



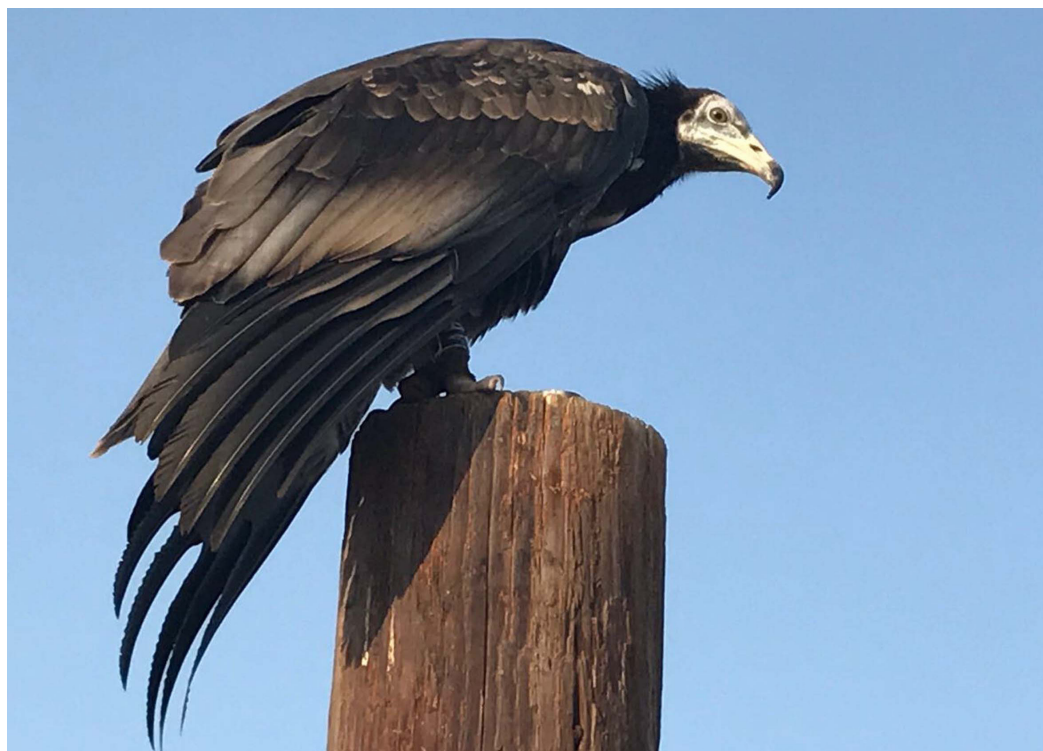
## Successful captive rearing of an Egyptian vulture at Kalba Bird of Prey Centre, UAE

by Gerard Whitehouse-Tedd and Katherine Whitehouse-Tedd

### Abstract

Egyptian vultures (*Neophron percnopterus*) are endangered across their range, and *ex-situ* conservation efforts focus on establishing captive breeding programmes, with the ultimate goal of releasing captive-bred individuals into secure habitat. To date, this species has not been successfully bred in captivity in the Arabian peninsula. Moreover, efforts to reduce the risk of human imprinting by captive-reared birds of other species have typically included the use of hand puppets and excluding visual contact with humans. This report documents the first successful captive rearing of an Egyptian vulture in the United Arab Emirates, and describes the successful return of the chick to its parents without the use of hand puppets. By temporarily returning the chick to its parents during daylight from 11 days of age, it was possible to maintain normal parenting behaviours in the adult birds, this leading to the successful dual-imprinting of the chick. The chick is now included in a flight demonstration as part of a conservation education programme, and will be included in a regional captive breeding programme upon maturity.

**Keywords:** captive, hand-rearing, incubation, vulture, parent-rearing



The captive reared Egyptian vulture

### Introduction

Egyptian Vultures (*Neophron percnopterus*), along with the majority of other species of African vultures, were recently uplisted to Endangered status by the International Union for the Conservation of Nature, IUCN, as a result of dramatic declines in their populations due to intentional and secondary poisoning, poaching, electrocution, bush meat trade, and use in traditional medicines or folklore (Amezian & El Khamlichi 2016; Ogada *et al.* 2016; Birdlife International 2017). Within the Arabian peninsula, Egyptian Vultures occur in Oman and the United Arab Emirates (Inigo *et al.* 2008; Aspinall 2010; Jennings 2010; Porter & Aspinall 2010; Aspinall & Porter 2011), although tracking of birds moving between the two countries indicates that they form one population (IUCN Species Survival Commission

