APPENDIX F

SPECIALIST REPORT ON BIRDS

SPECIALIST REPORT ON THE WATERBIRDS OF THE ORANGE RIVER ESTUARY

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IMPORTANCE AND CONSERVATION STATUS

The Orange River Estuary (ORE) has a variety of wetland habitats and supports a high diversity of waterbirds (Grindley 1959; Ryan & Cooper 1985; Williams 1986). It is the sixth most important southern African coastal wetland in terms of the number and diversity of birds supported (Cooper & Hockey 1981; Williams 1986; Turpie 1995; Barnes & Anderson 1998; Simmons *et al.* 1998) and consequently was designated by South Africa in 1991 (and Namibia in 1995) to the List of Wetlands of International Importance under the Ramsar Convention (see Williams 1990). The ORE met several of the standard Ramsar criteria required for designation (Williams 1990): (1) It is an example of a rare and unusual wetland type on the arid and semi-arid coastline of western southern Africa (Noli-Peard & Williams 1991); (2) It supports an appreciable assemblage of rare and endangered bird species, 14 of which are listed in the previous South African (Brooke 1984) or draft Namibian list (Simmons *et al.* in prep). (3) At times it supports more than 20,000 waterbirds (of 50-57 species); and (4) The ORE regularly supports (a) more than 1% of the world population of three species of waterbirds that are endemic to southern Africa (Clancey 1986), namely the Cape Cormorant, Hartlaub's Gull and Damara Tern, and (b) more than 1% of the southern African populations of six species of waterbirds, namely the Black-necked Grebe, Lesser Flamingo, Chestnut-banded Plover, Curlew Sandpiper, Swift Tern and Caspian Tern.

Recently, several studies have confirmed the importance of the ORE as waterbird habitat. Using the data of Ryan & Cooper (1985), Turpie (1995) determined that the ORE ranked 4th (in terms of conservation status and bird abundance index), 5th (in terms of a multiple criteria index), 6th (in terms of a bird rarity index) and 7th (in terms of a bird diversity index) out of 42 estuaries in South Africa. In a recent study Turpie and co-workers (Turpie *et al.* 2002) found that the ORE ranked 7th in terms of conservation importance out of the top 50 South African estuaries.

The ORE is also recognised as one of South Africa's Important Bird Areas, mainly because of the significant populations of waterbirds species which it supports (Barnes & Anderson 1998). These include two nationally threatened and four globally near-threatened waterbird species, three nationally near-threatened waterbird species, and one nationally near-threatened and several range-restricted terrestrial bird species (Barnes & Anderson 1998). This wetland is also a key component of the Sperrgebiet Important Bird Area (Simmons *et al.* 1998). A recent analysis of the austral summer and winter 1997 waterbird survey data for the ORE found that significant proportions of the regional populations of South African Shelduck and Cape Shoveller and globally significant populations of the nominate race of Kelp Gull and Hartlaub's Gull were present during the winter months (Taylor *et al.* 1999). A flaw of Turpie and co-worker's studies were that old

survey data were been used in the analyses, some of which are now more than two decades old (e.g. Ryan & Cooper 1985).

WATERBIRD STUDIES AT THE ORANGE RIVER ESTUARY

Prior to the 1980s, knowledge about the waterbirds of the estuary was based on anecdotal accounts by several visitors to the area (e.g. Plowes 1943; Grindley 1959; Maclean 1960; Courtenay-Latimer 1963; Manry 1978).

Plowes (1943) visited the estuary in 1942 and subsequently compiled an annotated checklist for this site. In July 1956, Grindley (1959) recorded some of the birds present at the estuary. Courtenay-Latimer (1963) recorded the birds at the estuary and surrounding area during three visits, in July 1958, August 1958 and August 1960. Her annotated checklist provides a record of all birds seen from the Holgat River (about 50 km south of the Orange River) to the estuary. Frost & Johnson (1976) and Siegfried & Johnson (1977) provided information about Cape Cormorant breeding events during December 1976 and December 1997. Manry (1978) visited the estuary from 22-28 April 1978 and provided information on the area's birds. Roberts (1989) visited the estuary in August 1988 and made some general observations of the birds that were present. Greig conducted three waterbird surveys at the estuary during 1994 and 1995 (Simmons 1994, 1995).

The first comprehensive waterbird surveys were conducted in January 1980 (Ryan & Cooper 1985) and December 1995 and April 1996 (Williams 1986). Bi-annual surveys have been conducted since December 1995 until present (Anderson *et al.* 2003)

Barnes & Anderson (1998) included reference to the estuary's waterbirds and marine birds in their description of the Orange River mouth as an Important Bird Area. Taylor *et al.* (1999) provided a summary of some of the waterbird surveys that have been conducted at the estuary. Velasquez (1996) studied the effects of aircraft on the estuary's waterbirds. Anderson *et al.* (2003) re-evaluated the Ramsar status of the estuary, using data from recent waterbird surveys.

