PLAN FOR THE REPATRIATION OF LESSER FLAMINGOS (*PHOENICONAIAS MINOR*) TO THE WILD

FLAMINGOS REMOVED FROM KAMFERS DAM (KIMBERLEY) IN 2019

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1. INTRODUCTION

The temporary removal of Lesser Flamingo chicks from Kamfers Dam in 2019 was motivated primarily by welfare considerations and driven largely by public sentiment. Increased public awareness has given new impetus to efforts to improve and secure the quality of flamingo habitat at Kamfers Dam. This is a significant beneficial outcome of the operation. There are, however, risks associated with repatriation of captive-reared flamingos and the safety of the remaining 50 000-80 000 wild birds must to be prioritised.

The proposed release is primarily for the benefit of the released individuals and therefore falls outside the scope of the IUCN Guidelines for Reintroductions and Other Conservation Translocations (IUCN/SSC 2013). Such releases may yield some conservation benefit, but equally they may cause harm (IUCN/SSC 2013) and a thorough assessment of feasibility and risk is still necessary. The IUCN guidelines provide a useful framework for this. A firm commitment by relevant stakeholders to address long-recognised threats, support adaptive management and sustain appropriate levels of monitoring post-release are all critical. This is also an ideal opportunity to give renewed impetus to the regional and national implementation of the Single Species Action Plan for the Lesser Flamingo.

The plan is intended to cover all aspects of the proposed release from basic feasibility and risk assessments to an exit strategy. Its draws on the inputs of a diversity of experts and relevant international guidelines. Where written submissions were provided by individuals or working groups, these have been included unedited as appendices. The plan must be flexible and should be adjusted as circumstances and available knowledge dictate.

2. GOAL

To release captive-reared Lesser Flamingos removed from Kamfers Dam back to the wild.

3. FEASABILITY ASSESSMENT

Translocation is an effective conservation tool but its use either on its own or in conjunction with other conservation solutions needs rigorous justification. Feasibility assessment should include a balance of the conservation benefits against the costs and risks of both the translocation and alternative conservation actions. (IUCN/SSC 2013)

Table 1. Feasibility assessment for proposed repatriation of captive-reared Lesser Flamingos to the wild (adapted from IUCN/SSC 2013).

No.*	Category	Requirement	Assessment
5.1	Biological feasibility		
5.1.1	Basic biological knowledge	Necessary knowledge of any translocation candidate species should include its biotic and abiotic habitat needs, its interspecific relationships and critical dependencies, and its basic biology	Basic biological information is available for this species.
5.1.2	Habitat	Suitable habitat should meet the candidate species' total biotic and abiotic needs through space and time and for all life stages. In addition, habitat suitability should include assurance that the release of organisms, and their subsequent movements, are compatible with permitted land-uses in the affected areas.	Criteria for screening of potential release sites have been compiled. Food availability and water levels are being assessed and monitored.
5.1.3	Climate	The climate at destination site should be suitable for the foreseeable future. Bio-climate envelope models can be used to assess the likelihood of the climate changing beyond the species' limits of tolerance, and therefore for identifying suitable destination sites under future climate regimes	Potential release sites must have ≥100 Lesser Flamingos present to be considered suitable.
5.1.4	Founders	Founders should show characteristics based on genetic provenance, and on morphology, physiology and behaviour that are assessed as appropriate through comparison with the original or any remaining wild populations.	Captive-reared specimens originate from the same population into which they will be released.
5.1.5	Animal welfare	Conservation translocations should whenever possible adhere to internationally accepted standards for welfare, but should comply with the legislation, regulations and policies in both the source and release areas.	This intervention was prompted by welfare concerns and these remain a key focal area.
5.1.6	Disease and parasite considerations	The management of disease and known pathogen transfer is important, both to maximise the health of translocated organisms and to minimise the risk of introducing a new pathogen to the destination area.	Provision has been made for comprehensive disease screening prior to release.
		Quarantine before release, as a means of prevention of disease or pathogen introduction, is a basic precaution for most translocations; its use should be assessed on a case-by-case basis as it may cause unacceptable stress; conversely, stress may usefully bring out latent infections.	Provision has been made for pre-release quarantine
5.2.	Social feasibility		

No.*	Category	Requirement	Assessment
		Any conservation translocation proposal should be developed within national and regional conservation infrastructure, recognizing the mandate of existing agencies, legal and policy frameworks, national biodiversity action plans or existing species recovery plans.	The current operation falls outside the scope of the International Single Species Action Plan for the Conservation of the Lesser Flamingo (Childress *et al.* 2008), but national and provincial conservation departments/agencies are involved in planning and assessing the proposed release.
		Organisational aspects can also be critical for translocation success: where multiple bodies, such as government agencies, nongovernment organisations, informal interest groups (some of which may oppose a translocation) all have statutory or legitimate interests in a translocation, it is essential that mechanisms exist for all parties to play suitable and constructive roles. This may require establishment of special teams working outside formal, bureaucratic hierarchies that can guide, oversee and respond swiftly and effectively as management issues arise.	The International Single Species Action Plan for the Conservation of the Lesser Flamingo (Childress *et al.* 2008) calls for the development of national Lesser Flamingo action plans and the establishment of national Lesser Flamingo working groups to facilitate implementation. The National Department of Environmental Affairs needs to provide leadership in such an initiative.
		The multiple parties involved in most translocations have their own mandates, priorities and agendas; unless these are aligned through effective facilitation and leadership, unproductive conflict may fatally undermine translocation implementation or success.	
		A successful translocation can contribute to a general ethical obligation to conserve species and ecosystems; but the conservation gain from the translocation should be balanced against the obligation to avoid collateral harm to other species, ecosystems or human interests; this is especially important in the case of a conservation introduction.	BLSA has indicated that would be prepared to assist with the development of a post-release monitoring plan.
5.3	Regulatory compliance		
		A conservation translocation may need to meet regulatory requirements at any or all of international, national, regional or sub-regional levels. This may in include consideration of the compatibility of permitted and non-permitted land-uses in areas either proposed for a release or where released organisms might subsequently move to.	The construction of the proposed soft-release site may require authorization. This needs to be clarified and addressed before any site clearing or construction takes place. J. Hohne (CEO of Kimberley Ekapa Mining Joint Venture) has undertaken to build such a facility, but a formal mandate is required before he can proceed. This mandate needs to come from DENC.

No.*	Category	Requirement	Assessment
			Movement of captive-reared specimens is subject to import and export permits. These need to be arranged in advance to ensure that movements are not unnecessarily delayed once birds have met transport criteria.
		In any country, different agencies may be responsible for proposal evaluation, importation or release licensing, or certifying compliance. A translocation programme may have requirements to report regularly to such agencies on progress and compliance.	A reporting mechanism with responsible individuals and clear timeframes is required. The National Zoological Gardens should take the lead on this.
		Irrespective of any permission to import organisms, any conservation translocation should have been granted the appropriate government licence to release organisms.	Captive-rearing facilities have demonstrated a willingness to comply with provincial permitting requirements.
		National requirements for plant and animal health before release should be met. The importation of wild species that are implicated as vectors of human or domestic animal disease may be subject to particular regulation and control by national authorities.	The National Department of Agriculture Forestry and Fisheries and relevant state veterinarians must be consulted and all disease screening requirements satisfied. R. Campbell (Veterinarian, NZG) has undertaken to address this.
5.4	Resource Availability		
		Effective translocation management will be truly multi-disciplinary, with strong emphasis on incorporating social skill sets as well as biological/ technical expertise.	A multi-disciplinary group is involved in planning and implementing the diverse aspects of the project.
		Under normal circumstances, a translocation should not proceed without assurance of funding for all essential activities over an adequate period of time. Funding agencies should be aware that rational changes to a translocation plan during implementation are normal, and budgets should be flexible enough to accommodate such changes.	Each organisation has its own funding mechanisms, it is unknown whether these are adequate.

*Numbering follows the IUCN Guidelines for Reintroductions and Other Conservation Translocations (IUCN/SSC 2013) to facilitate cross-referencing to the original document.

4. RISK ANALYSIS

Risks in a translocation are multiple, affecting in many ways the focal species, their associated communities and ecosystem functions in both source and destination areas; there are also risks around human concerns. Any proposed translocation should have a comprehensive risk assessment with a level of effort appropriate to the situation. Where risk is high and/or uncertainty remains about risks and their impacts, a translocation should not proceed (IUCN/SSC 2013).

