staub and Gueho (1968); Mascarenes, Reunion, Barre (1983); Mauritius, Temple (1976); Rodriguez, Gill (1967), Staub (1973); Madagascar, Rand (1936), Homes (1947), Appert (1971), Dhondt (1975); Juan de Nova, Malzy (1965); and Europa, Malzy (1966). Prys-Jones and Wilson (1986) review the occurrence of snipe at western Indian Ocean islands. Bailey (1967) records migrant waders observed at sea.

Waders are regular vagrants to the sub-Antarctic islands of the western Indian Ocean: Prince Edward Islands, Burger *et al.* (1980), Newton *et al.* (1983); Crozet Island, Stahl *et al.* (1984); Kerguelen Island, Thomas (1983); and Saint Paul and Amsterdam, Roux and Martinez (in press). Waders reaching the Tristan da Cunha group and Gough Island in the Altantic Ocean are generally of Nearctic origin (Richardson 1984).

Eastern Mediterranean and Middle East

In this area there has been more published wader work carried out by expeditions, or foreigners spending short periods in a particular area, than by local ornithologists. For example there have been visits by Danish, Dutch and British teams, some working with local ornithologists (Etheridge 1971, Gyllin 1976, Curry 1978, Pomeroy 1980, Meininger and Mullie 1981a,b, Mullie and Meininger 1981, 1983, Petersen and Sorensen 1981, Engelmoer and Bloksma 1982, Scott and Carp 1982, Smart *et al.* 1983, Philippona 1985, de Roder 1985, van den Berk *et al.* 1985, Tucker 1985, L. Zwarts *in litt.*, J.D. Uttley *in litt.*). These expeditions have surveyed populations and in some cases ringed waders. Local ornithologists have provided more long-term information by counting at different seasons (Shirihai 1980) or during autumn migration (Baha el Din and Salama 1984, Paran and Paz 1978). Some information on breeding waders is also available (Meininger *et al.* 1986).

Aerial and ground surveys were conducted during the 1970s at wetlands throughout Iran and along the entire southern coast from Iraq to Pakistan, by D.A. Scott and colleagues at the Iran Department of the Environment. The Department of Environment initiated a bird ringing programme in the late 1960s, and during the mid 1970s, the Ringing Office, led by F.B. Argyle, mist-netted several thousand waders in the south Caspian and at Galenow Marsh near Tehran. L. Cornwallis, working on the avifauna of Fars Province in the late 1960s and early 1970s conducted regular ground surveys of the important wetlands of central Fars.

BREEDING GROUNDS

The breeding area for Siberian waders are comprised of two major habitats - the tundra and the taiga. The tundra habitat extends along the coast of the Arctic Ocean from 40° E to 190° E, occupying an area of 4 x 10^6 km^2, and four distinct sub-zones can be identified: the polar deserts (found only on the northern isles of Novaya Zemlya, Franz Josef Land and Severnaya Zemlya), the arctic tundra subzone, the typical tundra subzone and shrub/tussock tundra subzone (Chernov 1985). These sub-zones have distinct plant and animal communities, including waders; for example Knots, Sanderlings and Purple Sandpipers breed in the polar deserts, Curlew Sandpipers on the arctic tundra, Dunlins and Little Stints in typical tundra, and Bar-tailed Godwits and Spotted Redshanks in the shrub tundra (Chernov 1985).

Kokorev (1983) has carried out censuses on the

tundra of the Taimyr, mainly in the basins of the River Pura and River Logata. Average population densities (numbers/km²) over three years were 0.4 Grey Plovers, 10.9 Golden Plovers, 1.6 Ringed Plovers, 1.1 Red-necked Phalaropes, 1.9 Grey Phalaropes, 0.1 Turnstones, 4.1 Ruffs, 10.3 Little Stints, 10.4 Temminck's Stints, 7.4 Dunlins, 2.0 Pectoral Sandpipers and 0.4 Bar-tailed Godwits. These figures refer to the southern tundra sub-zones but it is not known to what extent they are representative of these zones.

The taiga habitat is more extensive than the tundra for its spans more degrees of latitude. General information on the breeding distribution of taiga and tundra waders is given in Cramp and Simmons (1983).

SOUTHWARD MIGRATION

There are several publications describing the pattern of southward migration of the different species through the USSR (Dement'ev *et al.* 1951, Kazakov *et al.* 1982), Iran (Feeny *et al.* 1968), Iraq (Marchant 1963), Israel (Safriel 1968, Shirihai 1980), Egypt (Paran and Paz 1978, Petersen and Sorensen 1981, Baha el Din and Salama 1984) where tens of thousands of waders (mainly Dunlin) have been seen passing west along the Mediterranean coast of Sinai in autumn, and the Dahlac Archipelago in the Red Sea (Mann 1971). Further south the pattern of arrival has been documented by Dowsett (1969) for Lake Chad, by Fogden (1963), Pearson and Britton (1980) and Pearson *et al.* (in press) for Kenya, Benson *et al.* (1971) for Zambia, Irwin (1981) for Zimbabwe, and Broekhuysen and Meiklejohn (1941), Broekhuysen (1956), Winterbottom (1960), Blaker and Winterbottom (1968), Pringle and Cooper (1975, 1977), and Martin and Baird (in press) for southern Africa. These counts have shown that migration is quite rapid: adults arrive in the Middle East and Kenya during August and September and most reach southern Africa during September and October, with first-year birds arriving a few weeks later, as late as December. It is perhaps the need to remain at one locality for moulting that leads to populations reaching their winter quarters with little delay. Turnstones, Curlew Sandpipers and Sanderlings which winter in southern Africa and Little Stints, Curlew Sandpipers, Common Sandpipers, Grey Plovers and Ringed Plovers which winter in Kenya do not undertake partial moult during their migration (Western Cape Wader Study Group unpubl. data, Pearson 1974, 1977, 1984a).

Observations of southward migration in progress are rare: Bailey (1967) saw small numbers of 8 species crossing the Indian Ocean off the east African coast during September and October; Pearson and Britton (1980) reported continuous coasting of waders, especially Curlew Sandpipers, in early autumn along the Kenya coast; Dowsett and Walsh (1968) and Dowsett (1980) has reviewed records of migrant maritime waders in the interior of Africa. In general, inland records of these species are more frequent during southward migration than northward. This suggests that different routes are used for these migrations, or that waders overfly inland Africa because habitat availability is different in spring.

Ringing recoveries in autumn of birds ringed either on the breeding areas or wintering areas have given an indication of migration routes and stop-over points. There have been numerous recoveries of Red-necked Phalaropes *Phalaropus lobatus*, ringed in arctic Norway, and recovered on the rivers of western USSR and the Caspian and Black Seas (Il'ichev *et al.* 1985). Huge numbers have been seen on lakes on the western Turkoman steppes (L. Cornwallis pers. comm.), and a detailed study of their autumn migration through Kasachstan has been made by Gavrilov *et al.* (1983). These birds winter in the southern Red Sea, Gulf of Aden and Arabian Sea (Curry-Lindahl 1981, Schiemann 1986). The importance of the Black Sea (particularly the north shore) and Caspian Sea has been highlighted by the recoveries of Grey Plovers, Curlew Sandpipers, Little Stints, Sanderlings, Ruff and Bar-tailed Godwits ringed in South Africa (Elliott *et al.* 1976, Summers and Waltner 1979, Il'ichev *et al.* 1985, South African Bird Ringing Unit (SAFRING) unpubl. data). Recoveries of Little Stints and a Turnstone on the Rift Valley lakes show that these are used *en route* to southern Africa (Summers and Waltner 1979, Pearson in press).

Most early autumn waders in the Rift Valley (especially adults in August - mid September) appear to be passage migrants, for few are retrapped there later. At some sites, e.g. Lake Magadi, southerly departures involving hundreds of birds have been observed in the early morning (Pearson 1981, Pearson *et al.* in press).

Chapin (1939) reported passage of Curlew Sandpipers through the Congo basin in September, "when they may drop in upon any open ground, often in villages, but never in any great number".

Few autumn surveys have identified sites of major importance for waders on southern migration. Hill and Nightingale (1984) reported thousands of Lesser Sandplovers *Charadrius mongolus*, Kentish Plovers *Charadrius alexandrinus* and Curlew Sandpipers at Bahrain. Later in autumn Tucker (1985) did not record as many, though he did count over 100 Broad-billed Sandpipers *Limicola falcinellus*. He speculated that these, plus other sandpipers, migrate across the Arabian Peninsula rather than migrate round the coast. Elsewhere in the Persian Gulf Smart *et al.* (1983) reported that Dubai Khor is likely to be an important staging area for waders on southward migration. Counts in October 1986 showed that there was a population of over 10 000 waders, including 4 000 Broad-billed Sandpipers, the largest concentration of this species ever recorded (J. Uttley *in litt.*). On the Red Sea coast some species (*e.g.* Curlew Sandpiper and Terek Sandpiper) occur in larger numbers in autumn than in winter, suggesting substantial passage (G. Nikolaus pers. comm.).

Surveys in Iran have identified Lake Rezaiyeh as immensely important for waders on southward migration - 146 000 *Calidris* sandpipers were counted out of a total of 188 000 waders during an aerial survey in late-August 1973 (Table 1). Much of the south Caspian Sea coast is of hard sand, but mud-flats at Miankaleh Peninsula support large numbers of Little Stints, Dunlins, Sanderlings and Curlew Sandpipers (Table 1). Other areas of Iran, e.g. the vast tidal flats at the head of the Persian Gulf and associated river plains are thought to be important (Figure 1).

WINTERING POPULATIONS

Southern Africa

Details of the size of the winter population on the coast of Namibia and South Africa are

TABLE 1. Important wetlands for waders in southern and eastern Africa, western Asia and the USSR. A = autumn count, W = winter, S = spring. See Figure 1 for locations.

Country		Wetland	Population	Conservation status/threats	Source
S. Africa	1	Langebaan Lagoon	38 000 W	National Park (declared 1985)	19,31
	2	Lake St Lucia	14 000 W	Increasing salinity	18
	3	Berg River mouth	14 000 W	Saltworks, recreational development	31
	2	Richards Bay	10 000 W	Industrial development, reclamation	21
	4	Rietvlei/Milnerton Lagoon	9500 W		31
	3	Olifants River mouth	7500 W		31
	5	Orange River mouth	7000 W		20
	4	Strandfontein Sewage Works	5000 W		
	4	Bot River Lagoon	5000 W		17
	4	De Hoop Vlei	4000 W	Ramsar site	
	6	Barberspan	2000	Ramsar site	28
Namibia	7	Walvis Bay	30 000 W	Salt works	9,30
	8	Sandwich Harbour	27 000 W	National Park, water extraction	22,30
Botswana	9	Lake Ngami			5
	10	Magkadigkadi salt pans			5
Zimbabwe	11	Darwendale Dam/ Lake McIlwaine	>5000 A		27
Zambia	12	Kafue flats		National Park	16
	13	Bangweulu flats			
	14	Lake Mweru		National Park	16
	15	Liuwa		National Park	16
Tanzania	16	Lake Natron			
	16	Lake Manyara	many 1000s	National Park	16
Burundi	17	Ruzizi marshes			
Uganda	18	Lake Edward			1
	19	Lake Albert and the White Nile			
Kenya	20	Lake Baringo			23
	20	Lake Bogoria		Nature Reserve	16,23
	20	Lake Nakaru	20 000 W	National Park	16,23
	20	Lake Naivasha			23
	20	Lake Magadi			23
	21	Mida Creek	5000 W		29
	21	Sabaki mouth	2000 W		29
	22	Lake Turkana (esp. Ferguson's Gulf)	50 000 W		
Ethiopia	23	Lake Zwai			
	23	Lake Langano			
	23	Lake Abiata	10 000s W		14
	23	Lake Abaya			
	23	Lake Shala			
	24	Eritrean coast	10 000s W		14
	22	Omo Delta	10 000s W		14
Sudan	25	Red Sea coast	10 000s W		12
	26	White Nile and Sudd	>1 million W		12
	27	Aweil	1000s W		12
Chad	28	Lake Chad	1 million		13
Egypt	29	Lake Manzala	>200 000 W	Reclamation, hunting	2,4,24,25
	30	Bay of Suez	10 000 W	Reclamation, pollution	2,25
	29	El Malaha, Bur Fuad	15 000 Avocets	Canal works	2,25
	29	Lake Burrulus	>10 000 W	Reclamation	2,25
Bahrain	31	Ra's Tublai			6,7
Trucial Oman	32	Khor Dubai	>15 000		8
	32	Khor al Beidah	>10 000		26
Iraq	33	Huar Al Hammar			10
	33	Fao			11
	33	Haur Zubair			
Iran	34	Lake Rezaiyeh, Azarbaijan	188 000 A 2000 W	Ramsar site	15
	34	Lakes south of Lake Rezaiyeh			15
	35	Pahlavi Mordab complex, Gilan		Ramsar site	15
	35	Bandar Farahnaz Lagoon and mouth Sefid Rud		Ramsar site	15
	36	Gorgan Bay and Miankaleh complex	12 000 W, 18 000 S 27 000 A	Ramsar site	15
	36	Lakes western Turkoman steppes		Ramsar site	15
	37	Lashgarak/Latian Dam area and Galanow Marsh	500 W, 500 S, 1000 A		
	38	Flood plain of Dez, Karun & Kharkeh rivers, incl. Shadegan marshes, & flats of Khor-Al Amaya & Khor Musa	28 000- 47 000 W	Ramsar site	15