In various papers on the status of various bird species, there is reference to waterbird and marine bird populations at the estuary (e.g. Crawford *et al.* 1995, Anderson 2000). Barnes (1998) and Anderson *et al.* (in prep) have recorded 187 and 253 terrestrial and waterbird species, respectively, at the estuary and areas to the south.

There are only a few other publications about birds at the estuary. These are mainly checklists for a wider area (for example, Maclean 1960; Winterbottom & Courtenay-Latimer 1961) and surveys along stretches of the Orange River, usually upstream of the mouth (for example, Balme 1991; Allan & Jenkins 1993; Simmons & Allan 2002). There is also reference to a Red-billed Quelea breeding colony in reedbeds just upstream of the estuary (Underhill 1998).

NUMBER OF WATERBIRDS

The number of waterbirds recorded at the ORE has varied considerably since 1980 when the first comprehensive survey was conducted (Ryan & Cooper 1985). The highest number of waterbirds was

recorded during the first survey, January 1980 (21,512 waterbirds; Ryan & Cooper 1985), and second survey, December 1985 (20,563-26,653 waterbirds; Williams 1986). Subsequent surveys, beginning seven years later, never recorded such high numbers. From December 1995 to August 2001 an average of 6873 (±1719SD; n=6) and 5547 (±2039SD; n=7) waterbirds was recorded during summer and winter, respectively; less than a third of early 1980s totals.

Despite this drop in the numbers of birds present, species richness of waterbirds remained relatively constant from 1980 to 2001: an average of 52 species (±5.1SD) was recorded. A total of 87 different waterbird species was recorded during 20 surveys (Ryan & Cooper 1985; Williams 1986; Anderson *et al.* 2003). There are however records of at least another 15 waterbird species being recorded at the ORE since 1964 (Anderson *et al.* in prep). The limited seasonal variation in the species richness is related to the presence of some individuals of the Palaearctic migrants during the winter months. During December 1995, 64 different waterbird species were present, the maximum number of species recorded during any single survey.

A ±74% decline in the number of waterbirds is evident between the January 1980 and December 1985 surveys (Ryan & Cooper 1985; Williams 1986) and the 12 most recent surveys (average of 5909 waterbirds). This is primarily accounted for by the virtual absence of Cape Cormorants and Common Terns during the latter surveys. Cape Cormorants have declined from an average of 6400 (±3861) individuals from January 1980 – January 1994 to 212 (±612) individuals during 16 surveys conducted from April 1994 to August 2001. During this same period, Common Terns have declined from an average of 3928 (±3678) individuals to 425 (±731) individuals. If these two species are excluded from the analysis, a lower appreciable decline between the 1980s (9027.7±4195.6) and the 1990s (4265.3±1853.) is evident.

The number of waterbirds present at the ORE is higher than would be expected (e.g. Barnes & Anderson 1998; Simmons *et al.* 1998) when one considers the general paucity at the ORE of invertebrate fauna, the food of many bird species. The depauperate invertebrate fauna has been attributed to the high turbidity and extreme fluctuations in salinity (Brown 1959). The large number of birds may be attributed to a paucity of other suitable habitat along the Namib Desert coastline between the mouths of the Cunene and Olifants Rivers. The ORE may also be an important staging area for migratory waders along the arid east Atlantic flyway (Barnes & Anderson 1998). Simmons & Allan (2002) estimated that the total number of waterbirds at the ORE exceeds the entire lower Orange River in overall abundance (31-34 birds/10 km).

HABITAT USE BY WATERBIRDS

The birds use a variety of areas of the ORE, but large numbers have been recorded at islets in the river floodplain (Williams 1986), an artificial island in the oxidation ponds (Williams 1986), on the sandspit and exposed tidal sandbank (Grindley 1959; Williams 1986; Anderson *et al.* 2003) and the lower end of the saltmarsh (Anderson *et al.* 2003). During six recent surveys (Anderson *et al.* 2003) the largest proportion of the waterbirds was counted at two wetland areas, namely the saltmarsh (12.1-37.3% of birds counted) and north bank, adjacent islands and Namibian beach area (24.5-44.9% of birds counted). During the latter six surveys the oxidation ponds supported an average of 12.0% (3.2-24.0%) or the ORE's waterbirds. Because of their accessibility, a greater proportion of this site's birds were counted relative to other ORE wetland habitats. These data refute previous suggestions that the oxidation ponds (which are located below the river's high

water mark) support a significant proportion of the ORE's waterbirds. This argument has been used to favour keeping these sewerage ponds within the Ramsar area (Genis 1998). It is also apparent that some of the peripheral wetlands, such as the pink pan and yacht club, support relatively fewer birds, although this does not necessarily warrant exclusion of these habitats from the Ramsar site.