Table 2. Risk analysis for the proposed repatriation of captive-reared Lesser Flamingos to the wild (adapted from IUCN/SSC 2013).

Category	Requirement	Assessment
Risk to source populations	Except under rare circumstances, removing individuals for translocation should not endanger the source population	Removal was prompted by welfare concerns and intended to improve survival prospects of chicks. Unintended disturbance impacts do occur, but have not been quantified. Their severity would need to be thoroughly assessed should a similar intervention be contemplated in future. The severity of this risk is unknown.
Ecological risk	A translocated species may have major impacts (whether desirable/undesirable, intended/ not intended) at its destination on other species, and on ecosystem functions; its own performance may not be the same as at its origin; evidence shows that risks are greater for a translocation outside a species' indigenous range, and adverse impacts may not appear for many years	The intention is to release the specimens where there are already conspecifics as well as adequate food and water. The ecological risk is expected to be low.
Disease risk	As no translocated organisms can be entirely free of infection with micro-organisms or parasites, with consequent risk of their spread, disease risk assessment should start at the planning stage, with its depth in proportion to the estimated likelihood of occurrence and severity of impact of any prospective pathogen.	Provision has been made for comprehensive disease screening prior to release. The disease risk is expected to be low.
Associated invasion risk	Separate from the risk of pathogen introduction, translocation design should be mindful of the wider biosecurity of the release area: care should be taken that potentially invasive species are not accidentally released with individuals of the focal species. This is a particular risk when translocating aquatic or island organisms.	Captive rearing was undertaken at a variety of facilities and the potential for accidental releases exists. The severity of this risk is unknown.

Category	Requirement	Assessment
Gene escape	Gene exchange between translocated individuals and residents is one purpose of a reinforcement; however, when historically isolated populations are mixed, or where organisms are moved outside their indigenous range, and there is a risk of hybridisation with closely-related species or sub- species, this may possibly result in lower fitness of offspring and/or loss of species integrity.	Repatriation will take place within the range of the source population. There is no risk of gene escape.
Socio-economic risk	These include the risk of direct, harmful impacts on people and their livelihoods from released organisms, and more indirect, ecological impacts that negatively affect ecosystem services; translocations outside indigenous range have greater likelihood of negative socio-economic impacts and, hence, adverse public attitudes.	Repatriation will take place within the range of the source population. Socio-economic risk is low.
Financial risk	While there should be some level of assurance of funding for the anticipated life of any translocation, there should be awareness of the possible need for funding to discontinue the translocation or to apply remedial funding to any damage caused by the translocated species.	There is no assurance of funding. This is being sourced as the need arises.

5. IDENTIFICATION OF WATERBODIES AS POTENTIAL RELEASE SITES FOR LESSER FLAMINGOS TEMPORARILY HELD IN CAPTIVITY (APPENDIX I)

Over 200 potential Lesser Flamingo release sites were screened using current and historical data from the Coordinated Waterbird Count (CWAC) project, recent (December 2018- February 2019) bird distribution data from BirdLasser, tracking data from the Endangered Wildlife Trust's Wildlife and Energy Programme and reports from other NGOs, provincial conservation departments and agencies, tertiary institutions and the private sector. Only four sites in South Africa were confirmed to have held more than 100 Lesser Flamingos in 2019.

At last count there were 130 Lesser Flamingos at Verlorenvlei (Western Cape), but this wetland was drying up and considered a poor release prospect (K. Shaw, pers. obs). A pan outside Hendrina (Mpumalanga) held 300 in January 2019, but this had dropped to 21 by mid-February (Birdlasser). This site was also considered inadequately known and relatively far from essential logistical support to consider further given the tight time constraints. Barberspan (North West) had 3000 Lesser Flamingos in January. This number declined to 300 following rain in February (M. Remisiewicz and L. Underhill, pers. comm.) and the site appeared to serve primarily as a nocturnal roost with the remaining birds foraging elsewhere during the day. Food availability was subsequently investigated by R. Colyn of BirdLife South Africa and found to be a limiting factor.

By mid-March 2019 Kamfers Dam was the only wetland in South Africa reported to still hold more than 100 Lesser Flamingos (BirdLasser). It has access to a well-motivated team of experts and trained volunteers to facilitate release. A quarantine facility has recently been completed and plans have been developed for a soft release enclosure. Although this site has been experiencing several well-publicised challenges (the most significant of which are water supply and food production), efforts to secure adequate water are ongoing and following good rains in March it seems likely that there will be enough

water to allow the remaining wild chicks to fledge (M. Anderson, pers. comm.). This is currently the only site where the release of captive-reared Lesser Flamingos can be attempted.

Wetlands in the winter rainfall area of South Africa may begin to attract dispersing Lesser Flamingos in sufficient numbers to contemplate releases elsewhere in the coming months. Ongoing assessment of alternative release sites, particularly in the Western Cape, could be of benefit for those captive birds with slower development that are not expected to meet release criteria soon enough to benefit from integration into wild crèches.

6. MEDICAL SCREENING OF BIRDS PROPOSED FOR RELEASE (APPENDIX II)

Prior to release, captive-reared Lesser Flamingos will need to be screened to ensure that they are physically ready and do not pose a preventable health risk to conspecifics at the release site and elsewhere in the species' range, to other waterfowl and to domestic poultry.

All birds will be screened and only those that qualify for release will be sent to the chosen release site(s) when they reach 500-700g. At least two groups will be required to accommodate age and developmental differences. All birds will be clinically assessed to determine whether both eyes are viable and to check for evidence of Pododermatitis, Candida, Aspergillus and Pox. A faecal sample will be collected for staining (mycobacterium (acid fast) and parasites). 10% of birds will be tested serologically for Avian Influenza (pathogenic), Newcastle Disease and Mycoplasma.

The first birds would be ready for transport to release sites by the beginning of March (K. Koppel, pers. Comm.).

7. TRANSPORT REQUIREMENTS (APPENDIX III)

The movement of the chicks should be done when they reach about 700g -750g (though 500-700g has also been suggested; K. Koppel, pers. comm.) at this stage they should be weaned, self-filter feeding, tall enough to be transported in open top boxes, and healthy enough to withstand the stress of relocation. The bottom of the cardboard transport boxes will be lined with shower matting to prevent the risk of leg injuries during transport.

J. Hohne (CEO of Kimberley Ekapa Mining Joint Venture) has offered the use of his private aircraft to transport captive-reared birds back to Kimberley, but this is no longer a viable release destination. J. Werth (Executive Director of the Pan-African Association of Zoos and Aquaria) has been in discussions with SA Airlink and The Bateleurs (www.bateleurs.co.za) have been suggested as a further option should additional capacity be required (N. Wright, pers. comm).

8. PRE-RELEASE QUARANTINE (APPENDICES II AND III)

A minimum of one week in quarantine is recommended (K. Koeppel, pers. comm.). A quarantine station is being constructed at the Kimberley SPCA (an architect's plan is available), but facilities of equivalent standard may not be available at other potential release sites.

Opinions vary on how long the captive-reared flamingos should remain in captivity at the release site. The total duration must be sufficient for transport-related stress to reduce to normal baseline, allow birds to recover their strength, begin self-feeding again and demonstrate all physical abilities (locomotion, flight, etc.) necessary for independent survival.

9. PRE-RELEASE ASSESSMENT (APPENDICES II, III AND IV)

Captive-reared Lesser Flamingos must be assessed on an individual basis and satisfy minimum health and developmental criteria before they can be released. They must:

- weigh ≥1000g (K. Koeppel);
- be foraging (filter feeding) independently (weaned from all syringe/tube feeding and maintaining weight for at least two weeks);
- be free of antibiotic care for at least two weeks;
- demonstrate all physical abilities (locomotion, flight etc.) necessary for independent survival;
- have good feather condition and be able to enter and exit the pool;
- be able to thermoregulate in ambient temperatures;
- be relatively free of imprinting (or released with a group of 50 or more);
- meet release criteria by 14 May (R. Campbell and K. Koeppel)

10. RELEASE METHOD (APPENDIX III AND IV)

Two alternative release methods termed “hard” and “soft” have been proposed. In a hard release, birds that meet all relevant health, developmental and behavioural criteria would be released from quarantine directly into suitable foraging habitat. While an area with existing crèches of unfledged wild flamingos of the same age is preferred, breeding only occurs at one site in South Africa and this may not be feasible.

