Flamingo "rescue" in Etosha National Park

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Flamingo 'rescue' in Etosha National Park, 1994: technical, conservation and economic considerations

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During April 1994, 144 Greater Flamingo *Phoenicopterus ruber* chicks were taken from Etosha Pan, Namibia, following drying of the shallow water and the death of hundreds of chicks. The captured chicks ranged from approximately 2 weeks to 2 months of age and were hand-reared at Okaukuejo until being released (7 weeks later) or sold (12 weeks later). Fourteen birds died within 8 days; only two died later. Of 77 chicks released at Walvis Bay, their traditional wintering grounds, 76 were fitted with yellow plastic rings and 73 with numbered metal rings. These grey juveniles were highly visible in the lagoon among the pink adults, and were resighted regularly. Most of the 20 birds recovered dead within two months of release were birds with wing chord measurements less than 315 mm, and black-backed jackal *Canis mesomelas* predation was the most likely cause of death. Bird counts 11 and 14 months later at Walvis Bay and surrounding wetlands revealed no juveniles at all, suggesting high mortality. However, four ringed flamingos were sighted in Jan. 1997, and one debilitated ringed flamingo was recovered at the Namibia–Botswana border in Feb. 1997. A lack of predator avoidance was thought to be the main factor responsible for the high mortalities.

INTRODUCTION

Both Greater *Phoenicopterus ruber* and Lesser *Phoeniconaias minor* Flamingos are breeding visitors to Etosha Pan (hereafter 'the Pan') in northern Namibia during the wet season (January through March) (Berry 1972). Etosha is one of only two regular breeding sites for Greater and Lesser Flamingos in southern Africa, the other being Sua Pan, Botswana (T. Liversidge pers. comm.), and flamingos probably have been attracted to Etosha Pan for a period far exceeding the relatively short 40-year period that they have been recorded there. However, since 1956 it appears there have been only three major successful (hatching to fledging) breeding attempts on the Pan (Simmons 1996). Failed breeding attempts occur because of rapid drying of the temporary shallow lagoons that form on the Pan in the rainy season, forcing the adult flamingos to abandon the chicks. For example, in 1969, approximately 20 000 chicks of an estimated 100 000 were rescued because of the rapidly receding waters (Berry 1972). During the rainy season of 1994, the entire surface of Etosha Pan (4731 km^2) was remotely monitored by the Etosha Ecological Institute (EEI) using satellite imagery. Images in April showed isolated shallow patches of rapidly disappearing water on the Pan, suggesting that conditions were likely to cause breeding failure of flamingos.

Park biologists decided to capture as many chicks as possible for the following reasons:

1) Initially, chicks were found along the roads, causing tourist concern; these were captured to prevent a possible negative image if they were left to die naturally.
2) From previous experience, the chicks most likely would die on the Pan (Berry 1972 & 1975; Archibald & Nott 1987). Capturing, raising and selling the chicks would provide flamingos to zoos and/or tourist lodges, which could contribute to public education, enhanced tourist appeal, and promotion of Namibia's flamingos. Additionally, it might decrease the risk of wild birds being captured illegally for black markets.
3) Returning chicks to their natural wintering grounds at Walvis Bay had never been attempted; therefore the release was an experiment to determine feasibility and survival rates.
4) The Ministry of Environment and Tourism (MET) previously had never sold flamingos, so this sale tested potential markets for flamingos as a trial for future sustainable utilisation of this wildlife resource.
5) Since the majority of chicks on the Pan had already died anyway, the few that were removed had a minor impact on the predator/scavenger ecology of this natural event.

This paper documents the capture, care and mortalities of chicks removed from the Etosha Pan and translocated or sold, and assesses their survival rate up to 36 months.

