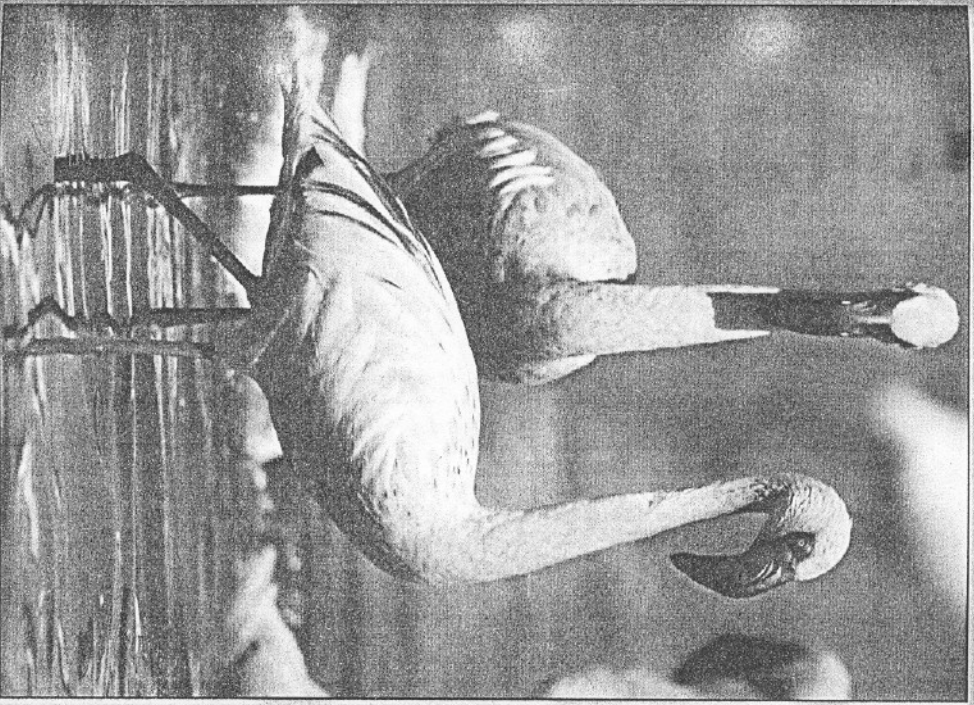


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CONSERVATION BIOLOGY OF FLAMINGOS

Edited by

Guy A. Balassarre, Felicity Arengo, and Keith L. Bildstein

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Waterbirds 23 (Special Publication 1) 2000

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# DECLINES AND MOVEMENTS OF LESSER FLAMINGOS IN AFRICA

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**Abstract.**—Lesser Flamingos (*Phoeniconaias minor*) occur mainly in Africa where they breed on isolated and often inhospitable soda lakes in the Rift Valley (East Africa), and on old lake beds in southern Africa (Botswana and Namibia). Controversy surrounds 2 aspects of their ecology: (1) whether populations are stable or declining, and (2) whether East African and southern African populations are genetically isolated. Here I review evidence showing that declines may be as high as 21% over 2 decades for African populations (5.10 million to 3.99 million present day), and 27% for southern African populations (55,000–40,000 birds in 20 years). Similarity in these declines, based on different sources of evidence, suggest the declines are real and not artifacts. Evidence for disjunct populations in East and southern Africa was based on (1) a presumed energetic inability to fly the 2,200 km from Natron (Tanzania) to Sua Pan (Botswana), (2) no evidence of birds landing in areas midway between the 2 areas, and (3) no evidence for birds flying north (or south). However, because resident southern African populations never exceed 55,000 birds, the 1 million birds reliably estimated from Etosha (Namibia) in 1971, and the 1.7 million birds reported from Sua Pan in 1974, show that birds must have come from elsewhere. Simultaneous declines in East African populations suggest an exodus from the Rift Valley. Research has also shown that flamingos deposit fat as do other migratory birds, allowing them to cover the distance nonstop. Night flights and alternative coastal routes through Mozambique would reduce the likelihood that birds would be seen migrating. Finally, an influx of thousands of young Lesser Flamingos into Kenya–Tanzania was reported in April–May 1997, when no breeding was known. At that time thousands of birds had been breeding on Sua Pan. The evidence, therefore, suggests both a population decline and constant movement between the 2 main breeding areas in East and southern Africa.