DECLINING NUMBERS OF CAPE CORMORANTS AND COMMON TERNS

Possible reasons for the relatively recent decline in the numbers of Cape Cormorants and Common Terns were discussed in detail by Anderson *et al.* (2003), but in summary suggested that both on-site and off-site factors may be responsible, including the following: (1) depletion of food reserves (Crawford & Dyer 1995; Crawford 1997a, 1999, 2000; Schwartzlose *et al.* 1999), (2) increased disturbance by humans (Cooper *et al.* 1982; Crawford 1997a, 2000), (3) disturbance and trampling by livestock (K. van Zyl pers. comm.), (4) predation and disturbance by feral dogs and cats, (5) change in the architecture of the mouth and islands (Swart *et al.* 1988; Morant & O'Callaghan 1990) with a consequent effect on roost site availability, (6) more suitable roosting sites elsewhere (R.E. Simmons pers. comm.), (7) disease (avian cholera *Pasteurella multocida*) (Crawford *et al.* 1992; Crawford & Dyer 1995), and (8) oiling.

POPULATION TRENDS OF OTHER WATERBIRD SPECIES

Several other waterbird species that were particularly numerous in January 1980 (Ryan & Cooper 1985) have not subsequently attained their original numbers. These include Black-necked Grebe, Great Cormorant and Redknobbed Coot. Several waders too have shown this pattern, with lower numbers of Common Ringed Plover, Chestnut-banded Plover, Common Greenshank, Little Stint, Ruff and Pied Avocet being recorded during the subsequent 19 surveys. The reason for this is unclear, but it could be related to the deterioration of the saltmarsh and the corresponding decrease in available mud-flat habitat for many of these species. Subsequent to 1980 there has, however, not been a significant decline in the numbers of the three main wader groups.

There is no evidence that the numbers of the other important bird species cited by Williams (1986) (Hartlaub's Gull, Damara Tern, Black-necked Grebe, Lesser Flamingo, Chestnut-banded Plover, Curlew Sandpiper, Swift Tern and Caspian Tern) have declined. In particular, the species which would use the saltmarsh (Lesser Flamingo, Chestnut-banded Plover and Curlew Sandpiper) have not shown significant declines. There have in fact been recent increases in the number of Curlew Sandpiper, a species that makes use of the saltmarsh and mudflats. These data suggest that the collapse of the saltmarsh wetland has not significantly affected the overall waterbird numbers. It should not be concluded that the rehabilitation of the saltmarsh would have little impact on the bird population, as the saltmarsh may be important for the functioning of the greater ORE wetland and may thus influence other habitats favoured by birds (Heath 2001). Another consideration is that with the now permanently open river mouth and the resultant tidal influence, extensive areas of shallow mud-flats favoured by wading birds has been maintained.

During the 20 waterbird surveys, 12 different waterfowl species (ducks and geese) have been recorded, with from 7-10 different species being recorded during a specific count. Since January 1995, there has been an increase in the numbers of ducks and geese utilising the ORE. There are two possible reasons

for this observation: (1) an increase in the area under irrigated agriculture, such as at Beauvallon (K. van Zyl pers. comm.) and (2) a halt in the hunting of these birds within the ORE and surrounding area (P. Laubscher pers. comm.). What is noticeable too, is the seasonal change in usage of the ORE by ducks and geese. Fewer waterfowl are present during the winter months, the time of year in this winter-rainfall area when they probably disperse to smaller, ephemeral wetlands.

One of the criteria originally used to designate the ORE as a Ramsar site was that it supported an appreciable assemblage of rare and endangered bird species, 14 of which are listed in either the South African (Brooke 1984) and Namibian (Barnard 1998; Simmons *et al.* in prep) red data books. The South African red data book has subsequently been revised, using the new IUCN criteria (Barnes 2000). Using these new criteria, the ORE now supports 21 red data species, 14 regularly occurring and an additional seven occasionally occurring species (as listed in either Barnes (2000), Barnard (1998), Simmons *et al.* (in prep) or BirdLife International (2000).

THREATS TO THE ORE'S WATERBIRDS

Prior to construction of major impoundments on the Orange River during the late 1960s and early 1970s, the Orange River displayed a distinct seasonal flow pattern characterised by high flow during the summer months and low-flow periods during winter. Regulation of the river by the Gariep and Vanderkloof dams, in order to generate hydro-electric power and satisfy downstream demands for irrigation, has resulted in lower summer and higher winter flows. The elevated winter flow has generally been sufficient to ensure that the factors causing the mouth to close have been dominated by those keeping it open. The result is that the dynamics of the mouth are now largely artificially controlled, and closure of the mouth seldom occurs.

