GREATER FLAMINGO | *Phoenicopterus roseus (Phoenicopterus ruber)*

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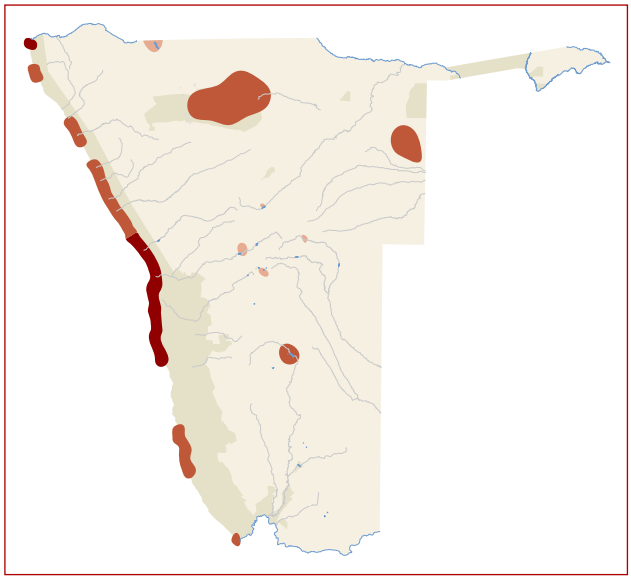
Conservation Status:	Vulnerable
Southern African Range:	Namibia, Botswana, South Africa, Zimbabwe, Mozambique
Area of Occupancy:	61,300 km^2
Population Estimate:	41,000 to 51,000 adults
Population Trend:	Stable to moderately increasing after a long-term decline
Habitat:	Coastal lagoons, flooded salt pans, farm dams
Threats:	Low breeding frequency and success, water abstraction, reduced rainfall, pesticides, hydrogen-sulphide eruptions, collisions with power lines, disturbance by aircraft



DISTRIBUTION AND ABUNDANCE

Greater Flamingos are widely distributed from southern Europe to southern Asia and throughout sub-Saharan Africa, with African core populations in Mauritania and Senegal (Johnson & Arengo 2001), East Africa (Nasirwa 1997) and southern Africa (Simmons *et al.* 2001a). It is concentrated at flooded salt pans during the breeding season and at coastal bays during the non-breeding season. In Namibia, Walvis Bay and Sandwich Harbour regularly support more than half of the southern African population (Kolberg 2012a); coastal wetlands and bays associated with river mouths and the Lüderitz peninsula frequently host small numbers of birds. Further inland, it is most numerous at Lake Oponono and the Etosha and Tsumkwe Pans (Williams & Velásquez 1997a), but is also found on farm dams that are scattered throughout the Namibian interior. The southern African population only attempts to breed regularly and in large numbers at Etosha Pan in Namibia and at the Makgadikgadi Pans (including Sua Pan) in Botswana (Simmons 1996), with smaller, often unsuccessful attempts recorded sporadically elsewhere (Uys *et al.* 1963, Porter & Forrest 1974, Anderson 2000i, R Braby pers. obs.). It occupies an area of 61,300 km^2 in Namibia, mainly in coastal regions; more than a third of this falls within protected areas (Jarvis *et al.* 2001).

A large proportion of the southern African population of this sporadically nomadic species may congregate in Namibia, for example in March 1999, when 51,000 birds were recorded in Namibia out of an estimated total southern African population of 59,300 (Simmons *et al.* 2001a). Up to 27,000 pairs on nests have been recorded on Etosha Pan (Berry 1972). Numbers of non-breeding birds at coastal locations fluctuate between seasons and years; a maximum count of nearly 43,700 birds was recorded at Walvis Bay in July 2004 (Kolberg 2012a).

ECOLOGY

The Greater Flamingo prefers less saline habitat than the Lesser Flamingo *Phoeniconaias minor*, including recently flooded salt pans, river mouths, coastal bays, sewage works and inland dams (Simmons 2005c). Breeding occurs on raised islands on the flooded salt pan at Etosha in large colonies that are far out on the salt pan; colonies may comprise several thousands of nests, often in mixed colonies with Lesser Flamingos (Berry 1972, W Versfeld unpubl. data). Egg-laying is induced by extensive flooding, and sustained high water levels increase chances of success (Cezilly *et al.* 1995, Simmons 2000, McCulloch & Irvine 2004). At Etosha Pan, laying typically starts when annual rains exceeds 400 mm (Berry 1972), usually in February and March, but as early as November (Berry 1972, Simmons 1996) and as late as May (Childress *et al.* 2008). By contrast, the Lesser Flamingo lays mainly in May and into June (Brown *et al.* 2015). Success tends to be greater when rainfall exceeds 440 mm (Simmons 1996); receding pan water reduces food supplies and increases predation, leading to mass breeding failure (Berry 1972, Berry & Berry 1976, Simmons 1996). Breeding frequency and success at Etosha Pan are low. Between 1956 and 1995, Greater and Lesser Flamingos attempted to breed there on 17 occasions and only succeeded five times. Two subsequent significant breeding attempts produced 5,000 fledged chicks in 2000 (TO Osborne, RE Simmons pers. obs.) and another 5,000 in 2004 (C Brain, W Versfeld pers. obs.). A breeding attempt by fewer than 100 birds at a site near Swakopmund failed because of jackal predation (R Braby pers. obs.).