## DISMINUCIONES EN LA POBLACIÓN Y MOVIMIENTOS DEL FLAMENCO MENOR EN ÁFRICA

**Resumen.**—El flamenco menor (*Phoeniconaias minor*) ocurre mayormente en África donde se reproduce en lagunas saladas aisladas y frecuentemente inhóspitas el Valle del Rift (África oriental), y en las cuencas secas de las lagunas en la parte sur de África (Botswana y Namibia). Dos aspectos de su ecología son polémicos: (1) si las poblaciones son estables o están disminuyendo y (2) si las poblaciones del este y del sur de África son aisladas genéticamente. Aquí yo hago una reseña de la evidencia que demuestra disminuciones que, a lo largo de 20 años, pueden ser tan altas como 21% para las poblaciones africanas (de 5.1 a 3.99 millones actualmente), y 27% para poblaciones de la parte sur de África (de 55,000 a 40,000 individuos en 20 años). En base a distintas fuentes de evidencia, estas disminuciones parecen ser reales y no artefactos. La evidencia para la separación de las poblaciones en el este y el sur de África fue basada en (1) la presumida inabilidad energética de volar los 2,200 km de Natron (Tanzania) a Sua (Botswana), (2) la falta de observaciones de flamencos en áreas entre estas dos áreas, y (3) no existen observaciones de flamencos volando hacia el norte (o sur). Sin embargo, como poblaciones residentes en el sur de África nunca superan los 55,000 individuos, el millón de flamencos estimado confiablemente en Etosha (Namibia) en 1971 y los 1.7 millones registrados en Sua Pan en 1974 demuestran que estos individuos tienen que haber provenido de otra parte. Desminuciones simultáneas en poblaciones en el este de África sugieren un éxodo del valle Rift. Las investigaciones han demostrado que los flamencos depositan grasa como las aves migratorias, lo cual les permite cubrir la distancia sin hacer escalas. Los vuelos nocturnos y el uso de rutas costeras alternativas por Mozambique reducirían la probabilidad de observar a estas aves durante la migración. Finalmente, se registró la llegada de miles de juveniles de flamenco menor a Kenya y Tanzania en abril–mayo de 1997, cuando se supone que no hubo reproducción allí. En ese momento, miles de flamencos habían estado nidificando en Sua Pan. La evidencia demuestra tanto una disminución en la población y un movimiento constante entre las dos áreas principales de reproducción en el este y sur de África.

**Key words.**—Africa, Greater Flamingo, Lesser Flamingo, migration, *Phoeniconaias minor*, *Phoenicopterus ruber roseus*, population decline.

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Despite their high profile in Africa and elsewhere, 2 fundamental aspects of flamingo biology remain unknown: (1) are populations stable or declining throughout Africa, and (2) does movement and interbreeding occur between the East African population

and southern Africa population some 2,200 km to the south. These questions were asked at the last world flamingo conference in Slimbridge, England, in 1973 (Kear and Duplaix-Hall 1975), but were then unanswerable. This paper attempts to answer them by assessing current evidence and presenting the latest information on population figures

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relative to 25 years ago. Kahl (1975a) summarized known population estimates, and I will use them as a basis for the present assessment. The second question, does interchange occur between East and southern Africa, was first answered by Brown (1957, 1975). He stated that there was no interchange, but I will show that is not true. I will also demonstrate that 1 million Lesser Flamingos (*Phoeniconaias minor*) are not resident in southern Africa, a statement that has appeared in virtually every publication on Africa's flamingos since 1973!

### METHODS

My review draws on data in the African Waterfowl Census published annually by Wetlands International (e.g., Dodman et al. 1997), data from a conference in Lake Bogoria organized by the International Union for the Conservation of Nature and Natural Resources (IUCN) East Africa (Howard 1997), and data presented by myself in previous publications on this topic (Simmons 1996, 1997). A large number of personal communications allowed many gaps to be filled where flamingo data were unpublished, or remains in internal reports. No new data are presented here, and therefore my review and interpretation are combined in the following results and discussion.