Iran (cont.)	39 Neiriz lakes and Kamjar marshes		Ramsar site	15
	39 Lake Maharlu and Soltanabad marshes			
	39 Dasht-e Arjan and Lake Parishan	10 000-15 000 W	Ramsar site	15
	40 Seistan Basin	7000-11 000 W	Ramsar site	15
	41 Khouran Straits	35 000	Ramsar site	15
	41 Deltas of Rud-e Shur, Rud-e Shirin and Rud-e Minab	12 000	Ramsar site	15
	42 Deltas of Rud-e Gaz and Rud-e Hara	35 000	Ramsar site	15
Jordan	43 Azraq Oasis		Ramsar site	16
USSR	44 Kandalaksha Bay		Ramsar site	16
	45 Matsalu Bay		Ramsar site	16
	46 Volga Delta		Ramsar site	16
	47 Kirov Bay		Ramsar site	16
	48 Krasnovodsk and North-Cheleken Bays		Ramsar site	16
	49 Sivash Bay		Ramsar site	16
	50 Karkinitski Bay		Ramsar site	16
	51 Intertidal area of the Dounai			
	49 Yagorlits & Tendrov Bays		Ramsar site	16
	52 Kourgaldzhin and Tengiz Lakes		Ramsar site	16
	53 Lakes of lower Turgay and Irgiz		Ramsar site	16

Sources

1 Curry-Lindahl 1960
2 Meininger and Mullie 1981a,b
3 Morant 1984
4 Mullie and Meininger 1981
5 Stanyard 1978
6 Hill and Nightingale 1984
7 Tucker 1985
8 Smart *et al.* 1983
9 Whitelaw *et al.* 1978
10 Scott and Carp 1982
11 George and Viellard 1970
12 G. Nikolaus pers. comm.
13 Ash *et al.* 1967
14 J.S. Ash pers. comm.
15 IUCN Conservation Monitoring Centre 1984
16 IUCN 1985
17 Heyl and Currie 1985
18 Berruti 1980
19 Underhill in press b
20 Ryan and Cooper 1985
21 Ryan *et al.* 1986
22 Berry and Berry 1975
23 Pearson and Stevenson 1980
24 Mullie and Meininger 1983
25 P.L.Meininger *in litt.*
26 J.D.Uttley *in litt.*
27 A.J.Tree *in litt.*
28 H.K.Morgan *in litt.*29 Pearson 1984a
30 Connor 1980
31 Cooper *et al.* 1976

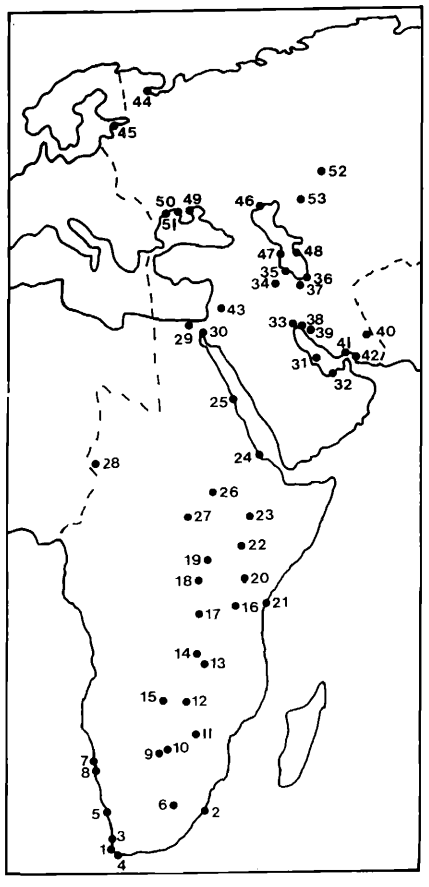


Figure 1. Localities of wetlands within southern and western Africa, western Asia and the USSR. Details of each wetland are given in Table 1.

fairly complete, the only major gaps being the southern half of Namibia, parts of the northern Cape and Transkei, where poor roads and/or security in diamond mining areas combine to make access difficult. However, by extrapolating figures for parts which were surveyed one can arrive at a reasonable estimate (Table 2, Figure 2). Coastal wetlands which support over 5 000 waders are Walvis Bay, Sandwich Harbour, Orange River estuary, Olifants River estuary, Berg River estuary, Langebaan Lagoon, Bot River Lagoon, Strand fontein sewage works, Rietvlei/Milnerton Lagoon, Richards Bay and Lake St. Lucia (Berruti 1980) (Figure 1, Table 1) The most abundant species is the Curlew Sandpiper.

The inland areas of south-western Africa are dry so there are few large wetlands other than the Okavango swamps. However, man-made dams provide small areas suitable for waders. Lake Ngami and the Makgadikgadi salt-pans in Botswana are likely to be important in years when the water levels provide favourable feeding for waders (Stanyard 1978). As with much of Africa, rains can be unpredictable so the locations of the wader populations vary enormously from year to year (Tree 1980). Etosha Pan in Namibia supports few waders (A.J. Williams pers. comm.).

The marshy areas and swamps of Zambia (Kafue Flats, Bangweulu swamp and flood-plain, Lakes Mweru and Liuwa) probably support over 100 000 waders, mainly Ruffs and Wood Sandpipers, but also Curlew Sandpipers and Little Stints (R. Dowsett *in litt.*). Great Snipes, which have a restricted wintering distribution in Africa, arrive in Bushmanland (Namibia), Zimbabwe, Zambia, Malawi and southwestern Tanzania in November at the time of the rains (November-March) (Benson *et al.* 1971, Irwin 1981, A.J.Williams pers. comm., B. Stronach *in litt.*).Waltner and Sinclair (1981) give counts of Terek Sandpipers from Mozambique: the maximum number was 3 200 at Inhaca Island.

Zimbabwe has no major natural wetlands, but the Harare water storage dams of Darwendale Dam and Lake McIwaine with a combined total shore length of 160 km may hold 5 000-10 000 waders. The commoner species are Little Stint, Ruff and Wood Sandpiper, whilst Common Sandpiper, Curlew Sandpiper, Marsh Sandpiper and Greenshank are less common (A.J.Tree *in litt.*).

The large lakes, Lake Malawi and Lake Tanganyika, provide poor habitats for waders, and no large numbers have been recorded.

Central Africa

Searle (1955) reported waders in small numbers on the coastline of Angola. In the Congo basin, the most frequently encountered wader is the Common Sandpiper *Actitis hypoleucos*, occurring "from sea-level up to 6 000 feet along the banks of almost every river even though wooded, or around any lake or open marshy spot, usually in small numbers, often singly" (Chapin 1939). On the coast of Gabon, Christy (1982) reported relatively small numbers of the commoner species: maximum flock sizes were 300 Grey Plovers, 200 Ringed Plovers, 100 Whimbrels *Numenius phaeopus*, 4 Curlews, 6 Bar-tailed Godwits, 100 Greenshanks, 200 Curlew Sandpipers, with Turnstone being common on rocky shores and Sanderling in limited numbers on the shores and coastal lagoons.

On the north-western coast of Cameroon, mud and sandflats in the mangrove areas support "good numbers" of waders, but few occur on the open shores of flat lava rock, pebbles or lava sand (searle 1965).

The largest number of waders encountered on any African wetland (excluding West Africa) has been the one million Ruffs estimated by Ash *et al.* (1967) in March-April 1967 within a 25 km radius of the mouth of the Yobe River, Lake Chad, where Ruffs feed on wheat and millet. Although observed in March-April, the birds were probably wintering.

East Africa

The winter population of waders in Kenya has been estimated at 200 000 of which about two-thirds occur inland (Table 3, Figure 2). The Rift Valley lakes, from Lake Baringo south to Lake Magadi, have about 20 000 waders (mainly Little Stints, Ruffs, and Marsh and Wood Sandpipers) (Table 1). The wader habitats on these lakes are very much influenced by the rains, which are broadly seasonal (mainly April-May and August-September) and have recently varied also on a long-term basis, with high water levels at the start of the last three decades and low water levels in the middle. However, the main wader sites at Lake Magadi are fed by soda springs which maintain a more constant environment, and therefore result in less variable wader populations (Pearson in press). Lake Turkana (exclusive of the Omo Delta, which lies in Ethiopia) supports over 50 000 waders; 20 000 are often concentrated in Ferguson's Gulf alone; mainly Little Stints, Marsh Sandpipers and Ruffs (Table 3).

Table 2. Numbers of waders counted in winter on the coasts and coastal wetlands of southern Africa. C = open coast (% surveyed), W = coastal wetlands, and I = offshore islands. Estimated totals are rounded numbers, others are as counted.