At times, when the mouth has closed, the sandspit has been artificially breached by the Alexkor and Namdeb mining companies, but as the mouth has remained open for at least the past eight years, this has not recently been necessary. With the growth of Oranjemund and Alexander Bay, agricultural lands were established within the flood plain of the river. On the southern bank a levee was built to protect these lands against flooding and a road embankment was built to provide access to the beach. This resulted in the effective isolation of wetland areas on the landward side of these obstructions from any surface flow in the mouth during minor flood events and tidal cycles. The saltmarsh has subsequently become severely degraded (Heath 2001). In order to rehabilitate the saltmarsh it will be necessary to open some of the original flood channels, annually flood the marsh in a controlled way, take steps to minimize the mine dump dust that blankets the vegetation, and possibly re-vegetate the marsh with suitable halophytic plants. In summary, the Orange/Vaal river system is a highly disturbed ecological system, mainly because of extensive regulation and water abstraction, although occasional flooding still occurs (Swart *et al.* 1988). Floods may play an important role in changing the morphology of the ORE and establishing bird roosting and breeding islands. With increased demand for water from this system for human consumption, industrial and agricultural purposes, the ORE will however be placed under increasing stress (O.R.E.T.G. 1989; Noli-Peard & Williams 1991).

During the past 3-4 decades the ORE has been subjected to significant negative anthropogenic influences, which appears to have influenced the number and diversity of waterbirds using this wetland. As a result of this decline in bird numbers, combined with the final collapse of the salt marsh component of the

wetland, South Africa requested the listing of the ORE on the Montreux Record of the Ramsar Convention in 1995 (Cowan & Marneweck 1996). The Montreux Record is a register of Ramsar sites where changes in ecological character have occurred as a result of human interference, and is intended to prioritise sites for positive national and international conservation attention.

Most major ecological problems at the ORE are related to the Orange River's altered flow regime, manifested through lower summer flows, higher winter flows and buffering of small and medium floods (see O.R.E.T.G. 1989). This has had direct and indirect effects on the waterbird habitats at the ORE. Elevated winter flows, which generally prevent the mouth from closing, a general decrease in summer flow and the buffering of small to medium floods have resulted in only occasional flooding of the saltmarsh, resulting in a further deterioration of this habitat. Mining and other human activities have also contributed to the deterioration of the saltmarsh, including the construction of levees and a road to the beach and the coating of vegetation with wind-blown sediments from adjacent mine dumps (Burns 1994). Other factors which have probably impacted the birds at the ORE include (1) recreational activities (fishing, off-road vehicles on the beach) at or in the vicinity of sensitive breeding and roosting sites (see above), (2) disturbance by aircraft (Velasquez 1996), (3) disturbance by cattle and possibly by feral cats and dogs, (4) the hunting of ducks and geese within the Ramsar site and (5) the possible hybridisation of Yellow-billed Ducks *Anas undulata* with exotic Mallards *Anas platyrhynchos*. It is also likely that the current flow regime has prevented the formation of suitable sand bars in the mouth, which would have been used as roosting and breeding sites by cormorants and terns.

Any attempt to restore historical flow patterns of the Orange River in order to restore the ecological character of the ORE should take, amongst others, the following into account:

- Floods may be necessary to scour channels and create and maintain islands, which are important cormorant, tern and gull roosting/breeding sites.
- Back-flooding during summer could flood breeding islands and reedbed roosting sites.
- During certain times of year, certain habitats may be important to groups of waterbirds (such as spring and autumn when Palaearctic migrants use the ORE on their way to/from wetlands in the Western Cape).
- The tidal inflow of water may be important for maintaining wader foraging habitats.
- The maintenance of a diversity of habitats (e.g. mudflats, reedbeds, etc.) will result in a diversity of waterbird species.
- Different waterbird species use wetlands of differing salinity and this should be taken into account when decisions are made regarding the management of the estuary, especially when the mouth is opened/closed.

DOES THE ORE STILL MEET THE RAMSAR CRITERIA?

This assessment of recent survey data has shown that the ORE still meets three of the four Ramsar criteria under which it was originally designated in 1991, and which are listed above. In particular, the ORE continues to support more than 1% of the southern African and global populations of all the waterbird species listed by Williams (1990) under criterion 4. The site no longer regularly supports in excess of 20,000 waterbirds, primarily as a result of the decline in the numbers of Cape Cormorant and Common Tern, and thus presently does not meet criterion 3. The criteria for identifying Wetlands of International Importance have recently been

rationalised (Ramsar Convention Bureau 1999) to a list of eight criteria based on wetland types, species and ecological communities, waterbirds and fish. Of these revised criteria, the ORE currently complies with the following:

Criterion 1: The wetland contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographical region.

The Succulent Karoo Biome, including the southern African west coast, is characterized by a lack of large perennial wetland systems. The ORE is one of the largest perennial and coastal wetlands in a climatic region characterised by average annual precipitation of less than 50 mm per annum and evaporation rates of 2450 mm per annum. The nearest wetlands holding significant waterbird habitat are the Olifants River mouth, some 400 km to the south, and Sandwich Harbour approximately 500 km to the north.