STUDY AREA

Etosha Pan is a large, saline clay pan situated in northern Namibia at 18°45'S, 16°40'E (Fig. 1), within the Etosha National Park. Average annual rainfall varies from 300 mm in the west to 450 mm in the east. The Pan is fed from runoff from the north via the Ekuma and Oshigambo Rivers. These ephemeral rivers drain the Cuvelai system while the other major feeders in the east, the Omurambas Owambo and Omuthiya, drain areas receiving 500–600 mm of rain annually (Lindeque & Archibald 1991). On average, the Pan floods sufficiently for flamingos to attempt breeding once every two years, but its mean rainfall (400 mm) is just below the threshold for successful breeding, which usually occurs above 440 mm (Simmons 1996). The high evaporation rates of *c.* 2.6 m per year (Berry 1972) cause rapid drying of any standing Pan water.

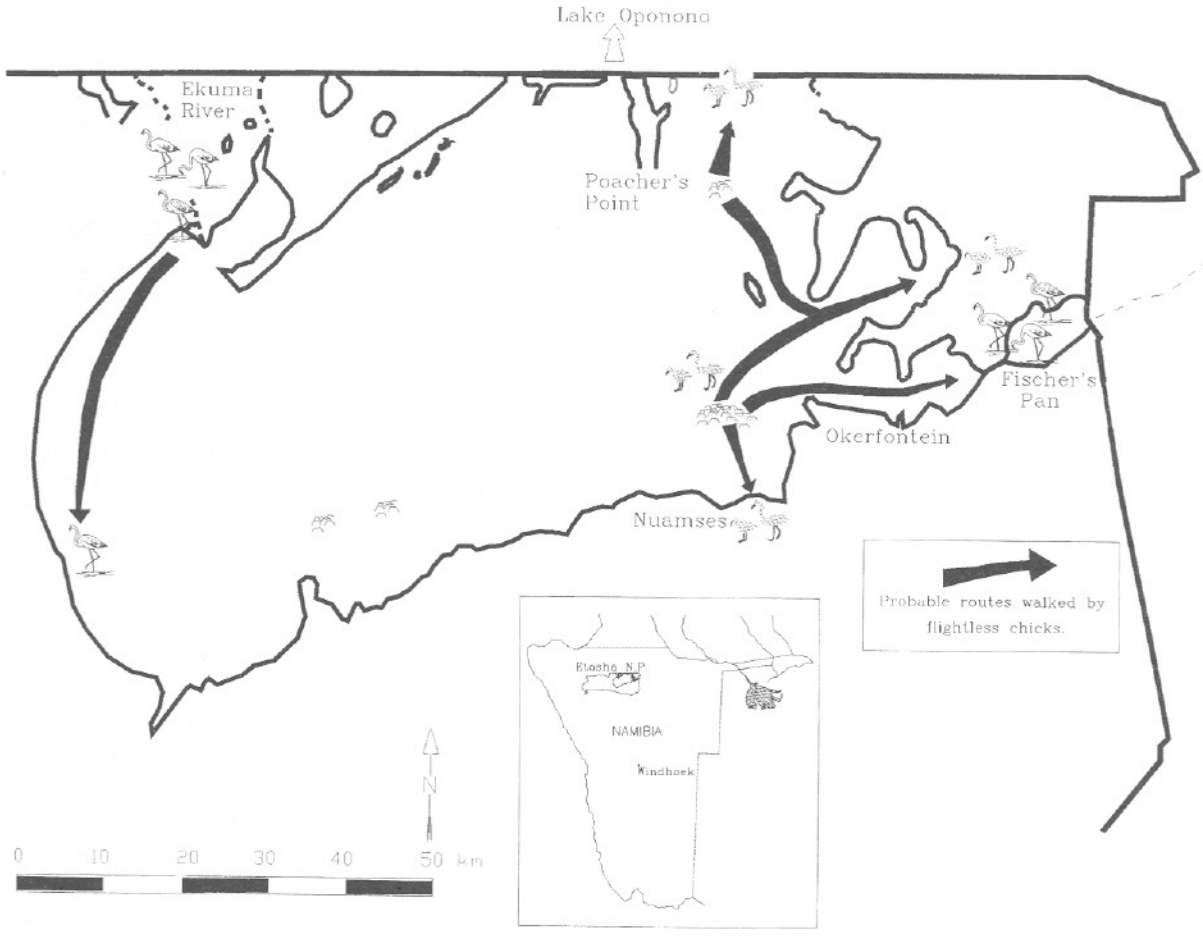

Fig. 1. Map of the Etosha Pan indicating breeding sites and probable routes taken by abandoned chicks in 1994. Inset shows map of Namibia indicating the location of Etosha National Park.