Once released, these birds would need to be monitored, but it is unlikely that they could be retrieved for further care if the need arose. This could cause unacceptable levels of disturbance to other members of the crèche and should not be attempted. It is essential that all role-players accept this basic premise and agree to abide by it.

A soft release would require the construction of an additional facility at the edge of the wetland where birds could acclimatize further to local environmental conditions and stimuli before being released. After the release they would continue to have access to familiar supplementary food sources should these be required. Once they join an existing crèche of wild or previously released captive-reared birds, further interventions would be unacceptable for the same reasons as given above.

There is currently no purpose-built soft-release facility at any of the potential release sites. The most advanced birds from the first cohort would therefore, of necessity, be subjected to a hard release irrespective of where they were sent. In the absence of a wild crèche to help locate the best foraging areas and to learn from, provision of supplementary food along the shoreline would be a worthwhile precaution at least during the initial transition from captivity to the wild. A minimum group of 50 individuals is preferred and these should be closely monitored to inform future releases. If the survival rate after the first week is below an agreed threshold then the approach to subsequent releases would need to be modified to minimise the potential for reoccurrence of identified problems.

It is critical that suitably qualified individuals be available to oversee the strategic management of the release operation as well as the day-to-day running of any quarantine station(s) and/or soft-release facilities. Adaptive management will be essential, and the appointees must be empowered to deviate from any agreed plan subject to due consultation with the relevant provincial conservation authorities.

11. LONG-TERM MARKING (APPENDIX III)

All captive-reared flamingos were fitted with miniature transponders and their unique alpha-numeric codes have been captured in a central database managed by PAAZA (J. Werth, pers. comm.). While this marking method allows for individual identification of birds whilst in captivity, the devices are of little use in field studies. Furthermore, the necessary microchip readers are unlikely to be widely available in most countries within the potential dispersal of the Lesser Flamingo where carcases might be found. It was generally agreed that a supplementary marking device would be required to assess post-release survival and dispersal.

Satellite and cell phone tracking devices are expensive and can only be fitted to a comparatively small sample of released individuals. While these devices provide high resolution movement data, the proportion of birds in each treatment group that are fitted with such devices will determine the confidence with which subsequent data on survival and dispersal can be extrapolated to other individuals. Fitting of such devices should be optional.

Use of tracking devices is not without risk to the subject animal and is therefore essential that clear parameters are established for use. All devices irrespective of their origin or funder must be registered with a single project, the project must have a lead researcher and clearly stated objectives and outputs, must have ethical clearance from a competent body and must have all necessary provincial permits. All devices must adhere to best practice norms in terms of percentage body weight and harness design. Devices must be fitted by individuals with prior experience of similar devices and species. All data must be downloaded to an online database (e.g. Movebank) and must be accessible to the Department of Environmental Affairs.

Engraved plastic rings are preferred for field identification of released birds and must be fitted above the ankle to improve visibility and minimise problems associated with fouling (Figure 1). The international ringing scheme for Lesser Flamingos allocated red rings to South Africa, but little ringing has been done and this colour could be substituted (C. King, pers. comm.). White or yellow rings with black engraved numbers are the most readable from a distance (C. King, pers. comm.). In captivity white rings don't last as well as yellow ones so yellow rings with black engraved numbers (Photo 1) are recommended (S. Wilkinson, pers. comm.). The plastic rings do not provide any contact information and are primarily of use in assessing survival at the release site, local dispersal and later integration into the breeding population.

The merits and risks of also attaching individually numbered metal SAFRING rings (above the ankle on the other leg) were debated at length via e-mail. Inputs were received from experts in captive husbandry, veterinarians, field biologists, government ornithologists and representatives of local NGOs. Expert guidance was provided throughout by Cathy King, co-chair of the IUCN SSC Flamingo Specialist Group.

Field biologists and conservationists generally supported the use of metal rings which are durable and provide basic contact information which would increase the probability of reporting if a bird were to re-captured or recovered dead. Those with first-hand experience of problems encountered with captive birds cautioned against their use. While it is acknowledged that metal rings can cause harm, this is also not invariably the case as evidenced by recoveries of Lesser Flamingos ringed up to 50 years previously as well as the shorter-term survival of satellite tagged birds that were also ringed (M. Pretorius, pers. comm.). Given that the objective of the marking exercise is to assess short-and-long term survival as well as dispersal, the use of both colour rings and SAFRING rings is required. It is nevertheless essential that all ringed birds that are re-captured or recovered are examined for injuries and the data obtained in this way are used to inform future decisions around marking of birds.

Photo 1. Example ring

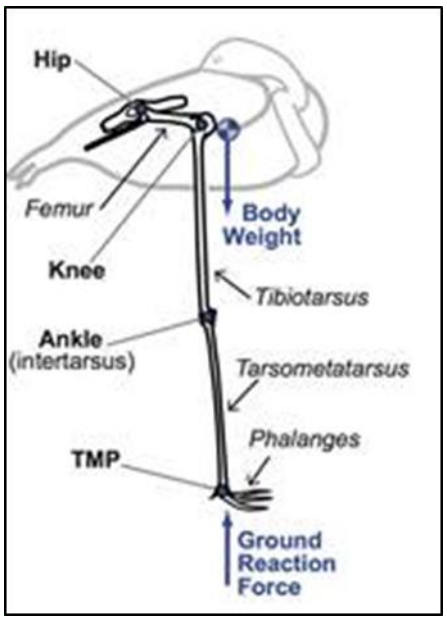

Figure 1. Ring position

Approximately 1000 rings will be required. Procurement of plastic rings which will need to be imported is underway (S. Wilkinson, pers. comm), but funding of metal rings still needs to be resolved. SAFRING reportedly has stocks of 14 and 16mm rings and each flamingo would need to be measured to determine the appropriate size (D. Oschadleus, pers. comm.). A decision is required on when and where birds will be ringed. This will depend in part on when the rings become available. H. Bantjes of BirdLife Northern Gauteng and his team of accredited ringers has been suggested to undertake the ringing in Gauteng (M. Anderson, pers. comm.), D. Harebottle of the Sol Plaatje University is available to ring birds in Kimberley and B. Coverdale of Ezemvelo KZN Wildlife has indicated that he is prepared to coordinate ringing of birds in KwaZulu-Natal. As per the standard requirement, all ringing data must be sent through to SAFRING for storage.

12. MONITORING AND ASSESSMENT OF RELEASE SUCCESS

Monitoring the course of a translocation is an essential activity. It should be considered as an integral part of translocation design, not to be merely added on at a later stage (IUCN/SSC 2013).

The monitoring programme must answer at least the following:

- *What evidence will measure progress towards meeting translocation objectives and, ultimately, success or failure?*

- *What data should be collected, where and when, to provide this evidence, and what methods and protocols should be used?*

- *Who will collect the data, analyse it and ensure safe keeping?*

- *Who will be responsible for disseminating monitoring information to relevant parties?*

BirdLife South Africa has indicated their willingness to assist in the development of a monitoring protocol and Res Altwegg of the Centre for Statistics in Ecology, Environment and Conservation has been proposed as a potential collaborator (M. Anderson, pers. comm.).

13. PERMITTING

No birds may be moved between facilities or across provincial boundaries without the appropriate permits. Banding of birds may only be done by permitted ringers. Attachment of tracking devices is subject to provincial permitting requirements in the province where the birds will be released.

14. DISPOSAL OF NON-RELEASABLE BIRDS

The International Single Species Action Plan for the Conservation of the Lesser Flamingo (Childress *et al.* 2008) recommends that range states maintain existing bans on trade in Lesser Flamingos. To give effect to this and long-standing norms related to the disposal of non-releasable animals at rehabilitation centres, non-releasable Lesser Flamingos may not be retained in private collections or commercially traded. If they cannot be accommodated in state institutions or permitted zoological gardens, then they must be humanely euthanized. C. Allenby (Acting Managing Director of the National Zoological Gardens) has undertaken to establish a studbook for non-releasable Lesser Flamingos.

15. EXIT STRATEGY

Not all translocations proceed according to plan. There will be a point at which investing further resources is no longer justified, despite any prior management adjustments. The decision to discontinue is defensible if translocation design includes indicators of lack of success and the tolerable limits of their duration, or if undesired and unacceptable consequences have occurred.