Criterion 2: ORE supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

The ORE supports 14 regularly occurring and an additional seven occasionally occurring bird species listed in the South African (Barnes 2000), Namibian (Barnard 1998; Simmons *et al.* in prep) and international (BirdLife International 2000) red data books. The ORE supports two freshwater fish species appearing on the IUCN Red Data List (Hilton-Taylor 2000), both of which are endemic to the Orange River system – largemouth yellowfish *Barbus kimberleyensis* and Namaqua barb *B. hospes* (Benade 1993; Seaman & Van As 1998). Several other freshwater fishes, endemic to the Orange River system, occur at the ORE, including smallmouth yellowfish *B. aeneus* and Orange River mudfish *Labeo capensis*. The marine white steenbras *Lithognathus lithognathus*, which is listed in the IUCN Red Data List, also occurs at the ORE.

Criterion 3: ORE supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographical region.

The ORE supports several animal species that would otherwise not have been present in this arid region. These include many waterbird species (such as Great White Pelican) and mammals, such as the straw-coloured fruit bat *Eidolon helvum* and the Cape clawless otter, *Aonyx capensis.* Desert-dwelling gemsbok *Oryx gazella* and Common Ostriches *Struthio camelus* are dependent on vegetation on the ORE floodplain during dry periods in the Sperrgebiet interior. The Orange River is a linear oasis through this arid region and may act as an important migration corridor or conduit for many species (Simmons & Allan in press).

Criterion 4: ORE supports plant and/or animal species at critical stages in their life-cycles, or provides refuge during adverse conditions.

The ORE is probably an important staging area for several Palaearctic migrants (such as Curlew Sandpiper, Little Stint and Common Ringed Plover) and intra-African migrant and nomadic waterbird species (such as Damara Tern, Pied Avocet and Lesser Flamingo). It is also a breeding area for several waterbird species, including White-fronted Plover *Charadrius marginatus*, Pied Avocet, Caspian Tern and Hartlaub's Gull, and roosting site for marine-feeding terns and cormorants.

Criterion 6: ORE supports 1% of the individuals in a population of one species or subspecies of waterbird.

The ORE supports more than 1% of the southern African population of 15 species and more than 1% of the global population of seven waterbird species.

MANAGEMENT AND ORNITHOLOGICAL RESEARCH AND MONITORING RECOMMENDATIONS

The listing of the ORE on the Montreux Record obligates the relevant conservation authorities in South Africa to put measures in place, where possible, to restore and maintain the site's ecological character. In the case of the ORE, this translates to the rehabilitation of the saltmarsh and a possible recovery in the numbers of certain species of waterbirds utilising this habitat and other components of the ORE wetland. Various measures can be implemented to improve the situation for waterbirds at the ORE, including: (1) Influencing decision-makers to amend the operating rules of dams, especially Vanderkloof, in order to simulate historical flow regimes, especially the sustained low winter flows required to close the mouth. The concept of the Ecological Reserve – that quantity, quality and timing of flow required to sustain aquatic ecosystem functioning – has been entrenched in South Africa's National Water Act (Act 36 of 1998). Although much work has been done towards determining this Reserve for the ORE (Venter & van Veelen 1996), it has yet to be implemented. A closer resemblance of future flow regimes at ORE to historical patterns will result in the occasional flooding of the saltmarsh, opening and closing of the mouth and establishment of a larger area of mud-flats, all of which will result in additional feeding habitats for birds. (2) Undertake hydrological and botanical studies to determine the feasibility of rehabilitating the saltmarsh and methods required to restore this habitat (this may require opening old river/flood channels, creating additional openings in the road embankment, and re-vegetation). (3) Until there has been an improvement in the ecological status of the ORE, it should remain on the Montreux Record. (4) Determine the locality of key waterbird breeding and roosting areas, especially for Damara Tern, Caspian Tern, Hartlaub's Gull and Cape Cormorants, and prohibit human and livestock access to these areas. (5) Restrict or prohibit illegal activities, including the hunting of waterfowl in the Ramsar site and impose restrictions on aircraft flying over the ORE. (6) Continue bi-annual monitoring of the ORE waterbird population and begin monthly monitoring of key species, such as Great White Pelican, flamingos, and Caspian and Damara Terns. These counts should also be coupled with aerial photography (in order to relate the dynamics of the mouth architecture to bird numbers). (7) Where feasible create artificial roosting and breeding sites for certain bird species, such as Great White Pelican, terns and cormorants, to encourage their return to former numbers. It is anticipated that, if the ORE receives statutory protection from the Northern Cape and Namibian conservation authorities (Heath 2001), the situation will improve for the wetland's waterbirds and it will remain a wetland of international importance.

REFERENCES

Allan, D.G. & Jenkins, A.R. 1993. A count of waterbirds along a section of the lower Orange River. Bontebok 8: 33-34.

Anderson, M.D. 2000. The status of flamingos in the Northern Cape Province, South Africa. Ostrich 71: 431-434.

Anderson, M.D., Kolberg, H., Anderson, P.C., Dini, J. & Abrahams, A. 2003. Waterbird populations at the Orange River mouth from 1980-2001: a reassessment of its Ramsar status. Ostrich 74(3&4): 159-172.

Balme, A. 1991. Birds along the Orange River. Birding in SA 43(2): 37.