METHODS

Historically, flamingo breeding has been reported on Etosha Pan for many years (e.g. Sauer & Rocher 1966; Berry 1972; Archibald 1991), mainly from flights over the Pan. Since 1992, however, the Etosha Ecological Institute has captured and processed National Oceanic and Atmospheric Administration (NOAA) satellite images of the Pan which can identify flood water or wet substrata. In 1994, aerial monitoring of the Pan and the counting of adult birds began in mid-April, using a Cessna 182.

On 15 April, 23 chicks were found on the roads and edges of the Pan. This prompted the capture, on 16 April, of 87 young birds remaining at the main nest site (Fig. 2). Additionally, two groups of older chicks were caught near Poacher's Point one to two weeks later. All were transported to Okaukuejo, where they were cared for under veterinary supervision until being released (2 June) or sold (7 July).

Care and maintenance

A shelter of shade cloth and canvas sails was built in one corner of the fenced tennis court where the chicks were housed to protect them from jackals and other small predators at night. A shallow wading pool was constructed using a canvas sail wrapped over a frame of utility poles. They were fed in large, shallow plastic or stainless steel trays (minimum size 50 x 70 cm) twice daily, at 08h00 and 14h30; any leftover food was put into the shelter with the chicks at night. Usually the food put into the shelters with the birds at night was consumed by morning.

The shelter and feeding trays were cleaned every morning; the pool and entire tennis court were cleaned as needed, usually once or twice a week. The birds were fed a mixture of Pro-Nutro™ cereal, chick starter mash, oats and a calcium–vitamin–mineral supplement (Calsup™) with water added to make a liquid soup which they could stir up with typical paddling action of the feet. Initially, Nestum™, Tasty Wheat™ or maize meal were sometimes also used. All chicks appeared able to feed themselves from the onset; none was hand-fed except those too weak to stand. Weak or comatose chicks were revived by administering a warm electrolyte solution via intraperitoneal injection or via a feeding tube introduced into the crop, followed later by feeding a warm, thin gruel of Pro Nutro™ and electrolyte solution. An antibiotic powder (Contromycin™, one teaspoon per food tray) was added to their food for three days to treat suspected pneumonia.

Once the birds had adjusted to captivity (approximately three weeks after capture), 20 representing the different size groups were caught, tagged and weighed weekly for four consecutive weeks; wing chords were measured from the fourth week, before the larger birds were released.

Transport and release

On 2 June, 78 of the largest chicks were transported 610 km to Walvis Bay, where they were released at the edge of a large (several kilometres square) shallow (30 cm deep) brine extraction pan. Thousands of adult birds were present at this site, which was chosen because it is the traditional wintering ground of the

majority of the subcontinent's flamingos; also, it was protected from disturbance by people and domestic dogs. Prior to release, all birds (except one which was trampled to death en route and one which escaped) were ringed with a yellow plastic ring and a 16 mm numbered metal ring (except four which escaped) above the left tibio-tarsal joint. Five of the largest birds were additionally fitted with yellow patagial wing tags (modified cow ear tags) to determine their effectiveness in resighting birds. Wing chord was measured upon release to determine age structure and any age-related mortality.

Surveys were conducted immediately after release, and wetland bird surveys of the release point and all surrounding wetlands were undertaken 45, 240, 330 and 420 days (14 months) later, using experienced observers (Simmons 1995).