Species[a]	Northern Namibia		Southern Namibia			Northern Cape		Western Cape			Southern Cape		Eastern Cape		Transkei		Natal			Totals		Estimated
	C(100)	W	C(8)	I	W	C(40)	W	C(100)	I	W	C(88)	W	C(98)	W	C(50)	W	C(99)	W	C&I	W	C,I&W	Total popn.
Black Oystercatcher	12	99	197	477	0	77	19	1023	839	87	788	82	474	77	22	0	0	0	3909	364	4273	4500
White-fronted Plover	2027	2112	160	686	17	1948	203	2655	69	745	2174	350	930	249	144	17	791	360	10 920	4053	14 973	18 000
Chestnut-banded Plover	0	4622	0	0	0	0	310	0	0	197	0	15	0	34	0	0	0	0	0	5178	5178	5200
Kittlitz's Plover	0	9	0	0	0	0	48	0	38	1447	0	760	0	160	0	0	0	128	38	2552	2590	2600
Three-banded Plover	0	87	4	0	3	19	45	18	3	125	19	197	10	136	4	0	0	43	77	636	713	750
Blacksmith Plover	0	14	0	0	8	1	166	15	53	949	20	748	0	76	0	0	0	45	89	2006	2095	2100
Grey Plover	2070	3481	126	16	50	310	20	320	8	4330	224	858	316	999	1	0	4	364	3395	10 102	13 497	14 500
Ringed Plover	39	470	17	4	6	1	433	49	39	789	178	962	161	645	1	10	38	1628	527	4943	5470	5500
Mongolian Sandplover	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	152	0	153	153	150
Greater Sandplover	0	0	0	0	0	0	0	0	0	7	0	4	1	4	0	0	0	13	1	28	29	30
Bar-tailed Godwit	219	2063	1	0	4	1	0	8	1	228	1	10	0	15	0	0	1	63	232	2383	2615	2600
Whimbrel	153	28	32	14	7	64	0	121	74	529	423	511	90	851	10	2	56	287	1037	2215	3252	3300
Curlew	0	18	0	0	0	1	4	11	0	392	0	16	0	22	4	0	0	9	16	461	477	500
Marsh Sandpiper	0	17	0	0	0	0	11	9	0	289	0	251	0	101	0	0	1	328	10	997	1007	1000
Greenshank	15	145	2	0	1	22	167	82	3	904	195	987	39	723	2	3	30	641	390	3571	3961	4000
Wood Sandpiper	0	16	0	0	1	0	4	0	0	43	2	284	0	166	0	0	0	415	2	929	931	930
Terek Sandpiper	0	5	0	0	0	0	0	0	0	123	0	73	0	197	0	0	0	162	0	560	560	560
Common Sandpiper	51	31	9	4	2	81	12	48	2	34	162	191	48	266	9	2	54	850	468	1388	1856	2000
Turnstone	8336	1515	477	686	16	2792	1	3411	1550	1710	2161	34	1183	495	125	0	95	83	20 816	3854	24 670	28 000
Knot	2031	1917	1	2	0	221	0	14	8	7869	25	87	166	83	5	0	0	67	2473	10 023	12 496	13 000
Sanderling	14 941	17 321	548	11	0	7422	26	9101	326	2247	1784	417	4626	1253	411	76	1726	48	40 896	21 388	62 284	78 000
Little Stint	19	3378	13	1	3	10	1790	43	6	4558	3	4496	65	1864	0	3	0	6499	160	22 591	22 751	23 000
Curlew Sandpiper	3566	20 164	273	26	69	4519	2916	3230	475	40 880	1254	15 835	127	4107	3	0	0	9094	13 473	93 065	106 538	115 000
Ruff	0	177	0	1	1	12	473	587	0	7166	0	5327	4	1939	0	0	0	5647	604	20 730	21 334	21 500
Ethiopian Snipe	0	0	0	0	0	0	0	0	0	27	0	114	0	6	0	0	0	1	0	148	148	150
Avocet	5	1759	0	0	0	0	658	10	0	1632	0	1312	0	623	0	0	0	1333	15	7317	7332	7500
Black-winged Stilt	0	53	0	0	0	0	55	0	0	498	0	1020	0	527	0	0	0	582	0	2735	2735	2800

[a]scientific names are given in Table 3 and Table 4

TABLE 3. Numbers of waders wintering in Kenya, based on counts and surveys by D.J. Pearson, T. Stevenson, P.L. Britton and D.A. Turner during 1975-1985. + vagrant; ++ irregular or in very small numbers; () "guesstimate".

	INLAND						COASTAL		
	Rift Valley[a]	Lake Turkana[b] Ferguson's Gulf	Lake Turkana[b] elsewhere	Lake Victoria[c]	other inland sites[d]	INLAND TOTAL	Msambweni -Sabaki R	COASTAL elsewhere	COASTAL TOTAL
Oystercatcher *Haematopus ostralegus*							++		<10
Caspian Plover *Eupoda asiatica*		50-100			(3000-5000)[e]	few 1000s	++		<50
Ringed Plover *Charadrius hiaticula*	200-600	2000	3000-6000	(500)	300-1500	8000	1000-2000	(1000)	2500
Little Ringed Plover *Charadrius dubius*	20-50	10-15	(20)		50-200	200	++		<10
Kentish Plover *Charadrius alexandrinus*	+	6-10	(20)			30		(1-10)	<10
Mongolian Sandplover *Charadrius mongolus*	++	2-10	(20)		+	30	1000-3000	(1000)	3000
Greater Sandplover *Charadrius leschenaulti*	+	++	(20)			20	6000-12 000	(6000)	15 000
Lesser Golden Plover *Pluvialis dominica*	+	++			++	<10	+		+
Grey Plover *Pluvialis squatarola*	++	2-20	(50)		+	70	2000-3000	(2000)	4500
Turnstone *Arenaria interpres*	+	++	?			<10	1000-3000	(1000)	3000
Little Stint *Calidris minuta*	6000-13 000	10 000	20 000-50 000	(2000)	5000-15 000	65 000	1000-2000	(2000)	3500
Temminck's Stint *Calidris temminckii*	25-50	++	(a few)		(20-50)	70			
Long-toed Stint *Calidris subminuta*	+					+			
Dunlin *Calidris alpina*	+	+				+			
Curlew Sandpiper *Calidris ferruginea*	500-1500	3000	2000-4000	(200)	200-1000	7500	6000-12 000	(15 000)	24 000
Sanderling *Calidris alba*	+	30	(100)			100	3000-6000	(3000)	7500
Ruff *Philomachus pugnax*	5000-7000	1000	1000-2000	(200-1000)	8000-12 000	19 000			
Broad-billed Sandpiper *Limicola falcinellus*	+	++				+	40-70	(?10s)	100
Spotted Redshank *Tringa erythropus*	10-50	++	(a few)		50-300	200			
Redshank *Tringa totanus*	+	+			+	+	5-20	(?10s)	30
Marsh Sandpiper *Tringa stagnatilis*	1000-1500	3000	1000-2000		500-1500	7000	30-60	(?10s)	100
Greenshank *Tringa nebularia*	100-200	50	500-1000	(200)	(200-500)	1500	300-500	(300)	700
Green Sandpiper *Tringa ochropus*	(10-30)	++	++	(10-50)	(100-300)	250			
Wood Sandpiper *Tringa glareola*	700-1500	500	(a few)	(5000)	(2000-5000)	7500	a few		a few
Terek sandpiper *Tringa terek*	++	++	?		+	<10	1000-2000	(1500)	3000
Common Sandpiper *Actitis hypoleucos*	50-200	10-20	300-1000	(1000)	(300-1000)	2500	100-200	(150)	300
Black-tailed Godwit *Limosa limosa*	10-100	30-100	(a few)		50-100	150	+		+
Bar-tailed Godwit *Limosa lapponica*	+					+	1-5		<10
Curlew *Numenius arquata*	++	++	++			<10	50-80	(100)	200
Whimbrel *Numenius phaeopus*	+	+	+	(a few)		<20	500-1000	(1500)	2250
Snipe *Gallinago gallinago*	(100s-1000s)	(a few)	(a few)	(100s)	(100s)	few 1000s			
Great Snipe *Gallinago media*	++				++	<10			
Pintail Snipe *Gallinago stenura*	+				+	+			
Jack Snipe *Lymnocryptes minimus*	++				+	+			
Red-necked Phalarope *Phalaropus lobatus*	++	++	++			<20			[f]
Black-winged Stilt *Himantopus himantopus*	1000-5000	10 000	1000s	(100s)	100s	(20 000)			
Avocet *Recurvirostra avosetta*	200-500	?	?			(few 1000s)			
Crab Plover *Dromas ardeola*							600-900	(1200)	2000
TOTAL	c 20 000	c 65 000		c 10 000	c 28 000	c 123 000	c 36 000	c 34 000	c70 000

[a] central and southern Kenya
[b] excluding Omo Delta (Ethiopia)
[c] Kenyan shores only
[d] pools, dams, rivers, swamps, sewage works, etc.
[e] on short grasslands
[f] hundreds offshore at times

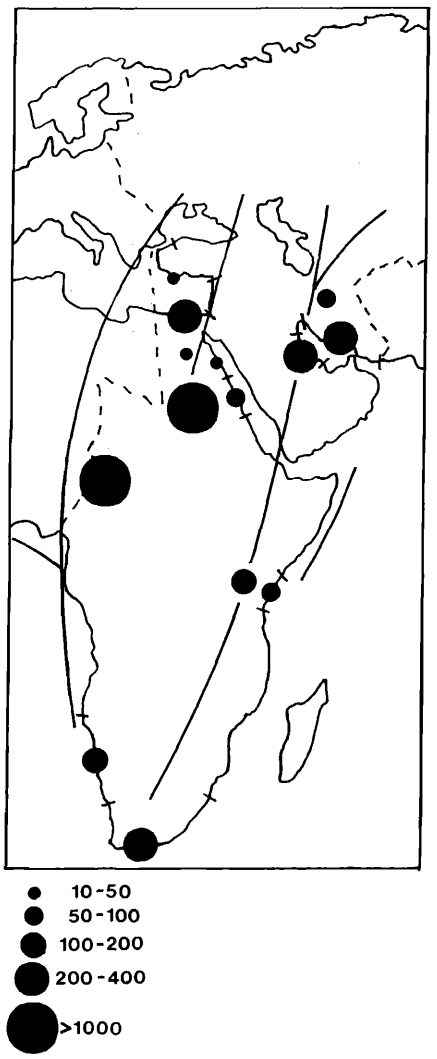


Figure 2. Populations of wintering waders in Iran, Egypt, Sudan, Kenya, at Lake Chad, and on the coasts of Turkey, Saudi Arabia, Namibia and South Africa. The numbers on the scale refer to thousands of birds. No estimates are available for other countries. Main migration routes are shown also; some are likely to be interconnected, and the inland routes are probably on very broad fronts.

Irrigation schemes, sewage ponds and dams support several thousands, but Lake Victoria, which has rocky/sandy shores and *Papyrus* swamps, is relatively poor for waders. The coastal estuaries, sandflats and coral flats hold about 60 000, mainly Curlew Sandpipers, Greater Sand Plovers, Sanderlings, Grey Plovers, Mongolian Sand Plovers and Terek Sandpipers. The main coastal wetlands are Mida Creek (5 000 waders) and the Sabaki mouth (2 000) (Pearson 1984b). The latter has a regular flock of 60 Broad-billed Sandpipers, the only site in east Africa with such large numbers of this species (Britton 1980).

In Tanzania, only Lakes Manyara and Natron are known to hold many thousands of waders. On the coast, however, densities of 150/km (Curlew Sandpipers, Little Stints, Greater Sandplovers, Grey Plovers, Greenshanks, Turnstones and Terek Sandpipers) occurred on 40 km of beach at Dar-es-Salaam (Harvey 1974).

In Uganda the most important site for waders appears to be Lake Edward and its associated swamps and pools; tens of thousands of waders winter there, mainly Little Stints, Ruffs, Marsh Sandpipers, Wood Sandpipers and Common Sandpipers (Curry-Lindahl 1960, J.M. Lock pers. comm.). Lake Albert, the muddy banks of the White Nile and the swamps in central/southern Uganda undoubtedly hold many thousands more. The Ruzizi marshes in Burundi are probably as important as Lake Edward (Gaugris 1979, J.M. van de Weghe *in litt.*).

The Rift Valley lakes of Ethiopia (Lakes Abiata, Lagana, etc., Table 1) are similar to the Kenya lakes in importance and probably hold tens of thousands of waders, mainly Ruffs and Little Stints (J.S. Ash pers. comm.). The Eritrean coast has many wintering Curlew Sandpipers and a few Broad-billed Sandpipers. A few km of the coast of Djibouti had *c.* 8 000 waders, mainly Curlew Sandpipers and Sanderlings (Ash 1985). In Somalia the Indian Ocean coast has relatively few waders, but the north coast is probably of greater importance (Archer and Godman 1937). There are few inland wetlands of note (J.S. Ash pers. comm.). The coastal shelf of Somalia is important for Red-necked Phalarope: *c.* 6 000 were recorded in the Gulf of Aden on 16-17 November 1983 in flocks of up to 300 birds, feeding mainly in the turbulent waters at the edge of the coastal shelf (Schiemann 1986).

The muddy and sandy shores of the Red Sea in the Sudan probably hold a few tens of thousands of Little Stints, Ringed Plovers, Redshanks *Tringa totanus*, Dunlins, Kentish Plovers and Greater Sandplovers, but at densities lower than the Kenya coast (G. Nikolaus pers. comm.). The main river of the Nile has extensive muddy edges, whilst in the Sudd there are pools and flooded grassland until about January. This area holds hundreds of thousands of Snipe *Gallinago gallinago*, Little Stints, Ruffs, Marsh Sandpipers, Common Sandpipers and Wood Sandpipers (Table 4, Figure 2). The 20 000 Black-tailed Godwits here represent the major eastern African concentration for this species (G. Nikolaus pers. comm.). Other rivers such as the Blue Nile, Sobat and Bahr-el-Ghazal are relatively unimportant. Rice schemes at Aweil, in the south-west, normally have thousands of waders including 100+ Spotted Redshanks. However, these areas are seasonally wet holding birds during only a month or two after the early autumn flood period.