## RESULTS AND DISCUSSION

### Africa's Lesser Flamingo Population

The stronghold of Africa's Lesser Flamingo occurs in the East African Rift Valley lakes in Ethiopia, Uganda, Kenya, and Tanzania. Estimates of the populations there are variable and have oscillated between 1.5 and 5 million birds (Brown 1975, Kahl 1975a, Tuite 1979, Rose and Scott 1997). The wide variation apparent in these numbers may be due to the difficulty in assessing huge concentrations of flamingos on relatively inaccessible lakes. Researchers generally agree that aerial surveying using photographs is the best way of counting such concentrations, and only 2 systematic surveys appear to have been undertaken. The first was undertaken by Tuite in the early 1970s (Tuite 1979, 1981), and the second was undertaken by Howard (1994). Their figures also show wide variation (1.5–4.0 million birds), suggesting that more than counting method or simple error is involved. Alternative reasons for differing population figures include (1) flamingo

populations are inherently unstable in space and time and move to other parts of Africa; (2) flamingos have increased dramatically in the 20 years between these counts; or (3) despite similar methods, counters use differing assumptions in their estimations.

Flamingo populations are unlikely to have increased because individual countries have reported stable or declining population numbers (J. Arinaitwe, Makerere University, Uganda, personal communication), and breeding has been generally poor in this period (Simmons 1996). Other forms of counting have improved in the last 8 years with the advent of the African Waterfowl Census coordinated by Wetlands International (Perennou 1991, Dodman et al. 1997), and we can use these data for comparison and rechecking. National coordinators encourage the counting of wetlands throughout 60% of the 50 countries in Africa, and West, East, and southern Africa are the best-covered regions. A reflection of the coverage is apparent in the figure of 4.9 million wetland birds counted in January 1997 (Dodman et al. 1997). In theory, if all countries holding extensive flamingo populations counted flamingos simultaneously, a snapshot picture of their populations would be possible. However, all such "instantaneous counts" are incomplete (Table 1). The best year was July 1994, when most of the East African population was monitored and was found to number just under 4 million birds (Nasirwa 1994; Table 1). The number of birds in southern Africa was low because Sua Pan, their main area of concentration, was dry (T. Liversedge, resident ornithologist Okavango Delta, personal communication). Because the maximum number of Lesser Flamingos in southern Africa during nonbreeding periods (i.e., when no flooded salt pans occur inland) is about 40,000 birds, the instantaneous count of Lesser Flamingos for Africa was 3,954,500 in July 1994. Including the 13,000 unidentified birds seen at Etosha Pan, Namibia, as Lesser Flamingos, the total becomes 3,967,500 (Table 1).

Neither Ethiopia nor Senegal are included in this total, but we can add estimates from 3 counts either side of July 1994, which averaged 8,300 and 15,400 Lesser Flamingos re-

Table 1. Simultaneous counts of Lesser Flamingos in Africa, 1991 to present. The total represents the best estimate of flamingo numbers based on coverage for any 1 year.

Date	Location							Total	Sources
	Mauritania	Senegal	Ethiopia	Kenya/Uganda	Tanzania	Namibia	South Africa	Botswana	
Jan 1994	370	4,755	>11,700	1,462,400	26,800	1,600	6,600	>960	Taylor and Rose 1994
July 1994	?	$\bar{x} = 8,300$	$\bar{x} = 15,400$	1,798,000	2,122,000	27,200 (+13,000)?	7,200	78 (Sua dry)	Nasiwa 1994; Dodman and Taylor 1995; T. Liversedge, unpublished data
Jan 1995	0	8,300	22,800	798,200	1,091,900	34,100	4,500	1,200	Dodman and Taylor 1995
Jan 1996	0	11,700	11,800	369,038/20,000	>2,100	35,200	600	?	Dodman and Taylor 1996
July 1997				1,307,000		19,800	3,600	150,000	T. Liversedge, G. Howard, IUCN, R. E. Simmons, Avian Demography Unit, University of Cape Town, unpublished data

spectively. Therefore, a further 23,700 birds (8,300 + 15,400) can be added to the total, bringing the maximum count for Africa to 3,991,200 Lesser Flamingos. Counts for Mauritania, where up to 39,600 Greater Flamingo (*Phoenicopterus ruber roseus*) can occur, are disappointing for Lesser Flamingos; January counts of only 370, 0, 0, and 3,500 have occurred there from 1994 to 1997 (African Waterfowl Census data). Therefore a total of about 4.00 million Lesser Flamingos was estimated in 1994, very similar to the aerial count of 4 million birds reported by Howard (1994).