Barnard, P. (ed). 1998. Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force. 332 pp.

Barnes K.N. 1998. An assessment of birdwatching-based tourism at the Orange River mouth wetlands and associated Alexkor property, northern Namaqualand. Ornithological Consultants Research Report No. 1. Cape Town: Ornithological Consultants.

Barnes, K.N. 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland. Johannesburg: BirdLife South Africa.

Barnes, K.N. & Anderson, M.D. 1998. Important Bird Areas of the Northern Cape. In: The Important Bird Areas of southern Africa. Barnes, K.N. (ed). pp 103-122. Johannesburg: BirdLife South Africa.

Benade, C. 1993. Studies on fish populations in the regulated Orange River system within the borders of the Cape Province. Unpublished MSc thesis. Bloemfontein: University of the Orange Free State.

BirdLife International. 2000. Threatened birds of the world. Barcelona and Cambridge: Lynx Edicions and BirdLife International.

Branch, W. R. 1988. South African Red Data Book - Reptiles and Amphibians. South African National Scientific Programmes Report. 151. Pretoria: Council for Scientific and Industrial Research.

Bremner, J.M., Rogers, J. & Willis, J.P. 1990. Sedimentological aspects of the 1988 Orange River floods. Transactions of the Royal Society of South Africa 47: 247-294.

Brooke, R.K. 1984. South African Red Data Book - Birds. South African National Scientific Programmes Report. 97. Pretoria: Council for Scientific and Industrial Research.

Brown, A.C. 1959. The ecology of South African estuaries Part IX: notes on the estuary of the Orange River. Transactions of the Royal Society of South Africa 35: 463-473.

Burns, M. 1994. Alexkor Environmental Management Programme Report: Volume Three. Report Number EMAS-C 94037(3). Stellenbosch: Council for Scientific and Industrial Research.

Clancey, P.A. 1986. Endemicity in southern African avifauna. Durban Museum Novitates 13: 245-284.

Cooper, J., Brooke, R.K., Cyrus, D.P., Martin, A.P., Taylor, R.H. & Williams, A.J. 1992. Distribution, population size and conservation of Caspian Tern *Sterna caspia* in southern Africa. Ostrich 63: 58-67.

Cooper, J., Brooke, R.K., Shelton. P.A. & Crawford, R.J.M. 1982. Distribution, population size and conservation of the Cape Cormorant *Phalacrocorax capensis*. Fish Bulletin of South Africa. 16: 121-143.

Cooper, J., Crawford, R.J.M., Suter, W. & Williams, A.J. 1990. Distribution, population size and conservation of the Swift Tern *Sterna bergii* in southern Africa. Ostrich 61: 56-65.

Cooper, J. & Hockey, P.A.R. 1981. The atlas and site register of South African coastal birds, Part 2 – the atlas. Unpublished report, Percy FitzPatrick Institute of African Ornithology. Cape Town: University of Cape Town.

Cordes, I., Crawford, R.J.M., Williams, A.J. & Dyer, B.M. 1999. Decrease of African Penguins at the Possession Island group 1956-1995. Marine Ornithology 27: 129-138.

Courtenay-Latimer, M. 1963. Birds of the State Alluvial Diamond Diggings from Holgat to the Orange River mouth. Annals of Cape Province Museums 3: 44-56.

Cowan, G.I. & Marneweck, G.C. 1996. South African National Report to the Ramsar Convention 1996. Pretoria: Department of Environmental Affairs and Tourism.

Crawford, R.J.M. 1997a. Cape Cormorant *Phalacrocorax capensis*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 32-33. Johannesburg: BirdLife South Africa.

Crawford, R.J.M. 1997b. Swift Tern *Sterna bergii*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 470-471. Johannesburg: BirdLife South Africa.

Crawford, R.J.M. 1999. Seabird responses to long-term changes of prey resources off southern Africa. In: Adams, L. & Slotow, R. (eds). Proceedings of 22nd International Ornithological Congress. Johannesburg: BirdLife South Africa.

Crawford, R.J.M. 2000. Cape Cormorant *Phalacrocorax capensis.* In: The Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland. Barnes, K.N. (ed.). pp 32-33. Johannesburg: BirdLife South Africa.

Crawford, R.J.M., Allwright, D.M. & Heÿl, C.W. 1992. High mortality of Cape Cormorants (*Phalacrocorax capensis*) off western South Africa in 1991 caused by *Pasteurella multocida*. Colonial Waterbirds 15(2): 236-238.

Crawford, R.J.M., Cooper, J. & Dyer, B.M. 1995. Conservation of an increasing population of Great White Pelicans *Pelecanus onocrotalus* in South Africa's Western Cape. South African Journal of Marine Science 15: 33-42.

Crawford, R.J.M., Cooper, J.& Shelton, P.A. 1982. Distribution, population size, breeding and conservation of the Kelp Gull in southern Africa. Ostrich 53: 164-177.