Indian Ocean

Small numbers of waders winter on the islands of the Indian Ocean, the Turnstone being the most abundant species (Feare and High 1977). Mahe (the largest island of the Seychelles) had a total population of 670 waders in November 1976 (R.W. Summers, unpubl. data). Aldabra may be an important wintering area for Crab Plovers *Dromas ardeola*, 220 being observed from December 1967 to March 1968 (Penny 1971), and even larger numbers have been observed there by R.P. Prys-Jones (pers. comm.).

Middle East/Eastern Mediterranean

Estimates of the wintering populations of waders on the coasts of the eastern Mediterranean have recently been reviewed by Smit (1986) who gave a figure of estimates of 12 600 for Turkey.

Table 4. Estimated numbers of waders wintering in Sudan (G. Nikolaus, pers. comm.). All values are "guestimates". + vagrant; ++ irregular or in small numbers.

Species	Inland[a]	Red Sea Coast
Grey Plover	++	1000
Lesser Golden Plover	+	<20
White-tailed Plover[b]	500-1000	100
Lapwing[c]	+	
Oystercatcher		10-100
Spurwinged Plover[d]	1000-5000	
Mongolian Sandplover	++	1000-2000
Greater Sandplover	++	10 000-25 000
Caspian Plover	5000-10 000	
Kentish Plover	1000-3000	2000-5000
Little Ringed Plover	1000-2000	
Ringed Plover	2000-5000	2000-5000
Jack Snipe	500-10 000[e]	
Common Snipe	1 500 000	100s
Turnstone	++	5000-10 000
Curlew	++	500-1000
Whimbrel	+	500
Bar-tailed Godwit		<50
Black-tailed Godwit	15 000-30 000	
Wood Sandpiper	250 000-500 000	<100
Greenshank	5000-10 000	1000-2000
Marsh Sandpiper	5000-10 000	
Spotted Redshank	1000	<50
Redshank	1000-2000	1000
Green Sandpiper	<500[g]	
Terek Sandpiper	++[f]	++[g]
Common Sandpiper	1000-2000	50
Sanderling		1000-2000
Broad-billed Sandpiper	++[f]	?
Ruff	300 000-1 000 000	
Curlew Sandpiper	30 000-100 000	5000-10 000
Dunlin	3000-6000	5000-10 000
Temminck's Stint	1000-2000	
Little Stint	250 000-500 000	10 000-25 000
Total	c. 3 000 000	c. 70 000

[a] chiefly the Nile and associated irrigation
[b] *Vanellus leucurus*
[c] *Vanellus vanellus*
[d] *Vanellus spinosus*
[e] much annual variation
[f] only on passage
[g] mostly on passage

In Egypt the lakes at the mouth of the Nile are important, especially Lake Manzala where large numbers of Kentish Plovers, Little Stints, Dunlins and Redshanks winter (Table 1) (Meininger and Mullie 1981a). Other important sites include the Bay of Suez, El Mahala near Bur Fud and Lake Burrulus. The total winter wader population of Egypt has been estimated at 250 000-400 000 (Meininger and Mullie 1981a, P.L.Meininger *in litt.*)(Table 5).

The creek at Khawr Barr al Hikman and mudflats at Ghubbat al Hashish are the most important places for wintering waders in Oman (Gallagher and Woodcock 1980).

Surveys in Iran have shown that Lake Rezaiyeh is less important than in autumn, perhaps because it can be very cold in this part of Iran (down to -35°C in winter). As in autumn, the Miankalah area is the best place in the southern Caspian Sea for waders, holding 5 000 Dunlins and 4 000 Black-tailed Godwits in its population of 12 000 waders (Table 1). The vast tidal mudflats at the head of the Persian Gulf and associated flood plains of the Dez, Karum and Kharkeh rivers, including the Shadegan marshes, the tidal flats of Khar-Al Amaya, Khouran Straits and deltas of nearby rivers, are all important areas (Table 1 and 6). The entire coast of Iran supports 130 000-200 000 waders, including 9 000-12 000 European Oystercatchers, 23 000-32 000 Bar-tailed Godwits and 15 000-21 000 Curlews, though the most abundant species is Dunlin (45 000-73 000 (Table 6).

The most important wintering areas for waders in Iraq are probably the intertidal mudflats around Fao and in the Haw Zubair. Hour Al Hammar also has many waders: 6 000 Kentish Plovers, 1 000 Dunlins and 1 000 Little Stints were seen on a few kilometres of shore - good waders habitat extends along 50 km of shore (Scott and Carp 1982).

In January and February 1986, L. Zwarts (*in litt.*) surveyed waders around Tarut Bay and Abu Ali, and at Safaniya, Manifa, Al Khobar and the Gulf of Salwah, on the Saudi Arabian Gulf coast. From the numbers counted (30 000, one-third of which were Dunlins), Zwarts estimated that about 250 000 waders overwinter on the Saudi Arabian Gulf (Figure 2).

Table 5. Estimated numbers of waders wintering in Egypt (P.L.Meininger pers. comm.).

	Med. Coast (incl. Nile Delta Lakes)	inland (Nile)	Red Sea coast	Total
Painted Snipe	100s B	100 B		100s B
Oystercatcher	250-500	+	250-500	500-1000
Black-winged Stilt	10-50	10-50 B	P	20-100 B
Avocet	5000-15 000	50-100	P	5000-15 000
Crab Plover	+		200-300	200-300
Little Ringed Plover	++ P	++ B,P	++	++ B
Ringed Plover	2000-3000	100-200	250-500	2500-3700
Kittlitz's Plover	scarce B	scarce B		scarce B
Kentish Plover	25 000-40 000 B	1000-2000 B	250-500 B	26 000-43 000 B
Lesser Sandplover	+		+	+
Greater Sandplover	200-500	25-100	800-1500	1000-2000
Caspian Plover	+	+	P	P
Dotterel	100-500	+	+	100-500
Golden Plover	++	100-1000	+	100-1000
Grey Plover	200-500	100-200	400-600	700-1300
Spur-winged Plover	B	5000-15 000 B	++	5000-15 000 B
Sociable Plover	P	++ P	P	++ P
White-tailed Plover	++ P	++ P	P	++ P
Lapwing		500-5000		500-5000
Knot	+	+	+	+
Sanderling	3000-10 000	+	100-500	3000-10 000
Little Stint	>100 000	5000-10 000	5000-10 000	>110 000
Temminck's Stint	++ P	++ P	P	++ P
Curlew Sandpiper	++ P	++ P	++ P	++ P
Dunlin	>100 000	500-1000	2000-4000	>100 000
Broad-billed Sandpiper	++ P		P	++ P
Buff-breasted Sandpiper			+	+
Ruff	500-1000 P	500-1000 P	++ P	1000-2000 P
Jack Snipe	++	++		++
Snipe	1000s	1000s	P	1000s
Great Snipe	++	++		++
Woodcock	++	++	+	++
Black-tailed Godwit	50-100 P	50-100 P	P	100-200 P
Bar-tailed Godwit	++	+	++	++
Whimbrel	P	P	++ P	++ P
Slender-billed Curlew	+	+		+
Curlew	100-300	100-200	300-500	500-1000
Spotted Redshank	50-100	500-1000	50-100	600-1100
Redshank	7000-15 000	500-1000	500-1000	8000-17 000
Greenshank	100-200 P	100-200P	100-200 P	300-600 P
Marsh Sandpiper	100-200 P	100-200 P	++ P	300-400 P
Green Sandpiper	100s P	100s P	++ P	100s P
Wood Sandpiper	100s P	100s P	P	100s P
Terek Sandpiper	P	+	P	P
Common Sandpiper	100s P	100s P	++ P	100s P
Turnstone	200-400	+	500-1000	700-1500
Red-necked Phalarope	P	+	P	P
Grey Phalarope	++			

B also breeds
P mainly on passage
+ vagrant
++ irregular or in very small numbers in winter

Table 6. Numbers of waders wintering in Iran, based on mid-winter counts from 1968/9 to 1975/6. + vagrant in winter; ++ irregular in very small numbers; A = abundant; C = common; U = uncommon. Numbers in brackets are guestimates.

	Azarbaijan	Gilan	Mazandaran	Turkoman Steppes	Western Provinces	Northern Plateau	Isfahan	Khuzestan (inland)
	1	2	3	4	5	6	7	8
Oystercatcher			50-100					
Ringed Plover		20-50	200-300					10-50
Little Ringed Plover								++
Kentish Plover		150-300	500-800	100-200		+		400-800
Mongolian Plover								
Greater Sandplover		+	1-10					
Dotterel	+		++					100-250
Golden Plover		50-100	450-750	10-50				
Lesser Golden Plover								
Grey Plover		50-100	200-300	10-50				++
White-tailed Plover		+		+	+			900-1200
Lapwing	300-500	4000-6000	4000-6000	7000-10 000	500-800	400-600	200-300	1500-2000
Turnstone			1-10					
Little Stint		++	++					100-300
Temminck's Stint		++	1-10	++	+			50-200
Dunlin	300-600	700-1000	6000-8000	300-500		++		800-1200
Curlew Sandpiper								
Sanderling		20-50	250-350					
Ruff		++				++		50-100
Broad-billed Sandpiper								
Spotted Redshank	++	80-150	50-100	10-50	++			50-100
Redshank	50-100	700-1000	800-1200	250-400	100-200	20-50	50-100	1800-2200
Marsh Sandpiper		++	+	+				100-250
Greenshank	10-50	10-50	50-100	1-10	++	+	++	50-100
Green Sandpiper	10-50	100-250	100-250	20-50	50-100	50-100	20-50	100-250
Wood Sandpiper		++	+					20-50
Common Sandpiper		+	+			+		1-10
Terek Sandpiper								+
Black-tailed Godwit	10-50	800-1500	2000-4000	10-50	+	+		2000-4000
Bar-tailed Godwit			1-10					
Curlew	20-50	+	150-300	50-100				++
Whimbrel								
Woodcock		A	C	U	+	U	+	+
Snipe	(100-250)	A	A	(100-250)	(250-500)	(250-500)	(100-250)	C
Jack Snipe	+	C	C			U		C
Black-winged Stilt	+	1-10	50-150	20-50				1400-1800
Avocet	20-100	20-50	500-900	10-50				150-250
Crab Plover								
Stone Curlew								
Cream-coloured Courser								
Red-wattled Lapwing					U			C
Great Stone Plover								

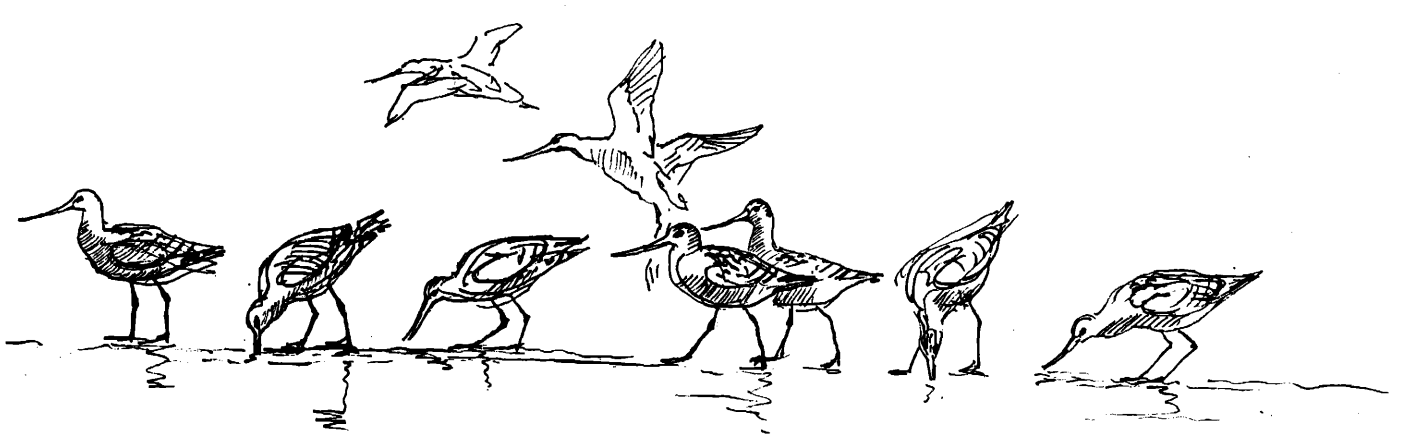
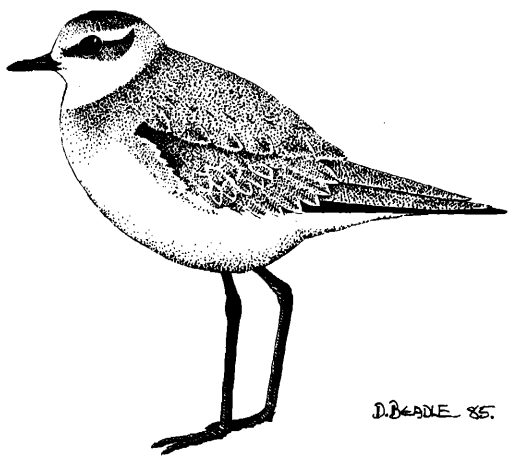


Table 6 (continued).