2016). In the United Arab Emirates, Egyptian Vultures are classified as year-round residents to the west of the Hajar Mountains, primarily in the area of Jebel Hafit, just south of Al Ain, an isolated massif which is partly in the UAE and partly in Oman (Aspinall 2010, Porter & Aspinall 2010, Aspinall & Porter 2011). Populations in the UAE are considered to have declined significantly since 2006 (UAE Bird Database). Some migration occurs southwards into the UAE and Oman from southern Iran (Porter & Aspinall, 2010). There are also separate resident populations in Yemen and western and central Saudi Arabia (Aspinall & Porter 2011).

Although coordinated captive breeding programmes have been established for a number of vulture species,





including the Egyptian Vulture, these programmes have not yet extended to the Arabian peninsula (Inigo *et al.* 2008). To the authors' knowledge (and according to the species' studbook) no Egyptian Vultures have previously been bred in captivity in the Arabian peninsula.

Given the endangered status of this species, it is imperative that any captive breeding is performed in a manner that promotes natural behavioural development of individuals in order that captive-bred birds are suitable for future breeding or even release projects. In the event that a chick requires hand-rearing, it is therefore vital that imprinting on humans is prevented (Mendelssohn & Marder 1984). Although many zoos and captive facilities utilise puppets to mimic parent birds when hand-feeding chicks, successful prevention of imprinting (including normal behavioural and breeding development) has previously been reported in hand-reared Lappet-faced Vultures *Torgos tracheliotus* without the use of these puppets (Mendelssohn & Marder 1984). Instead of utilising the somewhat cumbersome hand-puppets which lack the facial expressions of parent birds, these authors provided hand-reared chicks with the opportunity to see conspecifics (i.e. other chicks or its own reflection in a mirror) and early exposure to conspecific adult birds during the hand-rearing process (Mendelssohn & Marder 1984). This current paper documents the successful breeding and artificial rearing of an Egyptian Vulture, which was subsequently returned to its parents without the use of hand puppets, following a similar method of introduction as previously described in Lappet-faced Vultures (Mendelssohn & Marder 1984).

### **Breeding and rearing of Egyptian Vulture chicks at Kalba Bird of Prey Centre**

#### **The 2015 breeding season**

The parent birds were part of a group of six adult wild-born birds (three male and three female) that were donated to the Sharjah Environment and Protected Areas Authority, EPAA, by colleagues in Oman. All of the birds were injured and therefore unsuitable for release. One pair were housed at Kalba Bird of Prey Centre (hereafter KBOPC) on public display, and two pairs were housed off-display at the Breeding Centre for Endangered Arabian Wildlife (hereafter BCEAW) both facilities being operated by the EPAA in Sharjah. The KBOPC pair arrived on 23rd March 2014 and settled quickly into their new environment, as evidenced by their calm behaviour and normal activity. Due to the poor flight ability of the pair, they constructed a nest on the ground of the aviary (a natural rock and soil substrate). The female laid an egg early in the morning on 3rd May 2014, but had broken it prior to staff discovery. No more eggs were laid that season.

The pair were seen to be mating again around 13th February 2015 and laid one egg on 3rd March 2015 and both birds displayed normal nesting and incubating behaviours; therefore, the decision was made to leave the egg with the parents. On 8th March a second egg was laid. Both eggs were temporarily removed from

the parents during their feeding time and examined on a digital egg monitor ("Egg Buddy", Avitronics; Biotech, UK) on 22nd March. No heartbeat was detectable in the first-laid egg although a heart-beat was detected in the second-laid egg. Both eggs were returned to the female within 5 minutes. On 14th April the first-laid egg hatched and the chick was seen to be healthy and being well cared for by the parents (they were sitting over it in the nest and displayed heightened protective behaviour when human caretakers were visible). The lack of detectable heartbeat during the incubation period of this egg may be explained by the thickness of the egg shell, which may have reduced the detection ability of the Egg-Buddy (see discussion in a later section).

The following morning, the chick was still being cared for by the parents, but at midday the chick could not be found; the parents were no longer sitting on the nest and were visibly disturbed, exhibiting excited and aggressive behaviours. A search of the aviary and surrounding areas revealed no evidence of the chick or its remains, and it is our belief that it was taken by a predator (either a rat or snake) as a rats' nest was subsequently located in an adjacent aviary. Rodent traps had already been placed around the centre, but additional traps were laid and intensive searches implemented to locate and destroy any rodent nests. The parents continued to incubate the remaining egg, which hatched on 20th April 2015, and was immediately removed from the parents and hand-reared. At this point, in order to maintain normal incubating behaviours in the pair, a painted wooden replica egg was placed in the nest, which the female continued to incubate. The pair were seen mating repeatedly over the next 2 weeks, after which time the female vacated the nest (10th May 2015).