Crawford, R.J.M. & Dyer, B.M. 1995. Responses by four seabird species to a fluctuating availability of Cape Anchovy *Engraulis capensis* off South Africa. Ibis 137: 329-339.

Crowther, J. 1988. Basic physical geography/hydro data for 'estuaries' of the western Cape (CW1-32). NRIO Data Report D8802. Stellenbosch: Council for Scientific and Industrial Research.

Day, J.H. 1981. Summaries of current knowledge of 43 estuaries in southern Africa. pp 251-329. In: Estuarine ecology with particular reference to southern Africa. (ed) Day, J.H. Cape Town: A.A. Balkema.

Del Hoyo, J., Elliot, A. & Sargatal, J. (eds) 1992. Handbook of the birds of the world. Vol. 1. Barcelona: Lynx Edicions.

Dodman, T. & Taylor, V. 1995. African Waterfowl Census 1995. Slimbridge, United Kingdom: IWRB.

Frost, P. & Johnson, P. 1977. Seabirds on the Diamond Coast, South West Africa, December 1976. Cormorant 2: 3-4.

Genis, O. 1998. Die voorkoms van 'n riooldamstelsel in die Oranjeriviermond Ramsarvleiland - bate of las? Unpublished Masters in Environmental Management thesis. Bloemfontein: University of the Orange Free State.

Grindley, J.R. 1959. Birds of the Orange River estuary. Ostrich 30: 127-129.

Heath, R. 2001. Orange River Mouth Development Plan. Unpubl. Report. Auckland Park, South Africa: Pulles Howard & De Lange.

Hilton-Taylor, C. 2000. 2000 IUCN Red List of Threatened species. Gland, Switzerland and Cambridge, UK: IUCN.

Kahl, M.P. 1975. Distribution and numbers – a summary. In: J. Kean Suplaix-Hall (eds). pp 93-102. Flamingos. TAD Poyser: Berkhamsted.

Maclean, G.L. 1960. Records from southern South-West Africa. Ostrich 31: 49-63.

Manry, D.E. 1978. Some seabird observations from the Orange River estuary, South Africa/South West Africa. Cormorant 5: 17-18.

Morant, P.D. & O'Callaghan, M. 1990. Some observations on the impact of the March 1988 flood on the biota of the Orange River mouth. Transactions of the Royal Society of South Africa 47: 295-305.

Noli-Peard, K.R. & Williams, A.J. 1991. Wetlands of the Namib Coast. Madoqua 17: 147-153.

Orange River Environmental Task Group. 1989. Orange River Ecology. Assessment of environmental water requirement for the Orange River mouth. Report on Orange River Environmental Workshop Oranjemund 1989. Pretoria: Bruinette Kruger Stoffberg Inc Consulting Engineers.

Plowes, D.C.H. 1943. Bird-life at the Orange River mouth. Ostrich 14: 123-138.

Ramsar Convention Bureau. 1999. Information Sheet on Ramsar Wetlands (RIS). Gland, Switzerland: Ramsar Convention Bureau.

Roberts, L. 1989. Birds at Alexander Bay. Promerops 189: 6-7.

Rose, P.M. & Scott, D.A. 1997. Waterfowl population estimates. 2nd edn. Wetlands International Publ. 44. Wageningen: The Netherlands.

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

Schwartzlose, R.A., Alheit, J., Bakun, A., Baumgartner, T.R., Cloete, R., Crawford, R.J.M, Fletcher, W.J., Green-Ruiz, Y., Hagen, E., Kawasaki, T., Lluch-Belda, D., Lluch-Cota, S.E., MacCall, A.D., Matsuura, Y., Nevarez-Martinez, M.O., Parrish, R.H., Roy, C., Shust, K.V., Ward, M.N. & Zuzunaga, J.Z. 1999. Worldwide large-scale fluctuations of sardine and anchovy populations. South African Journal of Marine Science 21: 289-347.

Seaman, M.T. & Van As, J.G. 1998. The environmental status of the Orange River mouth as reflected by the fish community. Water Research Commission Report No 505/1/98.

Siegfried, W.R. & Johnson, P. 1977. The Damara Tern and other seabirds on the Diamond Coast, South West Africa, December 1977. Cormorant 3: 13.

Simmons, R.E. 1994. Namibia/Namibie. In: Taylor, V. & Rose, P. (eds). African Waterfowl Census 1994. Slimbridge: The International Waterfowl and Wetlands Research Bureau.

Simmons, R.E. 1995. Namibia/Namibie. In: Taylor, V. & Dodman, T. (eds). African Waterfowl Census 1995. Slimbridge: The International Waterfowl and Wetlands Research Bureau.

Simmons, R.E. 1996. Population declines, viable breeding areas, and management options for flamingos in southern Africa. Conservation Biology 10: 504-514.

Simmons, R.E. 1997. Southern Africa's Lesser Flamingos – a summary. Proceedings of East African Flamingo Workshop. G. Howard (ed). Nairobi: IUCN.