	Fars	Seistan	Northern Gulf	Southern Gulf	Baluchistan	
	9	10	11	12	13	TOTAL
Oystercatcher			2000-3000	4000-5000	3000-4000	9000-12 000
Ringed Plover			(500-1000)	(1000-2500)	(1000-2500)	(2500-6000)
Little Ringed Plover			+			++
Kentish Plover	300-500	250-500	(1000-2500)	(2500-5000)	(1000-2500)	(5000-10 000)
Mongolian Plover			(250-500)	(1000-2500)	(1000-2500)	(2500-5000)
Greater Sandplover	++		(1000-2500)	(2500-5000)	(2500-5000)	(5000-10 000)
Dotterel			200-500			500-1000
Golden Plover	+			+		500-1000
Lesser Golden Plover					++	++
Grey Plover	++		50-200	500-1000	200-500	1000-2000
White-tailed Plover	300-400		10-50			1200-1600
Lapwing	5000-8000	1000-1200			+	25 000-35 000
Turnstone			(100-250)	(500-1000)	(100-250)	(500-1500)
Little Stint	50-200		(250-500)	(100-250)	(100-250)	(500-1500)
Temminck's Stint	20-50	++				100-250
Dunlin	800-1200	1300-1700	(5000-8000)	(25 000-40 000)	(15 000-25 000)	(50 000-90 000)
Curlew Sandpiper	+		+	10-50		10-50
Sanderling			(1000-2500)	(2500-5000)	(4000-6000)	(10 000-15 000)
Ruff	20-50	50-100		+		100-250
Broad-billed Sandpiper			(50-100)	(250-500)	(100-250)	(500-1000)
Spotted Redshank	10-50	10-20	10-50	+		250-500
Redshank	1600-2000	500-700	(1000-2000)	(3000-6000)	(4000-8000)	(15 000-25 000)
Marsh Sandpiper	++	+	(50-100)	(100-250)	(100-250)	(500-1000)
Greenshank	20-50		50-100	50-100	100-200	350-750
Green Sandpiper	100-250	20-50	10-50		1-10	750-1500
Wood Sandpiper	+					20-50
Common Sandpiper			++	20-50	20-50	(50-150)
Terek Sandpiper			(100-300)	(1500-2500)	(200-500)	(2000-3000)
Black-tailed Godwit	800-1000	4000-6000	200-300	++		10 000-15 000
Bar-tailed Godwit	+	+	3000-4000	10 000-15 000	10 000-13 000	25 000-35 000
Curlew	20-50	10-50	2000-3000	7000-10 000	6000-8000	15 000-25 000
Whimbrel			1-10	50-100	50-100	100-250
Woodcock	+				+	>5000
Snipe	C	C	(50-100)			>10 000
Jack Snipe	C	U				>1000
Black-winged Stilt	800-1200	100-150	20-50	+	+	2500-3000
Avocet	300-600	100-250	200-500	50-100	20-50	1500-2500
Crab Plover			150-250	800-1100	200-400	1250-1750
Stone Curlew	+	+	+			+
Cream-coloured Courser			+			+
Red-wattled Lapwing	C	U	C	C	C	>5000
Great Stone Plover				(20-50)	(50-100)	(50-100)



Mongolian Plover

NORTHWARD MIGRATION

Many of the studies mentioned in the section on southward migration give counts showing the time at which waders depart on northward migration. In general, the northward migration spans a shorter period than southward migration. Migrant waders leave the south-western Cape, South Africa, in April and early May (Pringle and Cooper 1975, 1977) and arrive on the Siberian breeding areas in June (Dement'ev *et al.* 1951).

As with southward migration there have been few instances of migration actually being observed; Ash (1981) noted northward migration of waders, particularly Whimbrels (13 000 counted) off the coast of Somalia during April. Observations of the spring migration from East Africa have shown that the main departure from the coast takes place during late April, whilst most birds leave the Rift Valley lakes rather later (not until mid-late May for Little Stints and Curlew Sandpipers)(Fry *et al.* 1974). These lakes appear to offer a good fattening area for several species. Adult Curlew Sandpipers pass through the Rift Valley, with numbers peaking about early May, and migrating parties of Wood Sandpipers also occur. Otherwise there is little augmentation of winter numbers. Spring passage is less noticeable in inland East Africa than the autumn movement (Pearson *et al.* 1970, Pearson and Britton 1980, Pearson *et al.* in press).

Waders have been tracked by radar heading north-east across the Sahara from Accra, Ghana (Grimes 1974, Grimes and Vanderstichelen 1974). Most departures occurred at dusk. Moreau (1967) lists records of waders that have been found in the Sahara.

In Iran, there have been few counts in spring to identify refuelling areas, though the tidal flats at the northern end of the Persian Gulf, wetlands of the Seistan Basin and coasts of the southern Persian Gulf and Baluchistan are all thought to be used. Counts at Miankaleh on the south Caspian show that this is an important area for Sanderlings, Dunlins and Black-tailed Godwits, but not for Curlew Sandpipers (*cf.* its importance in autumn) (Table 1).

Much of what is known of northward migration comes from ringing studies and measurements of changes in mass and fat prior to migration (*e.g.* Pearson *et al.* 1970, Summers and Waltner 1979). The best studied species are the Little Stint (Middlemiss 1961, Pearson in press), Curlew Sandpiper (Elliott *et al.* 1976, Wilson *et al.* 1980), Knot (Dick *et al.* 1976), Ruff (Schmitt and Whitehouse 1976, Pearson 1981, Tree 1985a), Sanderling (Crowe 1986, Summers *et al.* in press), Greenshank (Tree 1979a, in press), and Turnstone (WCWSG unpubl. data). Sanderlings, Curlew Sandpipers and Turnstones complete the northward migration of 13 000 km from the Cape in about seven weeks and probably have three flights of *c.* 4 000 km and two periods of refuelling, one in Africa and the other in the Mediterranean or Middle East. Recoveries in the central Mediterranean suggest that Sanderlings and Turnstones cross the Sahara, perhaps from the Gulf of Guinea. However, there are few counts in the Mediterranean in May to confirm that this is a major refuelling area. The recoveries of Curlew Sandpipers, Little Stints and Ruffs suggest that they take a more easterly route than Sanderlings and Turnstones from southern Africa, and use the Rift Valley lakes on their way to the Middle East (recoveries around the Caspian Sea) and hence onto Siberia. Little Stints apparently travel the 9 000 km from inland Kenya to the arctic in only three or four weeks, taking off with reserves sufficient to carry them perhaps to the Persian Gulf where they could refuel for the final flight to the arctic (Pearson in press). Other species such as Ruffs, Marsh Sandpipers, Wood Sandpipers and Curlew Sandpipers also leave Kenya with similar potential flight ranges (Pearson 1981, Pearson *et al.* in press). Ruffs ringed in southern and east Africa have been recovered on the breeding areas from central to eastern Siberia, as far as 164°E (Pearson 1981, Tree 1985a). In contrast, the Knot is believed to be entirely coastal during its northward migration, following the western bulge of Africa before reaching western Europe and then to Siberia (Dick *et al.* 1976). A few Sanderlings also pass through north-western Europe but it is not known by which route they arrive (Summers *et al.* in press). The main migratory routes for waders are shown in Figure 2).

SUMMER POPULATIONS

For some species (Little Stint, Ringed Plover, Common Sandpiper and Wood Sandpiper) virtually the entire population leaves Africa, but for the other species, large numbers of young waders (principally first-year birds) oversummer in Africa, in numbers that vary considerably from year to year. For several arctic-breeding species these annual variations follow a three-year cycle which has been correlated with lemming cycles *Lemmus sibricus* and *Dicrostonyx torquatus* in Siberia, and are thought to result from differences in predation rates: in years when the lemming populations are low the Arctic Foxes *Alopex lagopus* which largely subsist on lemmings, feed more on wader eggs and chicks (Summers *et al.* in press, Underhill in press a, Summers and Underhill in press). Therefore, the importance of localities for "oversummering" waders can be gauged accurately only after several years of surveys. These population cycles will also influence winter counts, but to a much lesser extent. Within southern Africa, Langebaan Lagoon, Sandwich Harbour, Walvis Bay Lagoon, Lake Ngami and the Swartkops estuary have been identified as important "oversummering" sites (Taylor 1956, Tree 1971, 1972a,b, Underhill in press b, A.J. Williams pers. comm., A.P. Martin pers. comm.). In Kenya, "oversummering" waders amount to about 15-20% of the winter population on the coast. Numbers are much lower inland, with small groups of Marsh Sandpipers, Greenshanks, Ruffs and Curlew Sandpipers confined mainly to the soda lakes (D.J. Pearson, unpubl. data). Whimbrels, Curlews and Curlew Sandpipers "oversummer" on the coast of Mozambique (van Eysshen 1958, R.K.Brooke pers. comm., A.B.Fletcher, field notes in PFIAO). Homes (1947) reported small numbers of Whimbrels, Turnstones, Curlew Sandpipers and Grey Plovers in northern Madagascar in summer 1946. The Indian Ocean islands of Rodrigues, Mauritius and Cargados Crajos shoals support small numbers of Turnstones, Whimbrels, Greenshanks and Curlew Sandpipers in summer.

DIRECTION FOR FUTURE STUDIES

Breeding

There is a need to make further quantitative surveys of waders on breeding areas, and to ring and mark birds to identify more clearly the limits of the breeding grounds of waders wintering in west Asia and Africa. The relationship between lemming cycles and

breeding success in the tundra also needs further research.

Migration

There have been few studies carried out in the Mediterranean or Middle East in May and early autumn, at times when the African waders pass through. Further studies are required during these periods. The value of colour-marking should be capitalised upon, as it will lead to involvement and interest by casual bird-watchers, as well as lead to a greater number of recoveries. Important refuelling areas need to be identified and their populations estimated.

Winter

We have listed some of the important and potentially important wetlands (Table 1). Additional surveys to obtain estimates of population sizes, and identify the undoubtedly many other wetlands used by waders would be of considerable interest. As many inland sites in Africa are likely to vary in their importance in response to rains, a series of surveys would be required to assess sites accurately. Whilst this seems impossible for every site, as a first step suitable sites for such detailed study should be identified.

The rarest and most endangered wader in the western Palaearctic is the Slender-billed Curlew *Numenius tenuirostris*. It is thought to winter in north-west Africa, but no sites have been identified as regular winter haunts. However, six were seen on Haur Al Hammar in Iraq in January 1979 (Scott and Carp 1982). Steps should be taken to establish the population size, and study its habits so that effective conservation measures can be developed.

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REFERENCES

Appert,O. 1971. Die Limikolen des Mangokygebietes in Sudwest-Madagaskar. *Orn. Boeb.* 68: 53-77.

Archer,G. and Godman,E.M. 1937. *The Birds of British Somaliland and the Gulf of Aden.* Vol. 2. Gurney and Jackson, London.