RESULTS

The first aerial reconnaisance on 15 April found fewer than 200 live chicks and hundreds of dead ones at the main nest site west of Okerfontein on the Etosha Pan (Fig. 1). No adults were present. Three other known breeding sites were checked, but fewer than 100 adults and chicks were found, far fewer than the numbers found in previous years (Editor 1970; Berry 1972, Archibald & Nott 1987). Between 15 and 20 April 1994, approximately 17 000 adult flamingos were counted at the Ekuma River on Etosha's northern border, and approximately 8000 were seen at Fischer's Pan near Namutoni, both traditional feeding areas. Berry (1972, 1975) reported that once all adults had left the nest area, they did not return, and he considered chicks still at the site to be abandoned. Therefore, Park Conservation Scientists considered intervention justifiable (Fig. 2).

Table 1 summarizes the events of the flamingo chicks' capture.

Five of the smallest chicks (approximately 200 g) were found comatose the first morning after they were removed from the nest site. Initially they were revived as described previously, but all died a few hours to a day later. Post mortem examinations revealed that three had died from crop rupture due to the tube feeding. The others had congested lungs suggestive of pneumonia. Mortalities stopped after the antibiotic powder was added to the food.

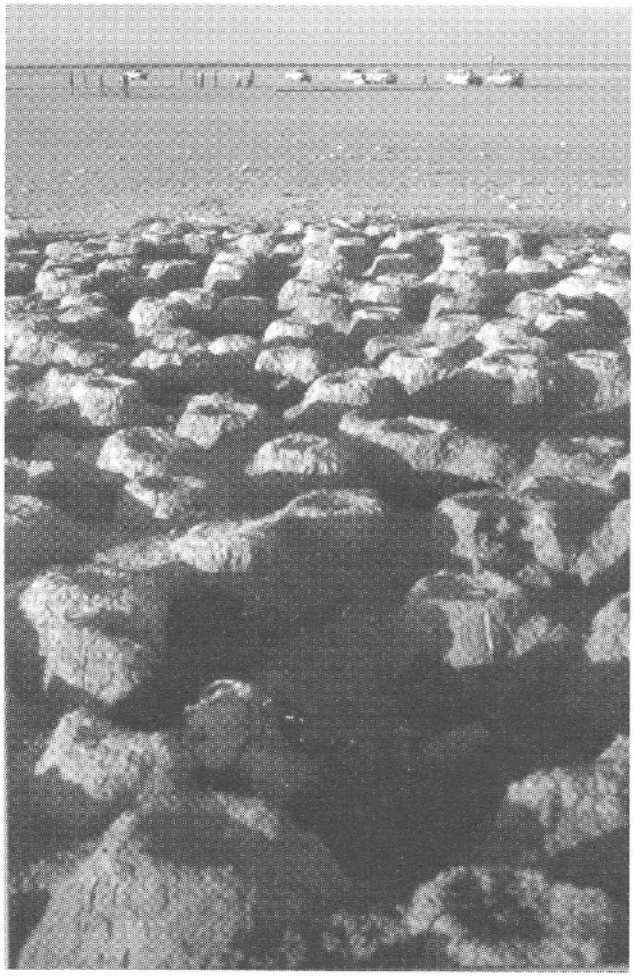

Fig 2. Nest site and abandoned flamingo chicks southwest of Okerfontein, Etosha Pan, 16 April 1994, following drying of the surface water. Ministry staff gather in the background in preparation for capturing the few chicks still alive. (Photo by W. du Plessis)

Post-release mortality

We observed the released flamingo chicks for the purpose of establishing survival/mortality rates and possible dispersal from the release site (Table 2).

The first mortalities were all smaller chicks (wing chord less than 300 mm). The carcases were close to one another and evidently had been killed by black-backed jackals (*Canis mesomelas*) which had eaten most of them. Subsequent deaths also were attributed to jackal predation because of jackal spoor around the carcases. Most of the 20 dead had wing chords less than 315 mm. By April 1995 (11 months post-release), no young birds were seen among 14 052 Greater and 24 192 Lesser Flamingos present at Sandwich Harbour and Walvis Bay. The complete absence of marked young was confirmed in the July 1995 counts, 14 months after release. Of 77 chicks released, only five confirmed sightings

Table 1. Dates, location, numbers, mortalities and suspected cause of death of Greater Flamingo chicks captured on the Etosha Pan during April 1994.