*An exit strategy should be an integral part of any translocation plan. Having a strategy in place allows an orderly and justifiable exit (*IUCN/SSC 2013).

Breeding success of Greater (*Phoenicopterus roseus*) and Lesser Flamingos is highly erratic, even at sites that are comparatively free of anthropogenic disturbances. Almost 100% survival to fledging has been reported for some sites in good years (e.g. McCulloch 2001 in Hockey *et al.* 2005) while mass mortalities of up to 100 000 chicks have been documented elsewhere (e.g. Berry 1972, Simmons 1996, Fox *et al.* 1997, Hockey *et al.* 2005). Recruitment estimates for both flamingo species at Etosha Pan, a formally protected area and regionally significant breeding site, were extremely low (i.e. 0.040 young/pair/year) (Simmons 1996).

Management interventions, including habitat manipulation, have been proposed to improve breeding success (Simmons 1996) and where implemented have proven successful (Anderson and Anderson 2010). In contrast, removal of chicks from drying wetlands for captive rearing and subsequent release was found to be resource intensive and ultimately considered unlikely to add significantly to future generations (Fox *et al.* 1997). Chick rescue is not included amongst the broad suite of priority actions identified by experts to improve the conservation status of the species (Childress *et al.* 2008). The total cost of the current operation needs to be calculated and weighed against projected benefits of similar expenditure on priorities listed in the International Single Species Action Plan for the Conservation of the Lesser Flamingo (Childress *et al.* 2008). Unless it can be demonstrated that rescue operations deliver commensurate benefits for species conservation, then scarce conservation resources should rather be allocated to other priorities.

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This plan was developed with the valuable input of numerous individuals and organizations. Rather than risk causing offence by accidental omission or unwanted association, all are thanked in anonymity. You know who you are and the role that you have played. Advancing the cause of Lesser Flamingo conservation should be enough for us all.

18. APPENDICES

IDENTIFICATION OF POTENTIAL RELEASE SITES FOR CAPTIVE-REARED LESSER FLAMINGOS *(PHOENICONAIAS MINOR*) CAPTURED AT KAMFERS DAM IN 2019.

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1. INTRODUCTION

The Single Species Action Plan for Lesser Flamingos (*Phoeniconaias minor*) highlights a multitude of threats to the species (Childress *et al.* 2008). In South Africa, habitat loss and degradation (including altered hydrology and/ water quality), disruption of nesting colonies, diseases, human disturbance, predation, competition (with crustaceans for food) and collision with man-made structures were considered of varying importance. An ideal release site would meet the ecological requirements of the species and avoid exposing naïve, captive-reared individuals to potential sources of harm. Unfortunately, the South African landscape is highly transformed and short, medium and longer-term interventions will undoubtedly be required to address long-standing problems and unforeseen challenges.

Adoption of multiple release sites necessitates duplication of effort and greater resource allocation, but also reduces the risk of a site-specific catastrophe undermining the success of whole release effort (R. Simmons, pers. comm.). To this end, a broad range of natural, modified and man-made wetlands were considered for their potential to serve as release sites for captive-reared Lesser Flamingos from Kamfers Dam.

2. RELEASE SITE CRITERIA

Potential release sites must:

1. have large numbers (> 100) of Lesser Flamingos present at the time of release;
2. have a consistent food supply (e.g. salt works and sewage works);
3. have an adequate supply of water to ensure that conditions remain suitable at least until the released birds are able move away unaided should the need arise;
4. have the approval and active support of the landowner and/or management authority;
5. be accessible by vehicle and close to a good road network to facilitate delivery and subsequent monitoring;
6. have a readily accessible source of appropriate veterinary and husbandry expertise;
7. be secure from predators (e.g. feral dogs and Jackal) either through appropriate perimeter fencing, low recorded levels of natural predation, or large size (i.e. potential for larger birds to escape into deeper water);
8. have no history of mass die-off through disease;
9. have restricted access (e.g. a well-managed protected area) and/or an adequate security presence to minimise the risk of deliberate or accidental disturbance and/or attempts at illegal harvesting of released birds;
10. be free of collision hazards such as fences and overhead lines or where these are present their potential impact is acknowledged and adequately mitigated.

Potential release sites should ideally also meet the following additional requirements:

1. have existing crèches;
2. provide or be close to accommodation for those involved in the release and monitoring

3. SITE IDENTIFICATION

The primary data source used to identify waterbodies that could potentially serve as release sites for captive-reared Lesser Flamingos (based on recent data or historical trends) was the Coordinated Waterbird Count (CWAC) project. CWAC was initiated by the then Avian Demography Unit (ADU) of the University of Cape Town in part to monitor populations of waterbirds at as many major wetlands in South Africa as possible (Taylor *et al.* 1999). For the purposes of this assessment, a threshold of ≥100 Lesser Flamingos was set to exclude smaller or more ephemeral sites which, though still very important to non-breeding flamingos (McCulloch *et al.* 2003), could not all be assessed further due to time constraints.

Where possible, spatial and temporal gaps in the dataset available for registered CWAC sites were overcome through cross-referencing of sites to BirdLasser (a smart phone application developed to facilitate recording of bird distribution data) and Bird Pix (a citizen science-based biodiversity data gathering initiative of the Animal Demography Unit) and through expert consultation (nature conservation agencies, research institutions, NGOs and independent experts).

The CWAC database currently lists 213 registered sites (not all of them independent) for which Lesser Flamingos have been recorded at least once since the inception of the project in 1991. Of these, 91 have recorded ≥100 Lesser Flamingos on at least one count (Figure 1). Unfortunately, more than half of these sites are no longer counted regularly as part of CWAC and even with reference to supplementary data sources, the presence/absence of Lesser Flamingos in 2019 could only be determined for 40 sites. Only 8 registered CWAC sites held Lesser Flamingos in 2019 (Table 1).

Table 1. Sites known (or considered likely) to support Lesser Flamingos in 2019.

Site	Province	DDS	DDE	2019 estimate	Source(s)
Kamfers Dam	Northern Cape	-28.6666	24.76833	50000-80000	T. Anderson, M. Anderson
Barberspan	North West	-26.5847	25.5847	300	M. Remisiewicz, L. Underhill
"Hendrina Pan"*	Mpumalanga	-26.1230	29.70195	300	BirdLasser
Verlorenvlei	Western Cape	-32.3333	18.41805	130	K. Shaw
Kliphoek Saltpans	Western Cape	-32.8333	18.2005	3	CWAC
Langebaan Lagoon	Western Cape	-33.1836	18.1186	Present	BirdLasser
Lake St Lucia and Mkuzi Swamps	KwaZulu-Natal	-28.0677	32.4519	Present	B. Coverdale, C. Fox, A. Marchant
Flamingo Pan	Free State	-28.0000	26.6836	No data	T. Anderson, B. Colahan
Voëlpan*	Free State	-27.7687	26.6537	Present	M. Pretorius
Orange River Mouth	Northern Cape	-28.6350	16.4635	No data	E. Taylor

*Not registered with CWAC

Kamfers Dam, Lake St Lucia (and Mkuzi Swamps), Flamingo Pan (Welkom) and the Orange River Mouth are considered the key sites (>10% of the regional population) for Lesser Flamingos in South

Africa (Childress *et al.* 2008). There are currently between 50 000 and 80 000 Lesser Flamingos at Kamfers Dam of which approximately 6000 pairs have attempted to breed (T. Anderson, pers. comm.). An unspecified number of Lesser Flamingos were recorded at Flamingo Pan in December 2018 (BirdLasser) and both that site and Voëlpan (to the north) regularly support ≥100 individuals (T. Anderson, pers. comm). Satellite tagging has shown regular movement between Kamfers Dam and Voëlpan, but there is no recent population data for either Flamingo Pan or Voëlpan (T. Anderson, pers. comm.). There have also been recent sightings of Lesser Flamingos in the False Bay section of Lake St Lucia and at the Orange River Mouth (BirdLasser), but no count data is available for either site.