Ash,J.S. 1981. Spring passage of Whimbrel *Numenius phaeopus* and other waders off the coast of Somalia. *Scopus* 5: 71-76.

Ash,J.S. 1985.Midwinter observations from Djibouti. *Scopus* 9: 43-49.

Ash,J.S., Ferguson-Lees,I.J. & Fry,C.H. 1967. Preliminary report. (B.O.U. Expedition to Lake Chad, northern Nigeria, March-April 1967.) *Ibis* 109: 478-486.

Ash,J.S. & Miskell,J.E. 1983. Birds of Somalia: their habitat, status and distribution. *Scopus Suppl.* 1: 1-97.

Baha el Din,S. & Salama,W. 1984. Waterbird migraton study at Zaranik, Sinai, 2-24 September 1982. *Courser* 1: 28-43.

Bailey,R.S. 1967. Migrant waders in the Indian Ocean. *Ibis* 109: 437-439.

Baldwin,E.D. (ed.) 1975. Danger Island Expedition Report.

Barre,N. 1983. Oiseaux migrateurs observes a la Reunion (ocean Indien). *Oiseau* 53: 323-333.

Becker,P. 1974. Beobachtungen an palaearktischen Zugvogeln in ihren Winterquartier Sudwestafrica. Windhoek: S.W.A. Wissenschaftlichen Gesellschaft.

Benson,C.W. 1936. The waders found at Beira. *Ostrich* 7: 116-118.

Benson,C.W. 1946. Aquatic birds at Blantyre, Nyasaland. *Ostrich* 17: 273-279.

Benson,C.W. 1960. The birds of the Comoro Islands: results of the British Ornithologists' Union Centenary Expedition 1958. *Ibis* 103b: 5-106.

Benson,C.W. 1970a. Land (including shore) birds of Cosmeledo. *Atoll Res. Bull.* 136: 67-81.

Benson,C.W. 1970b. Land (including shore) birds of Astove. *Atoll Res. Bull.* 136: 115-120.

Benson,C.W., Beamish,H.H., Jouanin,C., Salvan,J. and Watson,G.E. 1975. The birds of the Iles Glorieuses. *Atoll. Res. Bull.* 176: 1-34.

Benson,C.W., Brooke,R.K., Dowsett,R.J. and Irwin,M.P.S. 1971. *The Birds of Zambia.* Collins, London.

Berruti,A. 1980. Birds of Lake St Lucia. *Sth. Birds.* 8: 1-60.

Berry,H.H. and Berry,C.U. 1975. A checklist and notes on the birds of Sandvis, South West Africa. *Madoqua* 9: 5-18.

Blaker,D. and Winterbottom,J.M. 1968. Bird counts at Strandfontein sewage works and Riet Vlei, Cape Town. *Ostrich* 39: 94-104.

Bouet,G. 1955. Faune de l'Union Francaise XVI. L'Oiseaux de l'Afrique tropicale (premiere partie). Office de la Recherche Scientifique et Technique Outre-Mer, Paris.

Bourne,W.R.P. 1971. The birds of the Chagos Group, Indian Ocean. *Atoll Res. Bull.* 149: 175-207.

Britton,P.L. (ed.) 1980. *Birds of East Africa: their distribution, habitat and status.* East African Natural History Society, Nairobi.

Broekhuysen,G.J. 1948. Observations on the birds of the Bon Accord Dam, near Pretoria (March 1940 - November 1941). *Ostrich* 19: 108-121.

Broekhuysen,G.J. 1956. Occurrence and movement of migratory species in Rhodesia and southern Africa during the period 1950-1953 - Part II. *Ostrich* 27: 159-167.

Broekhuysen,G.J. 1971. Third report on bird migration in southern Africa. *Ostrich* 42: 41-64.

Broekhuysen,G.J., and Meiklejohn,M.F.A. 1941. Observations on Palaearctic waders and European Swallows in the south western Cape Province during the years 1938, 1939 and part of 1940. *Ostrich Suppl.* 1: 1-38.

Broekhuysen,G.J. and Meiklejohn,M.F.A. 1943. Palaearctic waders in South and middle Africa. *Ostrich* 13: 203-211.

Brooke,R.K. 1960. Waterfowl on the Orange Free State goldfields. *Ostrich* 31: 27-29.

Brosset,A. and Erard,C. 1986. Les oiseaux des regions forestieres du nord-est du Gabon. Vi. 1. Ecologie et compartement des especes. *Terre et Vie,* Suppl. 3: 3-297.

Bryant,D.M. 1980. Waders on the coast of Kenya: January 1979. *Wader Study Group Bull.* 28: 28-30.

Burger,A.E., Williams,A.J. and Sinclair,J.C. 1980. Vagrants and the paucity of land

bird species at the Prince Edward islands. *J. Biogeog.* 7: 305-310.
Campbell,N.A. and Miles,H.M. 1956. Bird counts on a high veld dam in Southern Rhodesia. *Ostrich* 27: 56-66.
Chapin,J.P. 1939. The birds of the Belgian Congo. Vol. 2. *Bull. Amer. Mus. Nat. Hist.* 75: 1-632.
Cheke,A.S. and Lawley,J.C. 1983. Biological history of Agalega, with species reference to birds and other land vertebrates. *Atoll Res. Bull.* 273: 65-108.
Chernov,Yu.I. 1985. *The Living Tundra.* Cambridge University Press, Cambridge.
Christy,P. 1982. Notes sur les migrateurs paleарctiques observes sur le littoral gabonais. *Oiseau* 52: 251-258.
Clancey,P.A. 1971. A handlist of the birds of southern Mocambique. *Mems. Inst. Invest. cient. Mocamb.* 10 Ser. A: 160-145-302.
Connor,M.A. 1980. Development of energy and mineral resources and its effects on bird conservation in southern Africa. *Proc. IV Pan-Afr. Orn. Congr.* 389-406.
Cooper,J., Robertson,H.G. and Shaughnessy,P.D. 1980. Waders (Charadrii) and other coastal birds of the Diamond Coast and the islands off South West Africa. *Madoqua* 12: 51-57.
Cooper,J., Summers,R.W. and Pringle,J.S. 1976. Conservation of caostal habitats of waders in the south-western Cape, South Africa. *Biol. Conserv.* 10: 239-247.
Cramp,S. and Simmons,K.E.L. (eds.) 1983. *The Birds of the Western Palearctic*, Vol. 3. Oxford University Press, Oxford.
Crowe,A.A. 1986. Aspects of the behaviour and ecology of White-fronted Sandplovers and Sanderlings on a South African sandy beach. Unpublished M.Sc. thesis, University of Cape Town.
Curry,A.C. 1978. Report of the Royal Air Force Ornithological Society's Expedition to Masirah Island 6 - 26 October 1976. RAF Northolt.
Curry-Lindahl,K. 1960. Ecological studies on mammals, birds, reptiles and amphibians in the eastern Belgium Congo. Part II. *Annales Musee Royal Congo Belge, Sciences Zoologiques* 87: 1-170.
Curry-Lindahl,K. 1981. *Bird Migration in Africa. Movements between six continents.* Vols 1 & 2. London: Academic Press.
Cyrus,D.P. and Robson,N.F. 1980. *Bird atlas of Natal.* University of Natal Press, Pietermaritzburg.
Dawson,J.L. and Jacka,R.D. 1975. Some notes on the water birds of Lake Ngami. Dept. of Wildlife, Gaberone.
Dean,W.R.J. 1977a. Moult of Little Stints in South Africa. *Ardea* 65: 73-79.
Dean,W.R.J. 1977b. Moult of the Curlew Sandpiper at Barberspan. *Ostrich Suppl.* 12: 97-101.
Dement'ev,G.P., Gladkov,N.A. and Spangenberg,E.P. 1951. *Birds of the Soviet Union*, Vol. 3. Jerusalem: Israel Program for Scientific Translation, 1969.
Dhondt,A.A. 1975. Note sur les echassiers (Charadrii) de Madagascar. *Oiseau* 45: 73-82.
Dick,W.J.A., Pienkowski,M.W., Waltner,M. and Minton,C.D.T. 1976. Distribution and geographical origins of Knot *Calidris canutus* wintering in Europe and Africa. *Ardea* 64: 22-47.
Dowsett,R.J. 1969. Migrants at Malam'fatori, Lake Chad, autumn 1968. *Bull. Niger. Orn. Soc.* 6: 39-45.
Dowsett,R.J. 1980. The migration of coastal waders from the Palaearctic across Africa. *Gerfaut* 70: 3-35.
Dowsett,R.J. and Walsh,F. 1968. Sanderlings inland in Nigeria. *Bull. Niger. Orn. Soc.* 5: 63-64.
Elliott,C.C.H., Waltner,M., Underhill,L.G., Pringle,J.S. and Dick,W.J.A. 1976. The migration system of the Curlew Sandpiper *Calidris ferruginea* in Africa. *Ostrich* 47: 191-213.
Engelmoer,M. and Bloksma,J. 1982. Waders in the Gulf of Arta, NW Greece, in April 1982. *Wader Study Group Bull.* 35: 26-28.
Erard,C. and Etchecopar,R.D. 1970. Some notes on birds of Angola. *Bull. Br. Orn. Club* 90: 158-161.
Etheridge,B. 1971. Weights and measurements of waders wintering in the Trucial States, Arabia. *Wader Study Group Bull.* 3: 5-7.
Farkas,T. 1962. Contribution to the bird fauna of Barberspan. *Ostrich Suppl.* 4: 1-39.
Feare,C.J. and High,J. 1977. Migrant shorebirds in the Seychelles. *Ibis* 119: 323-338.
Feare,C.J. and Watson,J. 1984. Occurrence of migrant birds in the Seychelles. Pp 559-573 *In* Stoddart,D.R. (Ed.) *Biogeography and ecology of the Seychelles Islands.* Dr. W. Junk, The Hague: Dr. W. Junk.
Feeny,P.P., Arnold,R.W. and Bailey,R.S. 1968. Autumn migration in the south Caspian region. *Ibis* 110: 35-86.
Fogden,M.P.L. 1963. Early autumn migrants in coastal Kenya. *Ibis* 105: 112-113.
Forbes-Watson,A.D. 1969. Notes on birds observed in the Comoros on behalf of the Smithsonian Institution. *Atoll. Res. Bull.* 128: 1-23.
Fraser,W. 1971. Birds at Lake Ngami, Botswana. *Ostrich* 42: 128-130.
Fry,C.H., Britton,P.L. and Horne,J.F.M. 1974. Lake Rudolf and the Palaearctic exodus from east Africa. *Ibis* 116: 44-51.
Gallagher,M. and Woodcock,M.W. 1980. *The Birds of Oman.* Quartet Book, London.
Gaugris,Y. 1979. Les oiseaux aquatiques de la plaine de la basse Rusizi (Burundi)(1973-1978). *Oiseaux* 48: 133-153.
Gavrilov, von E.I., Jerochov,S.N., Gavrilov,A.E. and Chrokov,V.V. 1983. Uber den Herbstzug des Odinwassertreters (*Phalaropus lobatus*) in Kasachstan. *Vogelwelte* 32: 103-116.
Gill,F.B. 1967. Birds of Rodriguez Island (Indian Ocean). *Ibis* 109: 383-390.
Grimes,L.G. 1974. Radar tracks of Palaearctic waders departing from the coast of Ghana in spring. *Ibis* 116: 165-171.
Grimes,L.G. and Vanderstichelen,G. 1974. Initial departure directions of waders and other waterbirds in spring at Accra. *Bull. Niger. Orn. Soc.* 10: 62-63.
Gyllin,R. 1976. Notes on waders of Iran. *Bonn. Zool. Beitr.* 27: 39-46.
Hanmer,D.B. 1976. Birds of the lower Zambesi. *Sth. Birds* 2: 1-66.
Harvey,W.G. 1974. The occurrence of waders in the Dar es Salaam area of Tanzania. *Bull. E. Afr. Nat. Hist. Soc.* 1974: 48-51, 66-69, 80-82 and 90-92.
Heyl,C.W. and Currie,M.H. 1985. Variations in the use of the Bot River estuary by water-birds. *Trans. Roy. Soc. S. Afr.* 45: 397-417.
Hill,M. and Nightingale,T. (eds.) 1984. Wildlife in Bahrain. Third Biennial Report of the Bahrain Natural History Society.
Hockey,P.A.R. 1982. Waders (Charadrii) and other coastal birds in the Luderitz region of South West Africa. *Madoqua* 13: 27-33.
Hockey,P.A.R. and Bosman,A.L. 1986. Man as an intertidal predator in Transkei: disturbance, community convergence and management of a natural food resource. *Oikos* 46: 3-14.
Hockey,P.A.R., Brooke,R.K., Cooper,J., Sinclair,J.C. and Tree,A.J. 1986. Rare and vagrant scolopacid waders in southern Africa. *Ostrich* 57: 37-55.

