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Waterbirds around the world

A global overview of the conservation,
management and research of the
world's waterbird flyways

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Conservation dilemmas for intra-African migratory waterbirds

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ABSTRACT

Africa is a vast and diverse continent, rich in coastal and inland wetlands, permanent and temporary, tropical and temperate. Waterbirds in Africa have developed diverse strategies to exploit this wetland diversity. Some species are largely sedentary, especially those in relatively static tropical climates. However, most demonstrate movements in response to changing seasons and environmental conditions. The onset of rain is an important trigger for migration within Africa. Some waterbirds are harbingers of the rainy season, whilst others follow in the wake of rain. However, levels and timing of rain can be unpredictable, and rain may not fall at all in some years. When rain falls in arid and semi-arid areas, productive temporary wetlands can appear overnight, and attract large numbers of waterbirds, many of which display some nomadic tendencies. This unpredictability presents difficult management scenarios. Overall, waterbird movements within Africa are poorly understood, and there are few clearly identifiable “named” flyways. This directly limits our abilities to conserve waterbirds in Africa, and to implement the African-Eurasian Migratory Waterbird Agreement. It will take major resources and many years before we have clear pictures of waterbird movements within Africa. Yet conservation measures are needed now, especially for those species in decline.

INTRODUCTION

This paper constitutes a desk-study review of the movements of waterbirds within Africa, drawing on published references, analyses of African Waterbird Census (AfWC) data and observations. As these movements are poorly understood, we aim to illustrate some intra-African migratory strategies and behaviours, and use these to draw up recommendations for conservation purposes and, in particular, improved implementation of the African-Eurasian Migratory Waterbird Agreement (AEWA) in Africa.

METHODS

The methodological process of the review was to identify potential conservation dilemmas for migratory waterbirds in Africa and, as far as possible, to illustrate in the “results” the migratory strategies adopted by waterbirds in relation to these dilemmas and to Africa’s geography and climate, whilst the focus of the discussion is on drawing up recommendations. However, the first dilemma concerns definitions, and is best considered under the methodology.

Dilemma 1: Definition disorders

Waterbird: The Convention on Wetlands (Ramsar, 1971) defines “waterfowl” as species of birds that are ecologically dependent upon wetlands, and “waterbird” as being synonymous with “waterfowl” (Wetlands International 2002). Rose & Scott (1994) define “waterfowl” more precisely as all species of 32 families,

essentially comprising the main waterbird groups falling between the Gaviidae (divers) and the Rynchopidae (skimmers) following the traditional sequence of bird families (Morony *et al.* 1975). This group of families is noted, non-exclusively, by the Convention on Wetlands for application of waterbird criteria, although not all their members are wetland-dependent, such as the Crowned Plover *Vanellus coronatus* and coursers. Conversely, there are wetland-dependent birds in other families, such as the Osprey *Pandion haliaetus*, and some kingfishers, coucals and warblers.

Migration, nomadism and “wintering”:

Using the definition of the Convention on the Conservation of Migratory Species of Wild Animals, “migratory species” refers to “the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries”. In terms of migratory waterbirds, the northwards and southwards movements of birds breeding in the Northern Hemisphere during the northern summer and spending the northern winter further south are arguably the most clearly understood and fit within this definition very well. Intra-African movements are often less clear, as they are sometimes neither cyclical nor predictable. Several species usually referred to as “migrants” in Africa are essentially “nomads” or “dispersers”, whilst many often described as “residents” do perform regular migrations within Africa. Waterbirds have developed a range of strategies to survive Africa’s changing seasons and to exploit temporary habitats, most usually linked to rainfall.

The term “migratory species” can also be misleading, as some species have both discrete migratory and sedentary populations. An example is the Eurasian Spoonbill *Platalea leucorodia*, which has four populations occurring in Africa. Two are migratory populations breeding in Europe and spending the northern winter in Africa, whilst there are also two (largely) resident populations, *balsaci* in coastal Mauritania and *archeri* in the Red Sea and Somalia.

Intra-African migration is generally accepted to refer to movements within Africa. In this paper, intra-African migration is considered as “the movement of birds within Africa and around its coastline according to local triggers and continental weather patterns, especially rainfall”. Movements between the African continent and its outlying islands are also considered here.

Nomadism is displayed by animals that move irregularly; nomads are wanderers, though their movements away from and to particular areas may be predictable, usually relating to climatic conditions.