400 Lesser Flamingos were reported for a small (approximately 80ha) pan 3km north of Hendrina in October 2018 (BirdLasser) and this had dropped to 300 by January 2019. The pan is not registered with CWAC and was not previously identified as important for Lesser Flamingos. Kamfers Dam, Barberspan, "Hendrina Pan" and Verlorenvlei are the only wetlands in South Africa for which concentrations of Lesser Flamingos have been reported in 2019. These sites and others listed in Table 1. are considered further below.

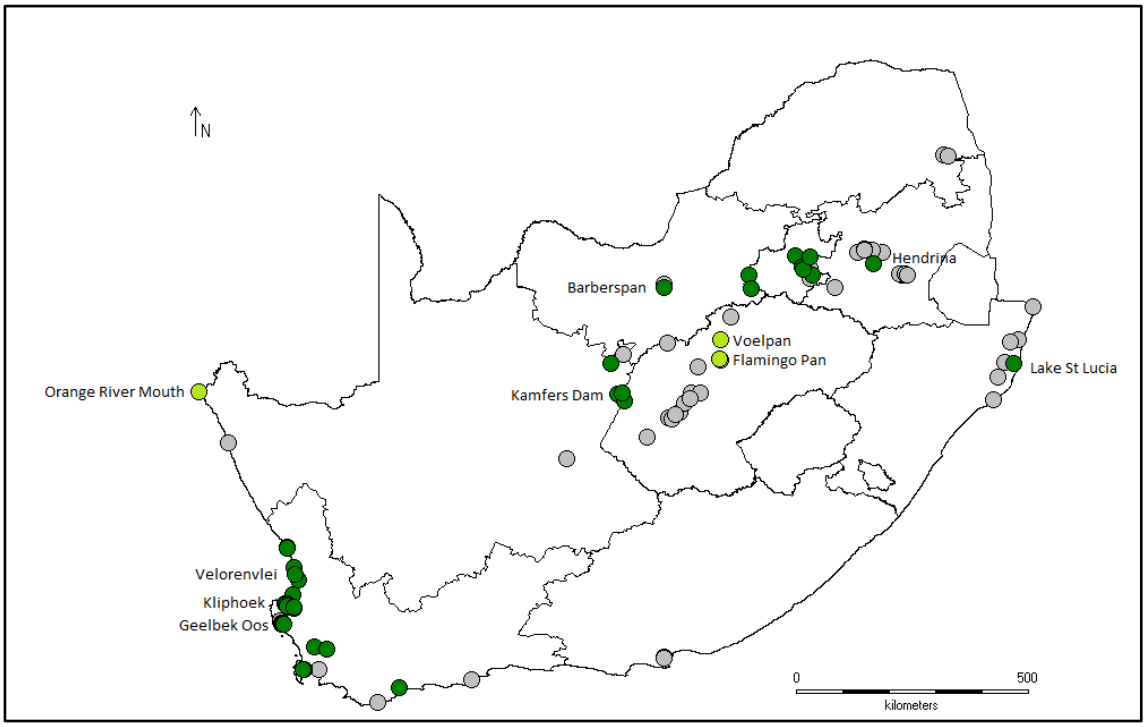

Figure 1. Sites where ≥100 Lesser Flamingo have been recorded through CWAC since 1991 (grey circles), the subset of sites which have been assessed in 2019 (dark green circles) and additional sites for consideration (light green circles).

4. SITE ASSESSMENTS

There is general agreement that any potential release site(s) must have Lesser Flamingos present at the time of release. This provides vital confirmation that local conditions satisfy the habitat and foraging requirements of the focal species.

Flamingo Pan, Voëlpan and Orange River Mouth

While it is acknowledged that even sites that have supported large numbers of Lesser Flamingos for extended periods may become unsuitable, these are preferred to sites for which there is little or no recent data, those that are only occupied erratically and those that typically support only low numbers of the species. There is currently inadequate data to contemplate releases at Flamingo Pan, Voëlpan and the Orange River Mouth.

Langebaan Lagoon and Lake St Lucia

Very large and complex wetland systems with multiple user groups (e.g. Langebaan Lagoon) and especially those with dangerous wildlife (e.g. Lake St Lucia and Mkuzi Swamps), would present considerable logistical challenges should a release be attempted. In addition to these considerations, there are no recent estimates of Lesser Flamingo numbers or data on population trends for these sites. They are also excluded from further consideration.

Verlorenvlei and Kliphoek Salt Pans

To minimise risk that further post-release interventions will be required due to deteriorating environmental conditions, the release site(s) must be deemed suitable for supporting captive reared birds at least until they can move to alternative feeding sites unaided should this be required. Verlorenvlei is drying up, fish deaths have been reported and the prospect of this site remaining suitable for Lesser Flamingos over the next few months is low (K. Shaw, pers. obs).

Salt-works and operational sewage-works provide a consistent food supply (microscopic cyanobacteria and benthic diatoms) and have the potential to be manipulated if required (R. Simmons, pers. comm.). Water levels at the Kliphoek Saltpans are artificially controlled, but numbers of Lesser Flamingos recorded there and elsewhere on the Berg River in February 2019 were uncharacteristically low. This site is also considered unfavourable for release.

Kamfers Dam, Barberspan and "Hendrina Pan"

All three of these wetlands supported concentrations of Lesser Flamingos in 2019 and their suitability as potential release sites was therefore assessed against the full suite of selection criteria (Table 2). The "Hendrina Pan" is relatively small and lies immediately adjacent to the N11 between Hendrina and Middleburg. It is a largely unknown entity and it is impractical to consider it further given the urgency of resolving this issue. The remaining two sites are better known, but neither is ideal.

The landowners of Kamfers Dam have expressed their support for the release project and local resources have been mobilised to facilitate the design and construction of appropriate quarantine and pre-release enclosures (M. Anderson and J. Werth, pers. comm.). S. van der Merwe, officer-in-charge of Barberspan Nature Reserve, similarly supports the release of rehabilitated flamingos and has offered to provide logistical support for the operation. Approval would still be required from the relevant authority responsible for management of South African Ramsar sites (N. Bila, pers. comm.).

Both sites reportedly have good road access, but are likely to experience constraints in terms of animal husbandry knowledge and veterinary expertise. Basic training of local staff and/or volunteers in the handling and care of flamingos has taken place at Kimberley and would need to be repeated

at other potential release sites. Appropriate veterinary expertise will need to be sourced locally or brought from further afield as required.

Predation was the main cause of high mortality amongst predator naïve juvenile Greater Flamingos (*Phoenicopterus roseus*) removed from Etosha National Park as chicks in April 1994 and translocated to Walvis Bay after a period of captive rearing (Fox *et al.* 1997). Flamingos are highly gregarious and while juveniles might be expected to gravitate towards good feeding areas identified by the resident birds (R. Simmons, pers. comm.) where they could acquire valuable learned behaviours, there is a risk that they may remain close to the release site and separate from wild birds (Fox *et al.* 1997). Large wetlands provide greater opportunity for flamingos to escape predators and other disturbances (M. Anderson, pers. comm.), but experience suggests that some form of pre-release anti-predator conditioning and pre-and-post-release predator exclusion is advisable (Fox *et al.* 1997, R. Simmons, pers. comm.). This is necessary to safeguard naïve juveniles at least until adequate levels of predator awareness have been achieved.

Protection from human disturbance (intentional or unintentional) and illegal harvesting will require regular patrols by trained security personnel. Patrols already take place at the proposed release site at Kamfers Dam (M. Anderson, pers. comm.) and while access to Barberspan is controlled, specific security arrangements at potential release sites need to be investigated further. Security could be reduced or removed once the released birds are judged to have integrated successfully back into the wild population or at least are deemed capable of avoiding such threats without assistance.

While there is no history of flamingo die-off through disease at either site, a toxin producing cyanobacteria that has been implicated in the mass die-offs of flamingos in East Africa was recorded for Kamfers Dam in 2012 and botulism is a sporadic threat (Marnewick *et al.* 2015). Clarity is required regarding the risk associated with releasing captive reared flamingos at a site where a relatively high incidence of avian pox has been recorded amongst juveniles in the past (Zimmerman 2011). Water quality at both sites is also negatively affected by inadequate provision for upstream waste-water management (Marnewick *et al.* 2015).

Existing crèches of same-age chicks are only available at Kamfers Dam, but the importance of these to the successful release of captive-reared juvenile Lesser Flamingos has yet to be demonstrated. Collision hazards were identified as a threat to waterbirds at Kamfers Dam, but not at Barberspan (Marnewick *et al.* 2015). It is not known whether these have subsequently been addressed.