Before comparing these counts with previous counts, it is important to assess resident populations of Lesser Flamingos in southern Africa (Fig. 1). This assessment is necessary because during the first global assessment of flamingo numbers by Kahl (1975a), 2 well-publicized breeding events of flamingos occurred in southern Africa on Etosha Pan, Namibia. This breeding led to the assumption that many more flamingos reside in Namibia and Botswana than actually occur. The first event was reported in 1969 when 100,000 chicks were counted but no adult counts were given (Berry 1972), and the second occurred in 1971 when 1.0 million Lesser Flamingos were counted (Berry 1972). In 1974, an aerial survey of Ostriches (*Struthio camelus*) on Sua Pan in Botswana (Parker 1975) included an estimate of 1.4 million Lesser Flamingos and 300,000 Greater Flamingos. In the following 20 years, such large numbers have never been encountered anywhere in southern Africa. At the time of these massive numbers on Etosha and Sua Pans, resident populations were estimated at only 55,000 birds (Cooper and Hockey 1981). Since then, resident populations recorded by the African Waterfowl Surveys and personal communications from ornithologists in southern Africa indicate a nonbreeding January population of 40,000–45,000 birds (Simmons 1997). The large 1970 populations suggest an influx of birds from elsewhere into southern Africa (see below for additional evidence), but at the time of the first global estimates of Lesser Flamingos in 1973, it suggested to Leslie Brown and M. P. Kahl that 1 million birds were *resident* in southern Africa.





Table 3. Flamingo population declines in southern Africa.<sup>a</sup>

	1975	1994-97	% decline
Lesser Flamingo	55,000	40,000	27%
Greater Flamingo	75,000	50,000	33%

<sup>a</sup>Sources: Cooper and Hockey (1981); Kahl (1975); Dodman and Taylor (1995, 1996); Simmons (1997).

While the similarity in declines between southern African "residents" (27%) and populations throughout Africa (21%) suggests the declines are real and not artifacts of sampling, the declines reported here for both species could merely represent short-term trends in population cycles of 2 species known to enjoy lifespans of up to 40 years. Clearly only data spanning periods longer than 4 decades can adequately answer this question. However, given that breeding success of flamingos from Etosha over this time span indicates too few recruits to maintain population stability (Simmons 1996), and given that rainfall over southern Africa appears to be declining (Seely 1998), there is good reason to believe that we are seeing a long-term trend. No short-term episodic events such as mass mortalities due to disease or poisoning can be identified that might explain these declines. While the very low recruitment on Etosha may account for the reduced populations in southern Africa (Simmons 1996), other sites such as Sua Pan in Botswana and Lake Natron in Tanzania probably add more recruits to the populations and are in urgent need of monitoring and protection.

#### Do flamingos Regularly Move From East Africa to Southern Africa?

Evidence presented above suggests that while resident populations of Lesser Flamingos in southern Africa number about 40,000 birds, 1 million flamingos can and do rarely occur. Several reasons were given by Brown (1975) for why flamingos could not migrate from Botswana to East Africa's Rift Valley. First, the distance (2,200 km from Sua Pan to Lake Natron) is presumed too long for 1 continuous flight and birds would have to stop somewhere, yet few are reported in Zambia Ornithological Society records dating back to 1972 (P. Le-

onard, Zambia Ornithological Society, personal communication). Second, none have ever been seen flying north. The distance is large, and even assuming birds stop at Lake Mweru (Zambia) or the bottom of Lake Tanganyika, they still have 1,200 km to fly. Third, energetically a flamingo would not be capable of flying 2,000 km. These arguments convinced Leslie Brown that there were 2 separate populations—about 5 million in East Africa and about 1 million in southern Africa.

Evidence against this view is compelling. First, work by Tuite (1981) on the energetic value of the blue-green algae *Spirulina* shows that not only is it a source of high-protein food, but flamingos do deposit fat when feeding on it, as do other migratory birds in readiness for migration. This fat could take them nonstop from East Africa to southern Africa. Hence, there would be no need for overnight stopovers, and birds would never be seen en route. The variability in appearance of *Spirulina* blooms in different Rift Valley lakes also appears to dictate when flamingos appear at and leave certain lakes as the algae blooms and then disappears (Tuite 2000).