“Wintering” is a term that is widely used to describe birds temporarily residing in areas during winter, usually the northern

winter. It is often more widely applied, such that “wintering areas” are taken to be the main places of residence when not breeding. As there are two winters in Africa (north and south of the equator) and no winter at all in the tropics, the term is very misleading in an African context, where most movements of birds bear no relation to winter as such. “Non-breeding” is proposed here as an alternative term for “wintering”.

RESULTS

Dilemma 2: Complicated arrows (diverse migratory behaviour)

Familiar flyway maps depict migratory routes, mostly in north-south directions and often reasonably well-defined and characterized by bottlenecks, such as the Straits of Gibraltar, coastlines, such as the East Atlantic Flyway, and major rivers, such as the Nile. By comparison, intra-African movements are more complex, with “arrows” in all directions. Some movements occur across a broad front, some are “one-way tickets”, some are of greatly varying lengths, whilst some species disperse widely in a wide range of directions. Recoveries of the Red-billed Teal *Anas erythrorhynchos* ringed in southern Zambia, for instance, are from further north in Zambia, west in Namibia, south in South Africa and Botswana, and east in Zimbabwe (Dowsett & Leonard 2001). Complex movements like these present difficult challenges for waterbird conservation, such as the identification of key sites for different stages in the life cycle.

The main causal factor for waterbird movements within Africa is the availability of food and water, which is principally affected by the climate, notably rainfall. Marine productivity also affects food availability for coastal species. Other factors, such as breeding, altitude, moulting and fire, are all important parts of “the migration equation”, but mostly relate to the underlying importance of food availability. There are several different “migratory behavioural types”:

- **Local movers / short-distance migrants.** Some waterbirds move relatively short distances between a network of key sites. Their migrations are fairly regular and predictable. An example is the sub-population of the Black Crowned Crane *Balearica pavonina* breeding in marshy floodplains of the Casamance of southern Senegal between August and November, then migrating to wetlands of Guinea-Bissau, where numbers peak in January (Diagana *et al.* in prep.).
- **Rains migrants / arid migrants.** This group includes a large number of species for which rainfall or, conversely, dwindling water resources are the principal triggers for movement, as discussed below (Dilemma 3).
- **Nutrition migrants / post-roost dispersers.** Some waterbirds share common night roosts and disperse widely by day in search of food. White Pelicans *Pelecanus onocrotalus* can cover large distances during a single day: in some areas, their roosts may be far from any water source. They are essentially day migrants, flying to distant wetlands daily from secure roosts or breeding colonies. Some large White Pelican roosts or breeding sites, however, are found very close to their main feeding areas, such as those in the lower Senegal Valley, so the need for undisturbed roosts may be the principal factor behind their migratory behaviour.
- **Post-breeding dispersers.** Many birds disperse after breeding and also fall into other “migration categories”, such

as rains migrants. Some, however, disperse widely away from breeding sites in different directions, an example being the Grey-headed Gull *Larus cirrocephalus*. Ringing recoveries from birds ringed at colonies in South Africa (on the eastern Witwatersrand) show striking dispersal, with movements to Mozambique, Zimbabwe, Zambia, Botswana, Namibia and Angola, and within South Africa to the south-west and east coasts (Underhill *et al.* 1999). It is hard to determine if these constitute migratory movements, as it is not clear if the same birds are returning to breed in the area or colony where they were themselves born.

- **Nomads.** True nomads are not migrants, as they do not move in a cyclical or predictable manner. However, some nomadic movements are predictable to a certain extent, in that they are usually in response to, often irregular, climatic or environmental conditions, for instance in semi-arid areas with irregular rainfall. In such areas, temporary wetlands may attract large numbers of waterbirds, even when they only appear every few years. The Lesser Flamingo *Phoenicopterus minor* can be considered as a nomad, with birds in eastern Africa moving frequently and unpredictably between a series of known key sites in the Rift Valley, as demonstrated by Childress *et al.* (2006).
- **Altitudinal migrants.** Some waterbirds, particularly in eastern Africa, are at least partial altitudinal migrants. One example is the (Eastern) African Snipe *Gallinago nigripennis aequatorialis*, which breeds in highland bogs up to 4 000 m above sea level, from where altitudinal migration takes place to lower-lying and warmer areas during the non-breeding season (Gichuki *et al.* 2000).
- **Environmental response migrants.** Some waterbirds move opportunistically as a result of, sometimes irregular, environmental conditions and local habitat changes. Apart from rainfall, other environmental conditions such as fire and locust eruptions can precipitate movement. Movements of the Lesser Black-winged Lapwing *Vanellus lugubris*, for instance, may in part be dictated by brush fires in some areas, which cause new grass growth suitable for nesting (Urban *et al.* 1986).