Table 2. Release site suitability assessment for Kamfers Dam, Barberspan and "Hendrina Pan".

Site requirements	**Kamfers Dam**	**Barberspan**	**"Hendrina Pan"**
Unmanageable variables (yes=1; no/?=0)			
Large numbers of Lesser Flamingos	1	1	1
Adequate food (at release)	0	0	0
Adequate food (until able to move away)	0	0	0
Adequate water (at release)	0	1	0
Adequate water (until able to move away)	0	0	0
No history of die-off through disease	0	1	0
Have existing crèches of same-age chicks	1	0	0
Adequate road network	1	1	1
Manageable variables (yes=0.5; no/?=0)			
Veterinary and husbandry expertise available	0.5	0	0
Restricted access or security	0.5	0.5	0
Landowner/management authority support	0.5	0.5	0
Free of collision hazards or risk mitigated	0	0.5	0
Accommodation available nearby	0.5	0.5	0
Secure from predators	0	0	0
Total (max=11)	5	6	2

The prevailing drought conditions over much of western South Africa are exacerbating the well-publicised water supply problems at Kamfers Dam. This situation is not unique amongst potential release sites and an expert assessment of the long-term adequacy of water and food supplies at each site is an essential precursor to release. The release of birds at a site where there is moderate-to-high risk that they may need to re-captured due to deteriorating water or food conditions must be avoided. Projections received on the 23rd of February are that Kamfers Dam will dry by early March (M. Anderson, pers. comm.) and cannot be considered a viable release site in the short-term. The reported daily departure of flamingos from Barberspan to forage at surrounding wetlands (L. Underhill and M. Remisiewicz, pers. comm.) suggests that local food resources may be inadequate. This is currently being assessed (R. Colyn, pers. comm.).

Most tracked Lesser Flamingos that were in South Africa in late 2018 and early 2019, including those at Kamfers Dam, have since moved to Sua Pan, Botswana (M. Pretorius, pers. comm). The imminent drying-up of Kamfers Dam will force a mass movement of adults and fledged juveniles and this dispersal needs to be closely observed. Wetlands in South Africa that were previously excluded from consideration due an absence of Lesser Flamingos may well experience an influx of these birds. Captive-reared flamingos will meet developmental release criteria at different times and a staggered release was always envisioned (K. Koeppel, pers. comm). Additional release options may become available for later cohorts, particularly after the arrival of winter rains in the Western Cape, and ongoing engagement with BirdLasser and other citizen scientist observer networks will be essential to allow these to be assessed with minimum delay.

5. RECOMMENDATION

Barberspan Nature Reserve is the only wetland in South Africa that currently supports a concentration of wild Lesser Flamingos and where captive-reared Lesser Flamingos could potentially be released. There are problems with the site, but given the urgency of preparing for release of the most advanced birds, some of these issues are unlikely to be satisfactorily resolved in time. An assessment of the adequacy of water and food supplies in the medium term (several months) is non-negotiable, and no birds should be released at the site if the probability of conditions deteriorating to the point where recapture is required should be considered. It is important to prepare for a scenario where release of captive-reared birds may need to be delayed beyond originally projected timeframes.

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7. ACKNOWLEDGEMENTS

Numerous individuals from many organizations freely contributed valuable ideas and data used in this analysis and their assistance is greatly appreciated. While this demonstrates their commitment to the conservation of Lesser Flamingos, it should not be misinterpreted as an endorsement of the analysis, the resulting inferences or recommendations.

VETERINARY CHALLENGES IN LESSER FLAMINGO CHICKS

Dr Katja Koeppel, University of Pretoria.

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Disease concern in neonates

Incubation usually takes 28 days (Brown & King, 2000). Lesser flamingo hatch at a weight of 55 to 60 g. They usually stay on the nest of 5 to 8 days (Brown & King, 2000).

Lesser flamingo chicks usually have a weight gain of 7 to 9 % from day 3 to day 20. From day 20 to 32 the weigh gain in hand reared chicks is around 5 to 7 %. And a weight gain of 3 to 5 % until day 50. Weaning should take place between 60 and 75 days and birds should weigh around 750 g. At the age of 95 days most birds will reach 1000g with 5 % of birds not reaching that weight. %0 % of primary feathers should be in place by then. (Personal communication Shelly Collinsworth, Forth Worth Zoo).

The biggest problem seen in the neonatal chicks was dehydration, hyperthermia and egg yolk peritonitis.

The chicks should be rehydrated with Ringer Lactate spiked with 2.5 % dextrose and Vit B on arrival and if younger then 8 to 10 hours only offered oral fluids every 2 to 3 hours.

Feeding should be started with small amount of 2 to 3 mls and increased offer time. It is best to feed the chick until the crop is full rather then on a fixed amount as the ml will vary between chicks.

Chicks require a warm spot at 35 °C for the first week or so and that can be reduced gradually.

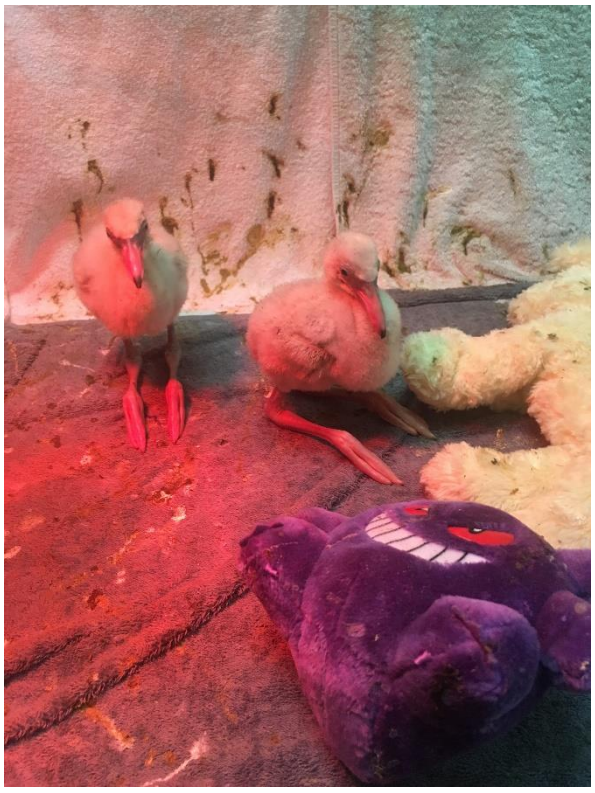

Figure 1: lesser flamingo chick with red light and teddy bear for comfort.

Weight gain is usually lower in hand reared versus parent-reared chicks.

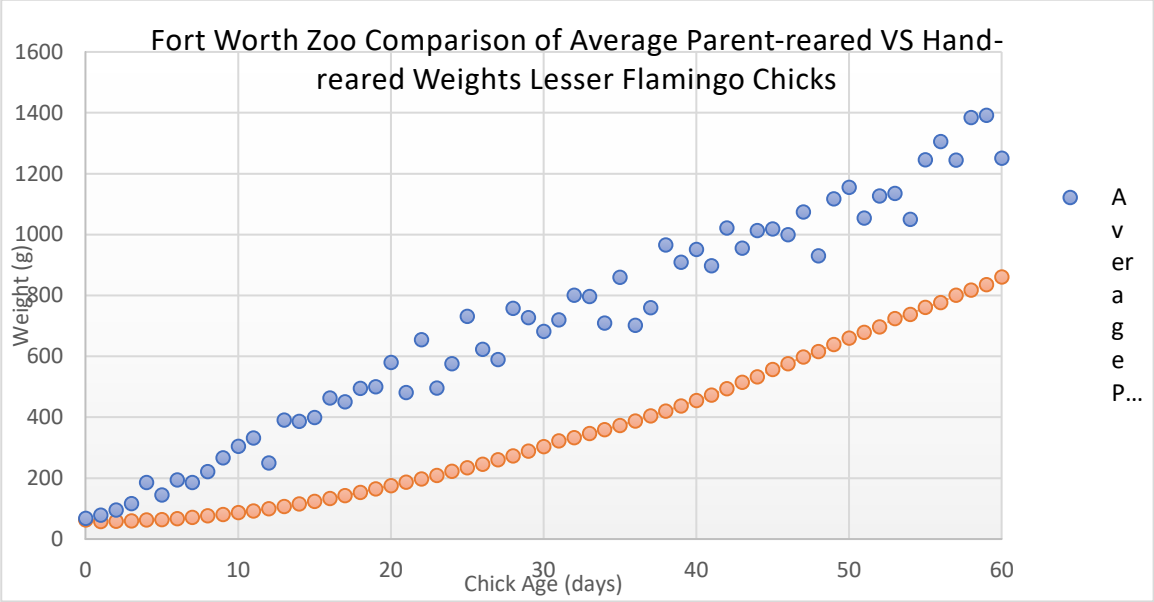

Figure 2: Comparison of parent-reared and hand reared lesser flamingo chicks (Forth Worth Zoo).