Date	Location	No. caught	Mortalities (days after capture)	Cause of mortality
15 Apr	Main Halali–Namutoni Rd.	23	–	
16 Apr.	Okerfontein nest site	87	4 (1), 5 (2), 1 (3), 1 (4), 1 (5), 1 (6), 1 (8), 1 (45), 1 (55)	Stress/cold/pneumonia/ hunger (9) Crop rupture (3) Drowned/weak (1) Caught in fence (1) Chronic lameness (1) Trampled in transport (1)
21 Apr.	Poacher's Point	24	–	
25 Apr.	Poacher's Point	10	–	
TOTALS		144	16	

Table 2. Observations on the fate of 77 Greater Flamingo chicks released at Walvis Bay Lagoon on 2 June 1994.

Days after release	No. of live chicks seen	Distance from release point (km)	No. of dead chicks found	Distance from release point (km)
2	77	1	—	—
8	63	2	8	2
45	37	3	7	2
60	23	3	5	2
240	6	1	—	—
330	0	—	—	—
420	0	—	—	—
930	1	5	—	—
950	3	530	—	—
960	1	700	—	—

(6.5% survival) of ringed young flamingos have been reported: 1) On 6 Feb. 1997 B. de Graaf found a bird exhausted but alive at Ghanzi, a post on the Namibia–Botswana border, more than 700 km east of Walvis Bay. It died the next day. 2) A French couple sighted a bird with a yellow leg ring and a yellow wing tag at Walvis Bay lagoon in January 1997. 3) Three flamingos with yellow leg bands were seen at the Ekuma River in Etosha in late January 1997 by C. Brain.

The remaining birds (50) were sold at the annual wildlife auction of the MET for N$500 to $800 each. Fifty was the maximum number that MET officials allowed to be sold at the auction; all other chicks were then destined for release. The sale realized a total gross income of N$28 500 (R28 500), which offset the approximate costs of N$10 000 (R 10 000) for food and transport of chicks to Walvis Bay for release. Of the 50 auctioned birds, 40 sold to three farms have survived for three years; the remaining ones sold to a fourth farm were killed by jackals when the water surrounding their island refuge dried up.

DISCUSSION

Post-capture mortality

When small chicks are already weak and malnourished at capture, it is not surprising that the additional stresses of transport across Etosha (up to150 km), subsequent captivity and cold nights, without the warmth of the nest and an attending parent, lead to the high mortality experienced in the first week. More intensive care initially, including heated indoor shelter at night and hand-feeding as described by Berry (1974) and Berry & Berry (1976), might have further reduced mortalities. Additionally, softer feeding tubes with a smaller diameter (which were not readily available in Okaukuejo at the time) and a thinner food mix in smaller quantities probably would have eliminated the deaths due to crop rupture. Addition of an antibiotic to the food during the first week to prevent and/or treat pneumonia is recommended.

Ring diameter

The chicks apparently were physically larger than Greater Flamingo young reared from the egg in 1974. This became apparent when recommended rings of internal diameter 12.5 mm (Berry 1974) were too small, and in the absence of 14.0 mm rings, overlapped 16.0 mm rings had to be used. For wild Greater Flamingos, we recommend that 14.0 mm diameter rings be used. We speculate that the size difference can be attributed to the parental care which the 1994 chicks received, but which the 1974 chicks lacked.