Dilemma 3: Complex rain patterns

The main trigger for intra-African migration of waterbirds is food availability in relation to rainfall. In Africa, rainfall derives primarily from the Inter-Tropical Convergence Zone (ITCZ), where moist maritime air meets dry continental air, along which rain then falls on a broad front (Jones 1995). The movement of the ITCZ north and south across the equator gives rise to the annual pattern of rainy seasons. In general, the broad rainy season north of the equator, including the Sahel zone, is between May and November, and in southern Africa between November and April, with rain in equatorial regions occurring all year round and with a pattern of variable twin rains in eastern Africa (Fig. 1). However, rainfall is not always regular, nor is it reliable in its duration and amount. Sometimes there is no rain at all in semi-arid and arid areas, such as south-western Africa. Rainfall is the major trigger for migration, and some species are trans-equatorial migrants, such as Abdim's Stork *Ciconia abdimi*, which leaves the Sahel after rains and visits eastern and southern Africa as rains begin.

Direct effects of local rainfall are particularly apparent in semi-arid areas, for instance the filling of ephemeral wetlands in

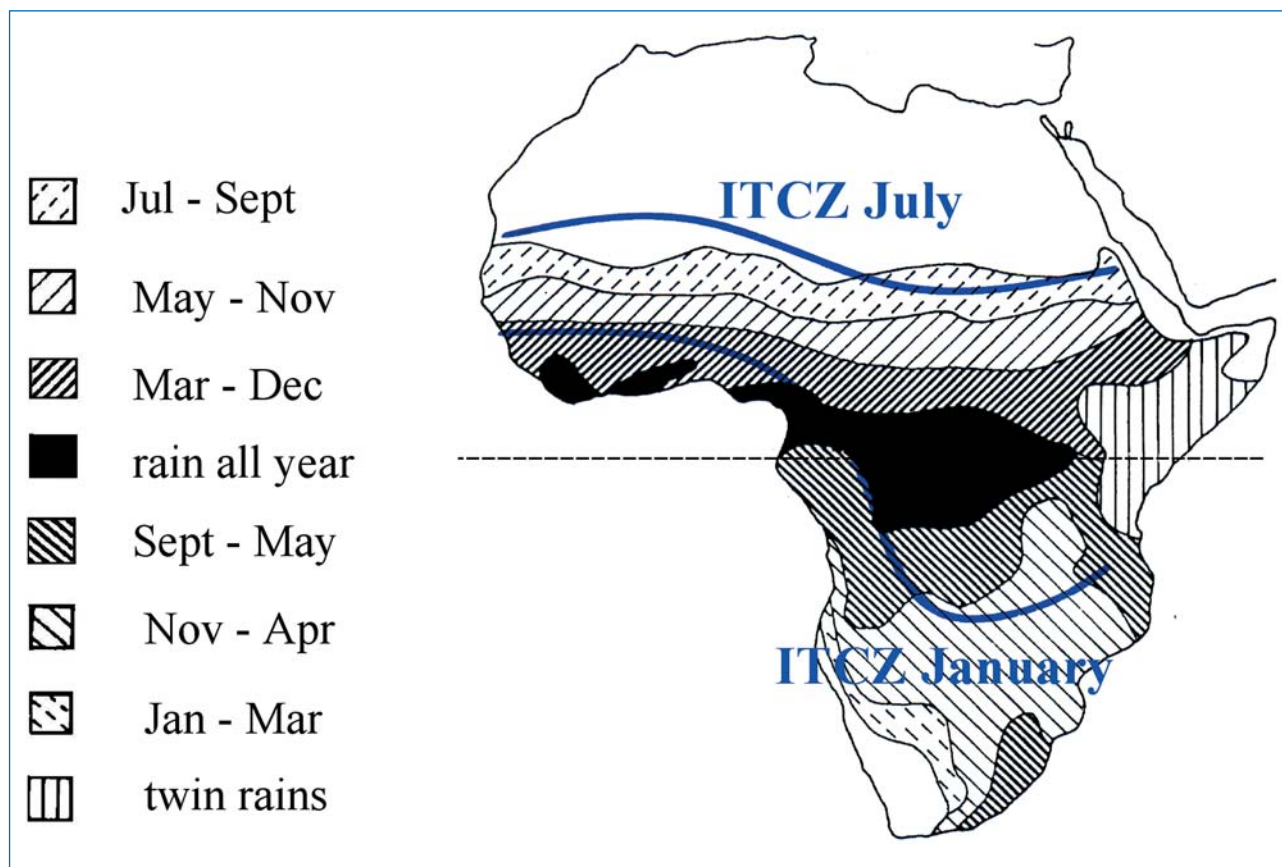


Fig. 1. The timing and duration of rainfall in sub-Saharan Africa (Jones 1995). The thick lines show the July (northern midsummer) and January (northern midwinter) positions of the Inter-Tropical Convergence Zone (ITCZ).

semi-arid Namibia and Niger. In Namibia, widespread rains reduce bird numbers at permanent wetlands, when birds disperse widely to newly flooded parts, whilst some breed opportunistically as wetlands fill up. This occurred in 1996/97, when the Common Coot *Fulica atra*, Lesser Moorhen *Gallinula angulata*, Whiskered Tern *Chlidonias hybridus* and Black-necked Grebe *Podiceps nigricollis* bred *en masse* at Nyae Nyae Pan in central north-east Namibia (R. Simmons in Dodman *et al.* 1997). Several species of wetland birds in Namibia directly follow rain fronts, descending onto pans as they fill (Simmons *et al.* 1999). In Niger, isolated temporary wetlands provide an important resource for waterbirds, with the smaller lakes usually having a higher nutrient load and supporting high densities of waterbirds as they gradually dry out (Mullié *et al.* 1999).