Hockey,P.A.R., Siegfried,W.R., Crowe,A.A. and Cooper,J. 1983. Ecological structure and energy requirements of the sandy beach avifauna of southern Africa. *In*: McLachlan,A. and Erasmus,T. (Eds.) *Sandy beaches as ecosystems.* Dr. W. Junk, The Hague.

Homes,R.C. 1947. Palaearctic waders "summering" in Madagascar. *Ibis* 89: 517-518.

Howells,M.J. 1983. The birds of Diego Garcia. *Sea Swallow* 32: 42-47.

Il'ichev,V.D.,Viksne,Ya.A. and Mikhel'son, K.A. 1985. *Migrations of Birds of Eastern Europe and Northern Asia, Gruiformes - Charadriiformes.* Nauka, Moscow.

Irwin,M.P.S. 1981. *The Birds of Zimbabwe.* Quest, Harare.

IUCN Conservation Monitoring Centre. 1984. Directory of Wetlands of International Importance. *Second Conference of Contracting Paeties to the Convention on Wetlands of International Importance Especially as Waterfowl Habitat.* Groningen, The Netherlands.

IUCN. 1985. *United Nations List of National Parks and Protected Areas.* IUCN, Gland, Switzerland, and Cambridge, U.K.

Jensen,R.A.C. 1968. Observations on migrants at Inhaca Island, Mocambique. *Ostrich* 39: 269-270.

Joubert,C.S.W. 1981. The density of shore birds on a Natal sandy beach. *Ostrich* 52: 190-192.

Kazakov,B.A., Belik,V.P., Peklo,A.M. and Tilba,P.A. 1982. Sandpipers (Aves, Charadriiformes) of the northern Caucasus. *Vestnik Zoologii* 6: 37-43.

Kemp,M.I., Kemp,A.C. and Tarboton,W.R. 1985. A catalogue of the birds of the Transvaal. Pretoria: Trsnvaal Museum/Transvaal Nature Conservation Division cyclostyled manuscript.

Kokorev,Ya.I. 1983. Numbers of birds and their energy transformation in the Subarctic tundras of the Taimyr. *In* Ecology and rational use of land vertebrates of north central Siberia. Sbornik Nanchnykh Trudov Sibirsk Otdel. VASKhNIL, Novosibirsk. pp. 109-117.

Laycock,H.T. 1965. Aquatic birds at Blantyre. *Ostrich* 36: 123-180.

Lippens,L. and Wille,H. 1976. *Les oiseaux du Zaire.* Presidency of the Republic of Zaire, Kinshasa.

Liversidge,R. 1958. The bird population of the dams on the Free State goldfields. *Ostrich* 29: 107-109.

Liversidge,R., Broekhuysen,G.J. and Thesen,A.R. 1958. The birds of Langebaan Lagoon. *Ostrich* 29: 95-106.

Louette,M. 1981. *The Birds of Cameroon, an annotated check-list.* Palais der Acadamien, Brussels.

Macdonald,I.A.W., Macdonald,S.A. and Ewbank,D.A. 1985. The avifauna of a small impoundment in southwestern Zimbabwe. *Proc. Symp. Birds & Man. Johannesburg 1983*: 247-265.

Malzy,P. 1965. Aprecu faunistique sur l'ile Juan de Nova. *Oiseau* 35: 152-154.

Malzy,P. 1966. Oiseaux et mammiferes de l'ile Europa. *Memoires Museum National Histoire Naturelle, Serie A. Zoologie* 41: 23-27.

Mann,C.F. 1971. Migration in the Dahlac Archipelago and the neighbouring mainland of Ethiopia, autumn 1962. *Bull. Br. Orn. Club* 91: 41-46.

Marchant,S. 1963. Notes on the winter status of certain species in Iraq. *Ardea* 51: 237-243.

Martin,A.P. and Baird,D. in press Seasonal abundance and distribution of birds on Swartkops Estuary, Port Elizabeth. *Ostrich.*

McLachlan,A., Wooldridge,K., Schramm,M. and Kuhn,M. 1980. Seasonal abundance, biomass and feeding of shore birds on sandy beaches in the eastern Cape, South Africa. *Ostrich* 51: 44-52.

Meininger,P.L. and Mullie,W.C. 1981a. The significance of Egyptian wetlands for wintering waterbirds. Holy Land Conservation Fund, New York, pp. 120.

Meininger,P.L. and Mullie,W.C. 1981b. Egyptian wetlands as threatened wintering areas for waterbirds. *Sandgrouse* 3: 62-77.

Meininger,P.L. Sorensen,V.G. and Atta,G.A.M. 1986. Breeding birds of the lakes in the Nile Delta, Egypt. *Sandgrouse* 7: 1-20.

Middlemiss,E. 1961. Biological aspects of *Calidris minuta* while wintering in south-west Cape. *Ostrich* 32: 107-121.

Milligan,B.S. 1979. Some observations of wader passage on the south Kenya coast during 1978. *Wader Study Group Bull.* 25: 28-30.

Milstein,P.le S. 1975. The biology of Barberspan, with special reference to the avifauna. *Ostrich Suppl.* 10: 1-74.

Milstein,P.le S. 1984. A waterfowl survey of southern Mocambique, with conservation implications. *Proc. 5th. Pan-Afr. Orn. Congr.*: 639-664.

Moreau,R.E. 1967. Water-birds over the Sahara. *Ibis* 109: 232-253.

Moreau,R.E. 1972. *The Palaearctic - African Bird Migration Systems.* Academic Press, London.

Morant,P.D. 1984. Estuaries of the Cape. Part II. Synopsis of available information on individual systems. Report 26: Olifants C.S.I.R. Research Report 425: 1-54. Estuarine and Coastal Research Unit, Stellenbosch.

Mullie,W.C. and Meininger,P.L. 1981. Numbers, measurements and stomach contents of Dunlins, Little Stints and Kentish Plovers from Lake Manzala, Egypt. *Wader Study Group Bull.* 32: 25-29.

Mullie,W.C. and Meininger,P.L. 1983. Waterbird trapping and hunting in Lake Manzala, Egypt, with an outline of its economic significance. *Biol. Conserv.*27: 23-43.

Newton,I.P., Adams,N.J., Brown,C.R., Enticott,J.W. and Fugler,S.R. 1983. Nonmarine vagrant birds at the Prince Edward Islands, June 1981-May 1983. *Cormorant* 11: 35-38.

Paran,Y. and Paz,U. 1978. Autumn migration of water birds on the north coast of Sinai. Poster presented at XVII IOC Berlin.

Pearson,D.J. 1974. The timing of wing moult in some Palearctic waders wintering in East Africa. *Wader Study Group Bull.* 12: 6-12.

Pearson,D.J. 1977. The first year moult of the Common Sandpiper *Tringa hypoleuchos*in Kenya. *Scopus* 1: 89-94.

Pearson,D.J. 1981. The wintering and moult of Ruffs *Philomachus pugnax* in the Kenyan Rift Valley. *Ibis* 123: 158-182.

Pearson,D.J. 1984a. The moult of the Little Stint in the Kenyan rift valley. *Ibis* 126:1-15.

Pearson,D.J. 1984b. Some counts of wintering waders on the south Kenya coast. *Scopus* 8: 93-95.

Pearson,D.J. in press. The status, migrations and seasonality of the Little Stint in Kenya. *Ringing and Migration.*

Pearson,D.J. and Britton,P.L. 1980. Arrival and departure times of Palaearctic waders on the Kenya coast. *Scopus* 4: 84-88.

Pearson,D.J., Phillips,J.H. and Backhurst, G.C. 1970. Weights of some Palaearctic waders wintering in Kenya. *Ibis* 112: 199-208.

Pearson,D.J. and Stevenson,T. 1980. A survey of wintering Palearctic waders in the

southern part of the Kenyan Rift Valley. *Scopus* 4: 59-63.

Pearson,D.J., Backhurst,G.C. and Duffus,W.P.H. in press. Weights, moult and seasonality of Palearctic waders on the southern lakes of the Kenyan rift valley. *Scopus*.

Penny,M.J. 1971. Migrant waders at Aldabra, September 1967-March 1968. *Phil. Trans. Roy. Soc. Lond. B.* 260: 549-559.

Penry,E.H. 1981. Palaearctic migrants at Jwaneng. *Babbler* 2: 16-19.

Petersen,I. and Sorensen,U.G. 1981. Migration studies from the eastern part of the lagoon 'Sabkhet el Bardawil' on the north coast of the Sinai peninsula, 7-30 September 1980. Unpubl. report.

Pinto,A.A.de Rosa. 1983. Ornitologie de Angola. Vol. 1. (Non passeres.) Lisboa: Instituto de Investigazao Cientifica Tropical.

Philippona,J. 1985. Waterbirds at some wetlands in Turkey and Greece, October 1984. WIWO report 3, Zeist, Netherlands.

Pomeroy,C.A. (ed.) 1980. Royal Air Force Ornithological Society Masirah Island Expedition (1979). Unpublished report.

Pringle,J.S. and Cooper,J. 1975. The Palaearctic wader population of Langebaan Lagoon. *Ostrich*46: 213-218.

Pringle,J.S. and Cooper,J. 1977. Wader populations (Chardrii) on the marine littoral of the Cape Peninsula, South Africa. *Ostrich* 48: 98-105.

Prys-Jones,R.P., Prys-Jones,M.S. and Lawley,J.C. 1981. The birds of Assumption Island, Indian Ocean. *Atoll Res. Bull.* 248: 1-16.

Prys-Jones,R.P. and Wilson,J.R. 1986. Migrant and vagrant snipe on western Indian Ocean island. *Bull. Br. orn. Club*106: 9-12.

Puttick,G.M. 1978. The diet of Curlew Sandpiper at Langebaan Lagoon, South Africa. *Ostrich* 49: 158-167.

Puttick,G.M. 1979. Foraging behaviour and activity budgets of Curlew Sandpipers. *Ardea* 67: 111-122.

Puttick,G.M. 1980. Energy budgets of Curlew Sandpipers at Langebaan Lagoon, South Africa. *Est. Coast. Mar. Sci.* 11: 207-215.

Rand,A.L. 1936. The distribution and habits of Madagascar birds. *Amer. Mus. Nat. Hist.* 72: 143-499.

Richardson,M.E. 1984. Aspects of the ornithology of the Tristan da Cunha group and Gough Island, 1972-1974. *Cormorant* 12: 123-201.

Robertson,H.G. 1981. Annual, summer and winter fluctuations of Palaearctic and resident waders (Charadrii) at Langebaan Lagoon, South Africa, 1975-1979. *In* J. Cooper (ed.), *Proceedings of the Symposium on Birds of the Sea and Shore*, Cape Town: African Seabird Group: 335-345.

de Roder,F.E. 1985. Waterbirds on some of Turkey's wetlands, October/November 1983. WIWO report 5, Zeist, The Netherlands.

Roux,J-P. and Martinez,J. in press. Rare, vagrant and introduced birds at Amsterdam and Saint Paul Islands, southern Indian Ocean. *Cormorant*.

Rudebeck,G. 1963. Waders (Charadriiformes: Charadrioidea). *S. Afr. Anim. Life* 9: 454-516.