The Greater Flamingo feeds by wading in shallow water with the bill upside down, filtering small crustaceans and other invertebrates from the water column and mud. It mainly takes saline lake crustaceans such as fairy shrimps (e.g. *Artemia* spp. and *Branchinella* spp.), brine flies (*Ephydra* spp.) and marine benthic organisms such as molluscs and diatoms (Berry 1972, del Hoyo *et al.* 1992, G McCulloch unpubl. data).

THREATS

Despite their longevity, the naturally low breeding frequency and success, with a recruitment rate estimate of 0.04 to 0.053 young per pair per year for the Greater Flamingo and Lesser Flamingo combined, are too low to sustain the southern African population of the Greater Flamingo (Simmons 1996). Recruitment rates may be further impacted by a possible reduction in eastward water inflow onto Etosha Pan from the Omuramba (an ephemerally flowing shallow drainage area) Omatako due to the mining of aquifer water outside the park (Christelis & Struckmeier 2001). At the only other main breeding site in southern Africa, Sua Pan in Botswana, soda ash mining around the

site may reduce water levels in the pan. Reduced rainfall, predicted for large parts of southern Africa under global warming scenarios (Midgley *et al.* 2001), could also reduce breeding opportunities (Simmons *et al.* 2004). Operations to rescue chicks stranded on drying salt pans are rarely successful (Berry & Berry 1976, Fox *et al.* 1997) because of high predation on released chicks. Survival of birds in captivity is high, and a small colony of abandoned chicks from Etosha is now breeding successfully at Mt. Etjo in central Namibia (J Oelofse pers. comm.).

Other threats in Namibia include low-level organochlorine pesticides used extensively in the catchment area of the Ekuma River against malaria-carrying mosquitoes. Sub-lethal levels of Dieldrin and DDT are known from flamingo and pelican eggs (Berry 1972, CJ Brown unpubl. data). Frequent hydrogen-sulphide eruptions in coastal areas (Weeks *et al.* 2003) contribute to the species' natural mortality; an eruption in April 2001 was associated with the death of about 400 flamingos in Walvis Bay (K Wearne pers. obs.). Night-time collisions with game fences and overhead power lines frequently occur in southern Africa (Scott & Scott 2011b, G McCulloch, PJ Mundy pers. obs.). Low-flying aircraft harass feeding birds on Sandwich Harbour mudflats and Walvis Bay Lagoon, despite constant warnings from relevant authorities to stay out to sea or at an altitude above 1,000 m, as per Namibian law.

CONSERVATION STATUS

The Greater Flamingo is classified as *Vulnerable* in Namibia, *Near Threatened* in South Africa (Tayor *et al.* in press), and is not considered globally threatened (IUCN 2012a). We have classified it in a higher category for a number of reasons: poor recruitment at Etosha Pan was suggested as one of the reasons for population declines between 1975 and 1995, estimated at 48% across Africa and 40% in southern Africa (Simmons 1996, 1997n). Following that assessment, birds have bred more frequently in Botswana (McCulloch & Irvine 2004), birds at Etosha Pan have bred successfully in 2000 and 2004, and non-breeding populations at Kamfers Dam, South Africa, have increased since 1996 (Anderson 2000b). Populations have the potential to increase quickly with several good breeding years, but can also decrease rapidly after long periods of unsuccessful breeding or as the result of mass mortality events, as have been reported from east Africa (B Childress pers. obs.). The southern African population has stabilised at between 65,000 and 87,000 birds (Nagy *et al.* 2012), representing a decline of between 47% and 60% since 1975 when the population was first estimated at 165,000 birds (Kahl 1975). Given a minimum generation time of five to six years (Johnson *et al.* 1993), the decline exceeds the *Vulnerable* threshold of a 20% decline in three generations. However, many of the earlier 1970s figures were based on few data, and Namibian populations

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have stabilized in the last two decades (Kolberg 2012a), so we suggest that the decline falls within 20% in the last three generation; this means this species is classed as *Vulnerable*. The species is found in four Ramsar sites in Namibia and is listed in Annex 2 of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and in Appendix II of the Convention for the Conservation of Migratory Species of Wild Animals (CMS). It should be accorded *Specially Protected* status in Namibia.

ACTIONS

There is a need to undertake regular simultaneous counts across Africa to gauge population fluctuations. Counts are best undertaken at mass breeding sites (Etosha and Sua Pan) from aerial photographs, or from massed non-breeding congregations at coastal locations. To safeguard the increasing trend of populations in southern Africa during the last two decades, research should investigate the feasibility of constructing artificial breeding islands at Etosha Pan. These could ensure more frequent breeding and greater success than currently experienced. Artificial islands could also be considered at other potentially suitable sites, although such a breeding island, constructed at Walvis Bay Salt Works in 2001, was never used (R Braby pers. comm.).

Monitoring of breeding events and their success on Etosha Pan should be continued by Etosha Ecological Institute staff. Cohorts of young birds should be marked with engraved rings when breeding is successful, to allow an assessment of survival and movement of these birds. Flight altitude restrictions need to be strictly enforced in collaboration with the Directorate of Civil Aviation of the Ministry of Works and Transport, to prevent flamingo disturbance by low-flying aircraft at the coast and at Etosha Pan.