Another feature of rainfall that drives the movements of waterbirds is the cycle of flooding and changing water levels of riverine wetlands. This is particularly important in floodplain areas, such as those found on the Niger, Nile and Zambezi rivers. The flooding patterns do not relate so much to local rainfall as rainfall in the headwaters and wider catchments of the rivers. The effect is particularly strong on the middle stretches of the Nile and Niger rivers, where rainfall in the Sahel zone is limited, whilst rainfall in the upper reaches of these rivers is much more significant. This effect of “indirect rain” is important in understanding the movements of birds into and out of extensive wetlands such as the Inner Niger Delta. Here, peak floods occur between November and January (Zwarts & Diallo 2002), several months after the period of peak rainfall from June to August in the upper reaches of the Niger River in Guinea.

Diverse rain triggers waterbird movements

Within this dynamic picture of rainfall in Africa, there are different triggers for the movements of waterbirds. These include:

- **Sudden availability of productive wetlands.** This is usually caused by direct rainfall, and is particularly apparent in semi-arid areas, with filling of ephemeral wetlands. Many prey items for waterbirds are prolific at the onset of rains, and ephemeral wetlands can support high biomass densities. In Niger, for example, small lakes tend to have the highest fish production and highest densities of waterbirds (Mullié *et al.* 1999).
- **Rising water levels / flooding.** Rising water levels are attractive for some floodplain waterbirds, especially those that feed on wetland plants and on prey items in swamps. The inundated wetlands and rice-fields of Guinea-Bissau are attractive for some Palearctic migrants such as the Black-tailed Godwit *Limosa limosa*, but they also support good numbers of intra-African migrants, notably herons, egrets, rails and Black Crowned Cranes (Dodman *et al.* 2004). The Wattled Crane *Grus carunculatus* also favours floodplains; its diet includes the tubers of floodplain plants (Meine & Archibald 1996). Conversely, rising water levels drive some waterbirds out of wetlands, especially shorebirds, which lose the habitat of exposed mud or lake edge. Almost the entire Zambian population of Kittlitz’s Plover *Charadrius pecuarius* leaves during high floods (Urban *et al.* 1986), when its preferred semi-arid floodplain habitat becomes inundated.