Egg peritonitis:

Usually associated with infection at the naval and premature feeding of food.

Crop stasis:

Crop stasis was frequently seen in the first few days and if not treated the chicks wound not gain weight and die. Crop stasis was treated with metaclopermide before feeding. Chicks with a full crop were not feed but received subcutaneous fluid until the crop empties. If the crop does not empty is will lead to sour crop and crop infection.

Crop infection

Crop infection are associated with trauma from sharp feeding tubes or inexperience in handling. Feeding of too hot or cold food results in damage to the crop mucosa with sloughing of the mucosa and infection in the surrounding tissue. Antibiotics (amoyxycillin clavuanic acid)) and antifungal have been used to resolve the issue. The prognosis of chicks with crop infection is poor.

Organ damage and ruptured air sacs

Organ damage and ruptured air sacs have been associated with rough handling and incorrect subcutaneous injections. Subcutaneous injection should be done only by trained personal and should be given in adjacent to leg, dorsal administration has resulted in air sac damage.

Eye infections

Were seen usually associated with trauma. The chicks were started on octin eye ointment and doxycycline antibiotic until resolved

Cloacal prolapse

Faecal smear for parasites to identify cause was done and chicks and prolapse was replaced and sutured if recurring. The chicks were treated with metronidazole and meloxicam.

Diarrhoea

Can have various reason and faecal smear and float is indicated to diagnose pathogens. Clostridium is normally present in faeces but found in high numbers or if the chick is not gaining weight should be treated.

Pneumonia

Aspiration pneumonia has been seen associated with inexperience tubing, too high volumes or incorrect dribble feeding. Broad spectrum antibiotics and antifungal have been used in conjunction with nebulisation in clearing the infection

Avian Pox

Avian pox has been seen in most facilities. It is reduced in facilities with good insecticide control. Lesion have been seen in approximately 8 % of chicks up to 3 weeks of age. In Kamfers Dam 30 % of fledgling have been seen with pox lesions (Zimmermann, Anderson, Lane, Wilpe, & Carulei, 2011). No high mortalities have been recorded associated with pox in the wild but the lesions seen were smaller then the ones noticed in the hand reared chicks. It is likely that hand raised chicks are more immunocompromised then parent reared chicks. The pox lesion can become proliferate and destroy adjacent tissue. They can also become secondary infected.

Splay leg

Splay leg has been seen especially in the beginning associated with incorrect substrate such as newspaper. Non-slip matting or towling should be used to prevent the issue. Affected chicks have been treated with hobbles and have recovered is treated early.

Figure 3: Splay leg in 3 day old chick before and after treatment

Leg problems and lameness:

Leg problems including paresis and lameness may be caused by infection, renal disease, arthritis, pododermatitis (bumblefoot) or trauma, including fractures, dislocations and soft tissue injuries. In addition, lameness in juvenile flamingos can result from metabolic bone disease or angular limb deformities.

Leg rotations have been associated with incorrect feeding/exercise as well as trauma. The legs can be tapped if noticed early but taping usually needs 3 weeks to correct (Diana boon, Dallas Zoo, personal communication).

Pododermatitis is important in captivity and unless with severe lesions should not be released.

Figure 4: Lesser flamingo with tension tape on right leg

Avian influenza

All birds are susceptible to avian influenza and good biosecurity is essential in rearing facilities. Birds should be tested prior to release via PCR to ensure they are negative. Avian influenza is notifiable.

Newcastle disease

All birds are susceptible to NCD and good biosecurity is essential in rearing facilities. Birds should be tested prior to release via PCR to ensure they are negative. Newcastle disease is notifiable. Vaccination of chicks prior to release could be considered.

Fungal diseases

Candida

Candida can be seen with diarrhoea and crop stasis and can be treated with antifungal medication.

Aspergillosis

Aspergillosis is usually associated with incorrect antibiotic or steroid treatment but have also been seen with aspiration pneumonia. Prognosis is poor unless localised.

Gastrointestinal foreign bodies

Flamingos will ingest harmful foreign bodies such blankets, teddy bears or material due to curiosity. Ideally material should be removed as the chicks bills harden to prevent ingestions. 2 chicks have died due to impaction with food/foreign material.

Medical for release:

Medical screening:

- Clinical
    - Eyes- both eyes need to be viable for release to ensure protection of chicks during breeding
    - Pododermatitis
    - Candida
    - Aspergillus
    - Pox analysis

- Faecal stain:
    - mycobacterium (Acid fast)
    - parasites

- Serology: (10%)
    - Avian influenza pathogenic
    - Newcastle disease
    - Mycoplasma

References:

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Rings:

From the information that has been coming in, it would be more a matter of opinion as to which ring to use, i.e... the SAFRING or the plastic ring with numbers. With the use of SAFRING rings we know the birds have the potential for medical issues related to band injuries and SAFRING cannot be read from a distance, so unless the bird has medical issues or is dead, then one would have no idea which bird it is. The numbered plastic rings are easily identifiable and can be read from a distance using commonly available binoculars or spotting scopes, thus making monitoring a lot easier. This specific type of plastic ring is available from Interrex in Poland, Hagee Engraving in the United States, or Peter Shannon in the United States. There have only been good comments / recommendation made about the plastic ring. By double ringing a bird, the cost implications double and all to achieve the same goals, this is not economically viable or necessary.

The rings should be yellow with black numbers engraved, 4 digits wide and 14.7mm in internal diameter which would fit both genders.

All the flamingo chicks have been transpondered as this is the legislated method for all TOPS species. Not only does that act as a back up to the plastic ring but also possible to be used in the field with passive transponder readers placed in strategic areas, possibly a monitoring project that could be implemented after release with certain criteria / aspects?

Rearing:

The current hand rearing protocol must be continued until the flamingo chicks are weaning and then transferred onto a 50:50 mix of Avi-plus Flamingo meal with Farmix Trout Pellets.

The Dallas Zoo nutritionist (Kerri Slifka) looked at the products and her recommendation would be to stick with a 50:50 mix of the flamingo meal and trout pellets for the use in the developing and weaning chicks. This mixture provides the desired target range for protein and fat in addition to supplying the necessary levels of critical vitamins and minerals. In a short-term usage, the higher than desired Ca:P ratio will not cause health concerns for the birds and the ratio is not high enough above target to begin inhibiting the proper absorption of other vitamins or minerals. If this was fed as a full year base diet, she said she would have significantly higher concern. For the chicks specifically she was more concerned that lowering the protein level too much below the ideal target of 34% would have a potential for developmental issues appearing.

Movement of Lesser Flamingo chicks:

The movement of the chicks should be done when they reach about 700g -750g, at this stage they should be weaned, self-filter feeding, tall enough to be transported in open top boxes, and healthy enough to withstand the stress of relocation. The bottom of the cardboard transport boxes will be lined with shower matting to prevent the risk of leg injuries during transport. Birds transferred to the final release site for soft-release will need to held in proper predator proof enclosures suitable to meet the husbandry needs of the species based on the number of birds being housed. The chicks should be maintained in this soft-release site for a period of time sufficient to allow the birds to recover their strength from the transport, reduce the transport stress back to normal baseline, begin self-feeding again within the soft-release enclosure, and demonstrate all physical abilities (locomotion, flight, etc.) necessary for independent survival. This is expected to be a duration of no

shorter than four weeks to allow the birds to adjust properly but could be longer based on the behavior of the birds.