Post-release mortalities

Previous attempts at hand-rearing abandoned flamingo chicks at Etosha have shown that subsequent release attempts mostly fail (Berry 1974; Berry & Berry 1976). The chicks sighted after eight weeks indicated that the released flamingos remained within 2–3 km of the release site and did not mingle with the wild Greater Flamingos. The survivors were noticeably less shy than the wild flamingos, walking or flying away only after a close approach on foot and long after the other birds had moved away. Apparently poor survival of the released birds was attributed partly to their initial flightlessness, as evidenced by the shorter wing chords of the majority of the depredated birds; to their decreased flight response; and to their failure to mingle with the wild birds further from land. These factors most likely contributed to their increased susceptibility to predation. Since it is unlikely that food supply was limiting in the pans and lagoon at Walvis Bay, it seems probable that predation also accounted for most of the unrecovered birds. Training to recognise and subsequently avoid mammalian predators might contribute to increased success for future projects. The problem of the chicks staying in a small group close to the release site and separate from the wild birds remains unresolved.

Other capture and release programs have experienced some success in Europe (Johnson & Green 1990), but these involved adult birds. Their study found that most mortalities occurred shortly after release; dead birds were lighter in weight and had gained less mass during captivity than surviving birds. In our study too, most mortalities occurred early and among the smaller birds. It seems likely that the majority of chicks died rather than moved, since all wetlands in Namibia with flamingo populations are monitored every six months (e.g. Simmons 1995), and that at most a few marked juveniles could have been overlooked. The yellow patagial wing tags did not seem to increase resightings of juveniles, as the yellow leg rings were highly visible, and the wing tag could go unseen on the opposite side of a bird.

Artificial breeding sites

One possible strategy to improve the success rate of flamingo breeding in Etosha might be to construct a breeding island similar to that used for many years in the Camargue (Johnson 1975). Such islands attract flamingos and can be modified to avoid mammalian predation. Their success has been impressive, with between 2000 and 8590 young being reared each year over the last 15 years. By contrast, Etosha Pan has produced no natural recruits in the last 15 years (Simmons 1996). Removing and rearing chicks found dying on a drying pan has been shown to be a relatively high-energy but low-return method which probably adds little to future generations (Berry & Berry 1976; this study). Success was higher when young were transported from dry sections of the pan to inundated areas (Editor 1970), but follow-up sightings were not then undertaken to determine long-term success. This method for attempting to save chicks has not been tried again. Although the release of flamingo chicks back into the wild has not been successful, the relocation of birds to zoos, game parks, farms etc.

generally has been successful. During the flamingo 'rescue' in 1989, for example, chicks were donated to several organizations in South Africa, where they survived and have bred successfully (i.e. Pretoria Zoo; P. Lindeque pers. comm.; World of Birds, Cape Town, *The Argus*, 23 Dec. 1994: Mt Etjo, Namibia). Artificially created breeding islands have not been attempted because of the fears of disturbing a pristine system in Etosha and of breeding out of synchrony with natural breeding events; these concerns have been assessed and answered elsewhere (Simmons 1996). At present, breeding islands may be the only long-term answer to the seemingly intractable problem of low breeding success and declining flamingo populations in Africa (Simmons 1996).

RECOMMENDATIONS

In view of the relatively high survival during captivity and the apparent low survival rate of released chicks, we recommend the following:

1) Remove only chicks that leave the Pan and are found in tourist areas. Closely monitor chicks remaining on the Pan to determine mortality/survival rates.
2) Alternatively, attempt to transport obviously abandoned chicks from dry sections of the Pan to areas where adults are feeding, with close monitoring of mortality/survival rates, to determine whether this action can increase chick survival. Remove weak chicks for hand-rearing.
3) Sell removed chicks to suitable zoos, bird parks and/or private individuals to recover the expense of caring for the chicks.
4) Release chicks only if the problems of predator recognition and failure to mix with wild flamingos have been satisfactorily resolved. Release only chicks close to fledging, in areas where adult flamingos live.
5) Investigate the possible creation of an artificial nesting site on the Etosha Pan, on smaller pans in the Park or on pans near the Park as an option to increase the breeding success of wild flamingos.

CONCLUSIONS

Based on this and previous experience, we consider the conservation benefits of chicks released after hand-rearing to be of no consequence to the wild population. Alternatively, capture, care and subsequent sale of chicks which otherwise would die appears to be a justifiable option which results in economic gain and is sustainable.

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