Ryan,P.G. and Cooper,J. 1985. Waders (Charadrii) and other coastal birds of the northwestern Cape Province, South Africa. *Bontebok* 4: 1-8.

Ryan,P.G., Cooper,J., Hockey,P.A.R. and Berruti,A. 1986. Waders (Charadrii) and other water birds on the coast and adjacent wetlands of Natal, 1980-81. *Lammergeyer* 36: 1-33.

Ryan,P.G., Cooper,J. and Stutterheim,C.J. 1984. Waders (Charadrii) and other coastal birds of the Skeleton Coast, South West Africa. *Madoqua* 14:71-78.

Ryan,P.G., Underhill,L.G. Cooper,J. and Waltner,M. in press. Waders (Charadrii) and other water birds on the coast, adjacent wetlands and offshore islands of the south western Cape Province, summer 1980/81. *Bontebok*.

Safriel,U. 1968. Bird migration at Eilat, Israel. *Ibis* 110: 283-320.

Schiemann,H. 1986. Red-necked Phalarope *Phalaropus lobatus* off the coast of Somalia and Kenya. *Scopus* 10: 42-44.

Schmitt,M.B. and Whitehouse,P.M. 1976. Moult and mensural data of Ruff on the Witwatersrand. *Ostrich* 47: 176-190.

Scott,D.A. and Carp,E. 1982. A midwinter survey of wetlands in Mesopotamia, Iraq: 1979. *Sandgrouse* 4: 60-76.

Searle,W. 1955. The bird-life of the Angolian littoral. *Ibis* 97: 425-431.

Searle,W. 1965. A third contribution to the ornithology of the British Cameroons. *Ibis* 107: 60-94, 230-246.

Shewell,E.L. 1950. Birds of the Gamtoos estuary. *Ostrich* 21: 97-102.

Shirihai,H. 1980. Bird migration in Eilat. *The Society for Nature Protection in Israel*: 1-79.

Siegfried,W.R. 1981. The estuarine avifauna of southern Africa. Pp 223-250 *in* J.H.Day (ed,), *Estuarine ecology with particular reference to southern Africa.* A.A. Balkema, Cape Town.

Skead,D.M. and Dean,W.R.J. 1977. Status of the Barberspan Avifauna, 1971-1975. *Ostrich Suppl.* 12: 3-42.

Smart,I., Miles,G.A. and West,M. 1983. Waders and waterbirds on Dubai Creek. *Wader Study Group Bull.* 37: 29-30.

Smit,C.J. 1986. Wintering and migrating waders in the Mediterranean. *Wader Study Group Bull.* 46: 13-15.

Smith,K.D. 1957.An annotated check list of the birds of Eritrea. *Ibis* 99: 1-26, 307-337.

Stahl,J.C., Weimerskirch,H. and Ridoux,V. 1984. Observations recentes d'oiseaux marins et terrestres visiteurs dans les iles Crozet, sud-ouest de l'ocean Indien. *Gerfaut* 74: 39-46.

Stanyard,D.J. 1978. A summary of Palaearctic waders recorded in northern Botswana. *Wader Study Group Bull.* 24: 26-27.

Staub,F. 1970. Geography and ecology of Tromelin Island. *Atoll Res. Bull.* 136: 197-209.

Staub,F. 1973. Birds of Rodriguez Island. *Proc. Roy. Soc. Arts Sci. Maurit.* 4: 18-59.

Staub,F. and Gueho,J. 1968. The Cargados Carajos Shoals or St. Brandon: resources, avifauna and vegetation. *Proc. Roy. Soc. Arts Sci. Maurit.* 3: 7-46.

Summers,R.W. 1977. Distribution, abundance and energy relationships of waders (Aves: Charadrii) at Langebaan Lagoon. *Trans. Roy. Soc. S. Afr.* 42: 483-495.

Summers,R.W. 1978. Results from dye-marking waders in the south-west Cape. *Ostrich* 49: 48-51.

Summers,R.W. and Cooper,J. 1977. The population ecology and conservation of the Black Oystercatcher *Haematopus moquini*. *Ostrich* 48: 28-40.

Summers,R.W., Cooper,J. and Pringle,J.S. 1977. Distribution and numbers of coastal waders (Charadrii) in the south western Cape, South Africa, summer 1975-76. *Ostrich* 48: 85-97.

Summers,R.W., Pringle,J.S. and Cooper,J. 1976. The status of coastal waders in the south-west Cape, South Africa. Report of Western Cape Wader Study Group, Cape Town.

Summers,R.W., Underhill,L.G., Waltner,M. and Whitelaw,D.A. in press. Population, biometrics and movements of the Sanderling *Calidris alba* in southern Africa. *Ostrich.*

Summers,R.W. and Waltner,M. 1979. Seasonal variation in the mass of waders in southern Africa with special reference to migration. *Ostrich* 50: 21-37.

Summers,R.W. and Underhill,L.G. in press. Factors related to the breding production of Brent Geese *Branta bernicla bernicla* and waders (Charadrii) on the Taimyr Peninsula. *Bird Study.*

Tarr,J.G. and Tarr,P.W. in press. Seasonal abundance and the distribution of coastal birds on the northern Skeleton Coast, SWA/Namibia. *Madoqua.*

Taylor,J.S. 1956. Palaearctic waders in winter at Port Elizabeth. *Ostrich* 27: 110-111.

Taylor,J.S. 1957. Notes on the birds of inland waters in the eastern Cape Province with special reference to the Karoo. *Ostrich* 28: 1-50.

Taylor,P.B. 1979. Palearctic and intra-African migrant birds in Zambia: a report for the period May 1971 to December 1976. *Zambian Orn. Soc. Occ. Paper* 1: 1-169.

Temple,S.A. 1976. Observations on seabirds and shorebirds in Mauritius. *Ostrich* 47: 117-125.

Thomas,T. 1983. Donnees recentes sur l'avifauna des iles Kerguelen, Terres Australes et Antarctiques Francaises. *Oiseau* 53: 113-139.

Traylor,M.A. 1963. Checklist of Angolan birds. *Publ. Cult. Co. Diam. Angola* 61: 12-250.

Tree,A.J. 1971. Notes on Palaearctic migrants in the eastern Cape. *Ostrich* 42: 198-204.

Tree,A.J. 1972a. Single-shelf wader netting. *Safring News* 1: 20-23.

Tree,A.J. 1972b. Mass wintering of palaearctic waders at Lake Ngami, Botswana, in 1970. *Ostrich* 43:139.

Tree,A.J. 1973. Birds on Lake McIlwaine. *Honeyguide* 76: 32-35.

Tree,A.J. 1974. Waders in the Salisbury area 1972/74. *Honeyguide* 80: 13-27.

Tree,A.J. 1976. Waders in central Mashonaland 1974/75. *Honeyguide* 85: 17-27.

Tree,A.J. 1977a. Waders in central Mashonaland 1975/77. *Honeyguide* 92: 31-41.

Tree,A.J. 1977b. Notes on the Ringed Plover *Charadrius hiaticula* in southern Africa. *Safring News* 6: 25-29.

Tree,A.J. 1979a. Biology of the Greenshank in southern Africa. *Ostrich* 50: 240-251.

Tree,A.J. 1979b. Occurrence of the Ringed Plover in Zimbabwe-Rhodesia. *Honeyguide* 100: 14-19.

Tree,A.J. 1980. Migration as an ecological adaptation in Central African Charadrii. *Honeyguide* 102: 16-25.

Tree,A.J. 1982. Greenshank studies. *Safring News* 11: 18-20.

Tree,A.J. 1984. Indian-ringed Ruff in South Africa. *Safring News* 13:39.

Tree,A.J. 1985a. Analysis of ringing recoveries of Ruff involving southern Africa. *Safring News* 14: 75-79.

Tree,A.J. 1985b. Studies of Greenshanks in southern Africa. *Wader Study Group Bull.* 45: 39-40.

Tree,A.J. in press. Ringing recoveries and migrations of Greenshank between Europe and Africa. *Ostrich.*

Tucker,G. 1985. Autumn wader migration in Bahrain. *Wader Study Group Bull.* 44: 30-32.

Underhill,L.G. 1979. The Western Cape Wader Study Group. *Bokmakierie* 31: 82-85.

Underhill,L.G. 1981. A classification of parts of the southern African coastline based on counts of waders (Charadrii). Pp. 315-333 *In* Cooper,J. (ed.), *Proc. Symposium on Birds of the Sea and Shore, 1979.* African Seabird Group, Cape Town.

Underhill,L.G. 1983. CADBANK, a databank of coastal avifaunal censuses in southern Africa. *Safring News* 12: 37-39.

Underhill,L.G. 1986. Counts of waterbirds at Langebaan Lagoon 1975-1986. Report of Western Cape Wader Study Group, Cape Town.

Underhill,L.G. in press a. Changes in the age structure of Curlew Sandpiper populations at Langebaan Lagoon, South Africa, in relation to lemming cycles in Siberia. *Trans. Roy. Soc. S. Afr.*

Underhill,L.G. in press b. Waders (Charadrii) and other waterbirds at Langebaan Lagoon, South Africa, 1975-1986. *Ostrich.*

Underhill,L.G. and Cooper,J. 1984a. Counts of waterbirds on the shoreline of southern Africa, 1976-1984. Report of Western Cape Wader Study Group and Fitzpatrick Institute, University of Cape Town.

Underhill,L.G. and Cooper,J. 1984b. Counts of waterbirds at coastal wetlands in southern Africa, 1976-1984. Report of Western Cape Wader Study Group and Fitzpatrick Institute, University of Cape Town.

Underhill,L.G. and Cooper,J. 1984c. Counts of waterbirds on the offshore islands of southern Africa, 1976-1984. Report of Western Cape Wader Study Group and Fitzpatrick Institute, University of Cape Town.

Underhill,L.G., Cooper,J. and Waltner,M. 1980. The status of waders (Charadrii) and other birds in the coastal region of the southern and eastern Cape, summer 1978/79. Cape Town: Western Cape Wader Study Group.

Underhill,L.G. and Whitelaw,D.A. 1977. An ornithological expedition to the Namib coast, summer 1976/77. Western Cape Wader Study Group, Cape Town.

Van den Berk,V., van den Berk,N., Bijlsma,R.G. and de Roder,F.E. 1985. The importance of some wetlands in Turkey as transient and wintering areas for waterbirds. WIWO report 7, Zeist, The Netherlands.

Van Eyssen,M.L. 1958. Some birds seen on Bazarato Island. *Ostrich* 29: 14-18.

Waltner,M. and Sinclair,J.C. 1981. Distribution, biometrics and moult of the Terek Sandpiper *Xenus cinereus* in southern Africa. Pp. 233-266 *In* Proc. Symposium on Birds of the Sea and Shore, 1979. African Seabird Group, Cape Town.

Watson,G.E., Zusi,R.L. and Storer,R.E. 1963. Preliminary field guide to the birds of the Indian Ocean. Smithsonian Institution, Washington.

Whitelaw,D.A., Underhill,L.G., Cooper,J. and Clinning,C.F. 1978. Waders (Charadrii) and other birds on the Namib coast: counts and conservation priorities. *Madoqua* 2: 137-150.

Williams,A.J. in press,a. Waders (Charadrii) and other coastal birds on islands off the southern Namib coast. *Madoqua.*

Williams,A.J. in press,b. Wetland birds at the Orange River Mouth and their conservation significance. *Bontebok.*

Williams,A.J., Walters,J.P. and Myer,E. in press. Waders (Charadrii) and wetland birds at Luderitzbucht. *Madoqua.*

Wilson,J.R. 1981. Observations of waders at Mogobane Dam, south-east Botswana. *Babbler* 1: 8-11.

Wilson,J.R., Czajkowski,M.A. and Pienkwoski,M.W. 1980. The migraton through Europe and wintering in west Africa of Curlew Sandpipers. *Wildfowl* 31: 107-122.

Winterbottom,J.M. 1936. Notes on birds around Beira in 1935. *Ostrich* 7: 32-38.

Winterbottom,J.M. 1960. Report on the Cape Bird Club vlei counts, 1952-58. *Ostrich* 31: 135-168.