- **Falling water levels / edge effects.** As dry seasons set in or as floods of major rivers recede, many wetlands start to shrink. This provides rich new food sources for many waterbirds, as previously unobtainable mud-dwelling invertebrates become exposed and as nutrient loads in smaller wetlands increase. As waters gradually recede, feeding conditions are optimal for birds which forage at the water's edge, and wader densities in particular can increase. Predatory species such as the Great Cormorant *Phalacrocorax carbo* and Marabou Stork *Leptoptilos crumeniferus* are attracted to shrinking pools, where concentrations of prey, such as catfish, can become very high. Water levels fall in the Inner Niger Delta mainly between January and April (Zwarts & Diallo 2002), providing optimum feeding conditions for several species of Palearctic-breeding waders. Some intra-African migrants also start to increase in number in the delta from February/March as floods recede, as detailed in van der Kamp & Diallo (1999): Kittlitz's Plover colonizes the dried flats, where it breeds, whilst the Spur-winged Plover *Vanellus spinosus* appears almost as soon as floods start to recede.
- **Lack of rain / increasing aridity.** In semi-arid areas where there are limited permanent water sources such as larger rivers, wetlands are only available for a relatively short period. When these ephemeral wetlands finally dry up, there can be a sudden exodus of waterbirds. In such cases, it is the prevailing arid conditions that act as the trigger for migration, not the onset of rains elsewhere. Some birds exploit the last shrinking wetlands until they dry up completely. There are several ephemeral pools in Botswana's Makgadikgadi System, including Rysana Pan. In January 2001, this pan was dry except for ten remnant pools; some of the last birds to leave here were Kittlitz's Plover, Chestnut-banded Plover *Charadrius pallidus*, Caspian Plover *Charadrius asiaticus* and Little Stint *Calidris minuta*, whilst a pair of South African Shelducks *Tadorna cana* still remained at one dwindling pool (Tyler 2001).

Most of the main rains/water-related triggers for migration, such as flooding, falling water levels and direct rainfall, can thus serve as instigators of arrival or departure. This may be illustrated by comparing the movements of two storks: Abdim's Stork and the African Openbill *Anastomus lamelligerus*. Both are trans-equatorial migrants. Abdim's Stork breeds in the Sahel belt of west-central Africa between May and August and migrates after breeding to eastern and southern Africa, stopping en route in productive feeding areas. Popular migration routes and key non-breeding sites have recently been described by Peterson *et al.* (in press), who tracked storks moving from breeding areas in Niger across to north-west Tanzania and further south, eventually moving back, following the rains north, to the same area to breed. Conversely, the African Openbill breeds mainly in southern and eastern Africa, usually late in the rainy season and into the dry season, with some thence migrating north of the equator, where it is mainly a dry season visitor, arriving after the rains and staying for a good part of the dry season. It also has some irregular mass migrations. The preferred food of Abdim's Stork is grasshoppers, whilst the African Openbill feeds almost exclusively on snails and freshwater mussels. Optimal feeding conditions for Abdim's Stork

are during wet periods, when there is plenty of food available in grasslands and floodplains. It pays for this stork to leave its breeding area as food resources become scarcer during the dry season, and to move into areas just as rains begin. However, for the African Openbill, molluscs are more readily available well into the rainy season and as wetlands start to recede.

One species that is often quick to exploit productive wetlands is the Fulvous Whistling Duck *Dendrocygna bicolor*, which can appear periodically in very large numbers, suggesting that it is highly mobile (Scott & Rose 1996). Whistling-ducks display semi-nomadic tendencies, exploiting diverse wetland habitats such as floodplains, coastal lagoons and ephemeral wetlands, congregating at large wetlands for moulting and feeding. The White-faced Whistling Duck *D. viduata* is also regular within the forest block. The importance of the forest block of Central Africa as a refuge and stopover zone for intra-African migrants is poorly understood.

Dilemma 4: Divergent coastal movements Madagascar-Africa migration

A handful of birds migrate between continental Africa and Madagascar. Two are of particularly unfavourable conservation status. The Madagascar Squacco Heron *Ardeola idae* leaves Madagascar around April after breeding and heads for southern and central-southern Africa, where it is mainly present during the dry season. It has declined dramatically, possibly due to competition with the Squacco Heron *A. ralloides*, which appears to be spreading in Madagascar and is more adaptable to man-made habitats (Morris & Hawkins 1998). The Madagascar Pratincole *Glareola ocularis* migrates to coastal eastern Africa, where it is mainly present from April to September. It breeds mostly in eastern Madagascar and migrates to Madagascar's west coast, before uplifting for coastal Tanzania, thence moving along the coastal belt of Kenya to southern Somalia. As the only pratincole to occur in Madagascar, its migratory behaviour may have originated in Africa, in pursuit of suitable breeding localities. Whatever the reason, it is a species in decline (Dodman 2002) and in need of conservation action at key non-breeding sites and in breeding areas.