Simmons, R.E. 2000. What is the world population of the Chesnutbanded Plover? Bird Numbers 9: 45.

Simmons, R.E. & Allan, D.G. 2002. The Orange River avifauna: abundance, richness and comparisons. Ostrich 73(3&4): 92-99.

Simmons, R.E., Boix-Hinzen, C., Barnes, K.N., Jarvis, A.M. & Robertson, A. 1998. Important Bird Areas of Namibia. In: The Important Bird Areas of southern Africa. Barnes, K.N. (ed). pp 295-332. Johannesburg: BirdLife South Africa.

Simmons, R.E., Brown, C.J. & Williams, A.J. (in prep). Birds to Watch in Namibia: a red list. National Biodiversity Programme, Ministry of Environment & Tourism.

Simmons, R.E., Cordes, I. & Braby, R. 1998. Latitudinal trends, population size and habitat preferences of the Damara Tern *Sterna balaenarum* on Namibia's desert coast. Ibis 140: 439-445.

Swart, D.H., Morant, P.D., Möller, J.P., Crowley, J.B. & de Wet, A. 1988. A record of events at the Orange river mouth during the March 1988 flood. South African Journal of Science 84: 881-889.

Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. TOTAL CWAC Report: Coordinated Waterbird Counts in South Africa, 1992-1997. Cape Town: Avian Demography Unit.

Tree A.J. 1997a. Chestnutbanded Plover *Charadrius pallidus*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 380-381. Johannesburg: BirdLife South Africa.

Tree A.J. 1997b. Avocet *Recurvirostra avosetta*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 434-435. Johannesburg: BirdLife South Africa.

Turpie, J.K. 1995. Prioritizing South African estuaries for conservation: a practical example using waterbirds. Biological Conservation 74: 175-185.

Turpie, J.K., Adams, J.B., Joubert, A., Harrison, T.D., Colloty, B.M., Maree, R.C., Whitfield, A.K., Wooldridge, T.H., Lamberth, S.J., Taljaard, S. & van Niekerk, L. 2002. Assessment of the conservation priority status of South African estuaries for use in management and water allocation. Water SA 28: 191-205.

Underhill, L.G. 1997. Curlew Sandpiper *Calidris ferruginea*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 418-419. Johannesburg: BirdLife South Africa.

Underhill, L.G. 1998. Redbilled Queleas breeding at the Orange River estuary. Bird Numbers 7(2): 23.

Underhill, L.G. 2000. Damara Tern. *Sterna balaenarum*. In: The Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland. Barnes, K.N. (ed.). Johannesburg: BirdLife South Africa.

Underhill, L.G., Oatley, T.B., & Harrison, J.A. 1991. The role of large-scale data collection projects in the study of southern African birds. Ostrich 62: 124-148.

Underhill, L.G., Tree, A.J., Oschadleus, H.D. & Parker, V. 1999. Review of ring recoveries of waterbirds in southern Africa. Cape Town: Avian Demography Unit, University of Cape Town.

Urban, E.K. 1984. Time of egg-laying and number of nesting Great White Pelicans at Lake Shala, Ethiopia, and elsewhere in Africa. In: Proceedings of the Fifth Pan-African Ornithological Congress. Ledger, J. (ed). Pp 809-823. Johannesburg: Southern African Ornithological Society.

Velasquez, C. 1996. Effects of aircraft on waterbirds on the Orange River estuary. Specialist study#14. Environmental Evaluation Unit. Report No. 1196/158. Deep Sea Mining Environmental Impact Report, Debmarine.

Venter, A. & van Veelen, M. 1996. Refinement of the Instream Flow Requirements for the Orange River and Orange River Mouth. Unpubl. Report. Pretoria: Department of Water Affairs and Forestry.

Williams, A.J. undated. Namib Coast seabird and wetland census – November/December 1993. Unpubl. Report. Cape Town: Cape Nature Conservation.

Williams, A.J. 1986. Wetland birds at the Orange River mouth and their conservation significance. Bontebok 5: 17-23.

Williams, A.J. 1990. Orange River Mouth Wetland. Directory of Wetlands of International Importance Data Sheet. Unpubl. Report. Pretoria: Department of Environmental Affairs and Tourism.

Williams, A.J., Steele, W.K., Cooper, J. & Crawford, R.J.M. 1990. Distribution, population size and conservation of the Hartlaub's Gull *Larus hartlaubii*. Ostrich 61: 66-76.

Williams, A.J. & Underhill, L.G. 1997. Common Tern *Sterna hirundo*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 57-59. Johannesburg: BirdLife South Africa.

Williams, A.J. & Velásquez, C. 1997. Lesser Flamingo *Phoeniconaias minor*. In: The atlas of southern African Birds. Vol 1: Non-passerines. Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds), pp 114-115. Johannesburg: BirdLife South Africa.

Winterbottom, J.M. & Courtenay-Latimer, M. 1961. A list of the birds of Little Namaqualand. South African Avifauna Series 1: 1-46.