Discussions among African flamingo workers at 2 conferences have also raised the possibility that flamingos are not flying directly to and from Tanzania and Botswana. The alternative is that birds are flying from the Rift Valley lakes to the East African coast and thereafter flying south along the Tanzanian and Mozambique coast before heading the remaining 910 km inland to Sua Pan (Simmons 1997, Simmons and Borello 1999). Returning birds may even island hop by flying to Madagascar and thereafter head due north (Borello et al. 1998). Three lines of evidence support these suggestions. First, regular migrations between coastal wintering areas in Namibia and Etosha Pan (approximately 500 km) involve night flights northwards up the coast (Williams and Velasquez 1997) and not directly to

Etosha Pan to the northeast. Coastal routes suffer from fewer aerial predators, some food is available along the shoreline, and the white surf along the beach may also act as a convenient guiding marker for night-flying birds. Second, a new power line stretching north-south from Zimbabwe into South Africa regularly kills flamingos, which are therefore flying in an east-west direction. Power lines oriented in different directions do not kill birds (P. Mundy, Zimbabwe Parks and Wildlife ornithologist, personal communication). Third, flamingos have been seen flying in an easterly direction through Zimbabwe towards the Mozambique coast (Williams 1993). Both localities lie on the flight path from Botswana's Sua Pan to coastal Mozambique. Milstein (1984) reported 15,000 flamingos in Lake Bobene during surveys of 14 wetlands in southern Mozambique in 1971. These observations suggest that flamingos would not be seen between the 2 main breeding areas because this is not their usual flight path. Satellite tracking of both species of flamingo leaving Sua Pan would help confirm this idea.

Most convincing for the idea of constant interchange between East and southern Africa is the observation that coincident with the influxes of large numbers of birds into southern Africa is their simultaneous disappearance from East Africa. These can be summarized as follows: (1) in 1969, only 1,043,800 birds were reported in all major lakes in Kenya and Tanzania in late March (Batholomew and Penny-cuik 1973); and (2) simultaneously, 100,000 flightless chicks were dying on Etosha Pan by early June 1969 (Berry 1972). Thus, well over 200,000 adult birds must have been present in late March on Etosha Pan, well above the known *resident* population. In 1974, the 1.7 million Lesser and Greater Flamingos in Botswana recorded by Parker (1975) coincided with a drop in the population on all lakes in Kenya and northern Tanzania; aerial censuses could not locate these missing birds (Tuite 1979, 1981), and Tuite suggested that emigration to southern Africa had occurred. In 1997, the same phenomenon was apparent: 400,000 Lesser Flamingos were present on Sua Pan in March (T. Liversedge, ornithologist, personal communication), and the African Waterfowl

counts for January 1997 in Kenya were lower than expected (only 350,000 birds were present). Finally, during the Lake Bogoria workshop, Githaga (1997) reported thousands of young Lesser Flamingos appearing in Kenya's Rift Valley in April-May 1997, when no breeding was known in East Africa. Unknown to Kenyan ornithologists, 400,000 Lesser Flamingos were present and breeding on Sua Pan by March 1997, and the young birds in Kenya may well have been birds from Botswana. Therefore, coincident with 3 reductions in numbers and 1 influx of young in East African populations, there were simultaneous massive increases in southern African populations. This evidence has not been previously available either because it was hidden in unpublished reports, or because the influxes into southern Africa, mainly Botswana, are not recorded in the African Waterfowl Census and thus not publicized.

In summary, I have presented evidence that (1) more flamingos occur in southern Africa than are resident there; (2) these influxes coincide with reductions in numbers in East Africa; (3) birds in good condition are theoretically capable of flying the entire 2,200 km from Natron to Sua Pan without stopping; and (4) birds may migrate via a coastal route between East and southern Africa, precluding sighting of them on a direct line between the 2 regions.

In conclusion, Africa-wide and southern African populations of both species of flamingo appear to have decreased (>20%) in the last 2 decades. While baseline population estimates must be treated cautiously (because of their paucity), data from different sources show similar declines, which support this conclusion. Resident populations of Lesser Flamingos in southern Africa do not exceed 45,000 birds, thus flocks of >1 million birds in 1971 and 1974 on Etosha Pan and Sua Pan were birds from elsewhere. Simultaneous reductions in Rift Valley populations in 1969, 1974, and 1997 suggest an interchange between East and southern Africa. Breeding in March 1977 in Botswana could account for young birds occurring in Kenya later the same year. The evidence suggests, therefore, that Lesser Flamingos have suffered a decline in Af-



rica, and that there is constant interchange between East and southern African populations.

Despite our advances in knowledge of flamingo ecology over the last 25 years, several factors remain unknown concerning African flamingo biology. Among these are (1) what is the flight path between Botswana and Kenya or Tanzania (Simmons and Borello 1999), (2) how do flamingos know when to leave their wintering quarters to fly to flooded lakes thousands of kilometers away, and (3) where do West African Lesser Flamingos breed. I suspect these questions will not need a further 25 years to resolve.

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