Compiled By;

Shaun Wilkinson, Montecasino Bird Gardens

Kevin Graham, Dallas Zoo

The products for the flamingos can be purchased from:

Avi Products

Waterfall - KZN

Tel: 031+766-0016

Flamingo food 25kg bag

Schmidt Feeds & Seeds

Germiston

Tel: 011 + 873-8571

Trout Pellets - 40kg bag - R700.00

APPENDIX IV

16 2 2018

Flamingo Rescue Report – Laurie Conrad

Continued Observations at SPCA location:

Chicks are growing and developing normally. Half are eating three times a day and half are eating two times a day. Two are receiving veterinary care, but are eating well and seem to be thriving.

Hydration – The most important aspect in hand rearing flamingos. They seem to require more fluids than other bird species in medical literature.

Dehydrated chick: Dehydrated chicks will often refuse feedings and appear ill.

The most common issue with hand rearing is dehydration. If the bird's eyes are not round and moist, give additional fluids. It can take up to two weeks to catch up on hydration in a dehydrated bird . As diets are modified, (usually because of ingredient availability) birds may require additional water between feedings. Most dehydrated birds refuse feedings. Often replacing a whole feeding with water instead of water is what they need. The feeder should evaluate hydration for each bird at each feeding.

Feces should be a quick "projectile squirt". If a chick is seen straining or produces thick and small droppings, replace the next scheduled feeding with oral water feedings and continue until hydration is improved.

Well hydrated bird

Bird's eye is round while walking around, skin below the eye and above the bill is plum and not sunken in. Tent-tests work, but the eyes may be easier to assess for some people.

Recommended Housing:

Towels and plush animals are great for chicks to brood against to aid in thermoregulation. Considerations: Towels should be free of holes and frayed edges to prevent unintended trauma to chick. Plush animals should be used sparingly after around day three to ensure that birds are not crowded and have plenty of room to learn to walk around, forage, and thermoregulate. Proper space is essential to proper development.

The first photo shows birds with adequate space to learn to walk. The second photo shows birds that are too crowded.

The first photo shows adequate space for the pictured birds. The second photo shows a temporary holding that is acceptable for short term holding.

Flat pan filled with water should be supplied as soon as the chick begins walking around. The chick should be walking strongly by day 5 and then feeders should check legs daily to make sure that they are straight and growing evenly. Notify a veterinarian immediately if leg issues are noted.

Suggested Pre-release Facilities for Juveniles:

The chicks require secure outdoor housing and increased space to prepare for release into wild habitats. Chicks are gaining between 10-24% of their bodyweight daily and must be moved to a larger enclosure.

Overcrowding will lead to disease and it is crucial to move flamingos to larger holding enclosures as they grow. The SPCA Facility is grading a 6000 metre square area today in preparation for a 50 x 50 metre holding pen. Potential designated space on the SPCA campus is almost 6000 square metres. Pen will be constructed of metal and galvanized welded wire with top netting partially covered with shade cloth. The enclosure would contain a light broom finish, concrete pool with a shallow area (~ 20 inches of additional loafing area) that slopes (less than 30 degrees) to a deep end (1-2 metres). Additional plans are underway to secure three containers (veterinary clinic and support area) to provide separate designated area for flamingo chicks and juveniles. The area may be dual purpose area when not in use as flamingo holding.

Holding enclosures for flamingos are fairly simple, but AZA strongly recommends a minimum 1.4 sq meters per bird (50 meters per 30). The Husbandry Manual does not provide minimum requirements for water elements; however most American AZA flamingo habits are around 2 parts land to 2 parts water.

Release Recommendations:

Hand raised flamingos have been successfully introduced into captive colonies for many years. Flamingos will accept chicks back two plus weeks after their chicks have been pulled and will resume chick rearing (per experience and per communication).

Flamingos often take several days to transition to new facilities. It is quite common for birds to lose weight before they acclimate to new habitats and feed.

I suggest moving the chicks to the SPCA facility flamingo pen to wean and maintain weight prior to a hard release into the Kamfer's Dam crèche. Adult flamingos are seldom interested in chicks other than their own. Sometimes chicks are harassed or killed by adults if they venture to close to their nest sites.

- I do not think that adults will visit a hack pen built on the pan. The enclosure location (if used) would need to be close in proximity to the crèche and in a position where all of the birds can forage and feed readily, otherwise, it is my belief that the birds will lose weight and be released at a deficit.
- It is difficult to monitor birds in an enclosure near to the colony without potentially disturbing the colony.
- It is preferable to disturb the colony one or two times than to check the birds daily and potentially causing disturbances.
- If the birds are enclosed and lose weight, what decisions will be made moving forward? If they are released anyway, it may be better to move the birds at their higher weight to give them the time to learn from the crèche.
- The crèche is currently very separate from the adult birds (14/2/18) and the juveniles will learn from the crèche behaviours rather than adults.
- I strongly recommend against releasing naive birds into a colony of adults that do not have a crèche formed near the nesting site.

Recommended Release Criteria

All flamingos must be screened for disease prior to release. The network coordinators will arrange veterinary care and flamingo examinations. Prior to release, flamingos are recommended meet the following criteria:

- Be foraging independently – weaned from all syringe/tube feeding and maintaining weight for at least two weeks
- Be free of antibiotic care for at least two weeks
- Be capable of flight without wing developmental issues
- Have good feather condition and be able to enter and exit the pool
- Be able to thermo-regulate in ambient temperatures
- Be relatively free of imprinting or released with a group of 50 or more
- Be released into an area approved by a veterinarian and designated representatives of the network
- Be released into an area containing adults and a crèche of similarly aged chicks
- Be released by an experienced person that knows how to move around the colony and how to handle birds.

I recommend releasing half of the chicks once they meet release criteria and release a second group once they reach criteria. The second release may be a month behind the first group and it may be advisable not to hold birds back that are ready for release. Chicks in facilities are various ages. Some chicks are completely covered in down and are under veterinary care while others appear to be healthy, are developing flight feathers, and are close to wean.

14/2/18I visited the Kamfer's Dam flamingo colony with Dr. Donavan Smith, Linja Allen, and Christy Simeone (AZA representative), property owners, (Mr. and Mrs. Booth), and Tania Anderson from BLI.

The crèche estimate we were given was about 3000 chicks. Mr. Booth transported me to an area of the pan where I was able to walk 100 metres from adult and first year juveniles without disturbance or reaction from

the birds. They continued to forage and vocalize in proximity. There were several appropriate release sites for the juveniles.

Release Criteria:

Many successful conservation programs have included release back into natural habitats. Zoos frequently work in situ with permitting officials, NGOs, and communities to improve species survival around the globe. Additional details can be provided by any of the listed contacts below. I have participated in release programs with hard releases that have documented survival and chick production. I support ringing the flamingos to gather data from the release in order to prepare for future events.

Crisis Management Plan:

The current AZA team (Christy Simeone, SeaWorld; Nicole LaGreco, San Diego Zoo; Lauren Wilson, Dallas World Aquarium; Laurie Conrad, IUCN & CP&P TAG Steering Committee representative) conducted three, two hour community training workshops in preparation for future crisis response. Trained, local expertise will greatly increase chick and egg survival potential. The workshop also acted as a forum for past responders to voice concerns and to share emotional experiences. The AZA team compiled relevant information and acted as contributing authors to produce a handout for all participants. See attached booklet. I recommend conducting additional training workshops annually at minimum.

I recommend starting a community Facebook group to communicate to potential volunteers monthly and maintain current contact information and availability with a Kimberley Facebook page Administrator.

Nicole LaGreco is developing draft electronic feeding records and intake sheets to help align responding organizations. The forms will be located in a draft electronic Crisis Management workbook that AZA volunteers are compiling. The electronic work book will be forwarded for John Werth's review

Egg Incubation and Hatch:

In the event of mass nest abandonment and if the decision is made to rescue eggs or chicks, the variables contributing to egg or chick death are more easily contained in a controlled environment. If future decisions include egg rescue, it is my recommendation to pull eggs within **24 hours** after abandonment to either humanely euthanize or hatch chicks.

Contact Information:

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Susie Kasielke, Toledo Zoo, Egg Incubation Workshop Contract Instructor – Susie.kasielke@toledozoo.org

Cathy King, IUCN Flamingo Specialist Group Co Chair- cathy.king@weltvogelpark.de

EAZA/AZA Joint Flamingo Husbandry Manual
http:\\www.aviansag.org/husbandry/unlocked/care_manuals/flamingo%20husbandry%20guidelines.pd