The Madagascar Teal *Anas bernieri*, however, is a short-distance migrant within Madagascar. After breeding in the mangroves of western Madagascar, this globally threatened duck moves to secluded areas for the moult, and then to wetland refugia during the dry season (Young 2004, 2006); conservation measures must take account of the networks of sites essential to the teal during the different stages of this annual cycle.

Coastal migration

There are divergent movements of waterbirds all around Africa's coastline, with varying patterns in West Africa, the Red Sea, the Mediterranean and the Mozambique Channel; but what are the main triggers for movement? A key factor affecting the distribution of many species is the availability of suitable breeding areas. Movement is mainly governed by marine productivity and the life cycles of pelagic fish, with breeding occurring when feeding conditions are optimal near breeding islands, and with subsequent dispersal afterwards in pursuit of profitable feeding areas. The Royal Tern *Sterna maxima* depends on a range of breeding sites in West Africa, mostly low-lying sandy islands, where it breeds in May. Yet estuarine systems and off-shore

sandy archipelagos are fairly dynamic, and some breeding islands may disappear completely in strong seas, as happened recently in Guinea (N. Keita pers. comm.). However, as the terns depend on a network of sites, they can breed elsewhere within a similar area. Indeed, there are regular fluctuations in breeding numbers at several sites monitored in Senegal, The Gambia and Mauritania (Veen *et al.* 2003). After breeding, the terns disperse along the coast. The Caspian Tern *S. caspia* also breeds on similar islands off West Africa, although it differs in having an extended breeding season, enabling birds to be much more flexible in their annual life cycle. Annual variations in timing of breeding of the Roseate Tern *S. dougallii* and Lesser Noddy *Anous tenuirostris* on Aride Island, Seychelles, reflect the unpredictability of food supplies at the start of the breeding season (Ramos & Monticelli in press).

DISCUSSION

Conservation management dilemmas

There are a number of difficulties in attempting to manage migratory species and to maintain populations in a healthy conservation status. Such challenges have been widely discussed in the past, and indeed formed the bedrock of international co-operation that led to the creation of the Ramsar Convention on Wetlands. More recently, the AEWA was launched as another vehicle for international co-operation. However conservation of intra-African migrants presents additional difficulties, in particular:

- Many African flyways are diffuse, and not easy to specify.
- Some sites are only important irregularly, e.g. once every few years, especially temporary wetlands.
- Site networks are not always obvious, and may include large numbers of small wetlands or sites that are not used regularly.
- Several species exploit wetlands at different periods and for different reasons, such that sites cannot be maintained in a constant state; rather it is important to permit natural flooding and other cycles.
- Many waterbirds are nomadic and are not faithful to specific routes or annual seasons.
- It is difficult to monitor intra-African migrants: current procedures under the AfWC focused on co-ordinated bi-annual censuses are not effective enough in identifying migratory strategies.
- On a practical level, there are low resources and capacity for conserving intra-African migrants, whilst other issues also influence monitoring, such as inaccessibility and security.

Recommendations for the conservation of intra-African migrants

The high diversity of “movement strategies” of African waterbirds and the often limited ability to predict movements render their management and conservation quite difficult. The life cycles and movements of most African waterbirds are not precisely known, and the networks of key sites not well determined. In light of this, and taking account the issues summarized above, the following recommendations are proposed:

- 1 Improve our knowledge of the status of African waterbirds and their migratory patterns through:
 - Applied research of weather patterns, site conditions and waterbird seasonality;
 - Extending the AfWC to other seasons and other areas;
 - Use/analysis of existing AfWC and other data to identify site linkages and migratory patterns;
 - Increased adoption of satellite telemetry;
 - Initial conservation focus on a series of “high profile species”;
 - Monitoring, research and conservation of threatened species;
 - Development of AFRING (African bird ringing scheme).
- 2 Identify key sites and site networks for intra-African migrants, especially threatened species.
- 3 Develop Species Action Plans for African waterbirds.
- 4 Promote increased focus on intra-African migrants in the implementation of the AEWA.
- 5 Adopt a precautionary principle; it is often necessary to implement conservation action before knowing the full picture.
- 6 Enhance awareness of African waterbirds, especially their values and ecological roles.
- 7 Highlight the plight and lack of knowledge of threatened African waterbirds.
- 8 Mobilize resources for conservation and monitoring of intra-African migrants, especially through development and subsequent implementation of a Conservation Strategy for African Waterbirds.

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Both humans and waterbirds depend on healthy wetlands. Sudan. Photo: Niels Gilissen - MIRATIO.