The chick (egg #2) was housed in an incubator (Grumbach C84, Germany) set at 37.2°C, with humidity at 65%. The chick was offered food approximately 17 hours after hatching, once the chick began displaying an interest in food. Typically, the first feed is recommended to occur 6 – 12 hours after hatching since the yolk-sac is still actively supplying nutrients to the chick during this period (Duerr 2007). Food should only be offered once a feeding response is seen in the chick, and therefore the first feeding event may be delayed for some chicks, particularly those with a large yolk reserve (Duerr 2007). The chick appeared slightly weak but had a fair appetite and took food for the following 2 days. The chick was offered breast of quail 3–4 times per day as this was a readily available prey item for the centre, and wild Egyptian Vultures are known to include a range of bird species in their diet during the breeding season (Margalida *et al.* 2012). However, the chick was found dead on the morning of 23rd April 2015 and was sent to the BCEAW for post-mortem examination. Examination revealed marked deformities in the chick's orbital sockets, and a variety of abnormalities associated with its internal organs.

#### **The 2016 breeding season**

As part of an internal evaluation of the previous year's breeding season, the temperaments of the parent





birds were reviewed. Records of their behaviour during routine cleaning and maintenance activity in or around their enclosure were assessed, and in particular, their behavioural response to the presence of caretakers during the breeding season was considered. This also included events in which eggs (or nests) were removed (or inspected) whilst the parent birds were feeding. At no point were the birds observed to exhibit any fear or aggression responses; they maintained normal feeding, preening, and social behaviours and were not deemed to exhibit any change in activity budget or enclosure use in relation to the presence of humans. Observations of their behaviour were made surreptitiously from hidden locations outside of their enclosure, as well as during enclosure cleaning and maintenance, whereby we were confident that our level of interaction with them, their eggs or chicks, was not likely to interfere with their potential for parenting.

The following breeding season an egg (#3) was laid on 14th February 2016, and a subsequent one (#4) on 20th February 2016. Both eggs were removed immediately upon laying, and artificially incubated (Grumbach incubator, set at 37.2°C with humidity of 35%, turned 180° in one direction, and then back again in the opposite direction, every 5 hours). Upon removal of egg #4, a replica egg was placed in the nest and the parents proceeded to incubate this for the duration. Forty days after each laying, each respective egg was removed from the rollers.

It is worth noting here that methods used to determine the fertility of the eggs prior to hatching were unsuccessful. Over the two breeding seasons reported here, heartbeats were often not detectable by the Egg-Buddy in eggs that subsequently hatched. Likewise, candling was unable to confirm fertility, as the eggshells were consistently too thick and impenetrable to our candling lamp (OvaView High Intensity Candling Lamp, Brinsea, UK). The Egg-Buddy manual (Avitronics; Biotech, UK) states that a heartbeat should be detectable 5 – 10 days, and that users should

check again 24 hours later before disposing of the egg. However, our decision to continue the incubation of eggs in spite of the absence of detectable heartbeat proved worthwhile. Moreover, in those eggs in which a heartbeat was detected, detection was not possible until at least 22 – 25 days since laying. We would therefore urge facilities to persevere with vulture eggs despite an inability to detect a heartbeat using the Egg-Buddy system, and to consider candling results with caution due to eggshell thickness.

Egg #3 began pipping (cracking the shell of the egg during hatching) on 26th March 2016, at which time it was transferred to a hatcher (Grumbach C84, set at 37.2°C and 85–90% humidity). This egg hatched, with assistance (due to delayed progress), on 27th March 2016 (42 days after laying, which is consistent with reported incubation periods in the wild (Jennings 2010)). Two hours later, the chick was then transferred to a brooder (Brinsea TLC50, UK, set at 37°C and 30–34% humidity) and first offered food approximately 18 hours after hatching. The chick had a good appetite, appearing to be stronger than the previous season's chick. Despite feeding as expected, the chick consistently lost weight, dropping from 58.5g on day 2 to 54.0g on day 4, and died on 1st April 2016 (day 5). Post mortem results determined the cause of death to be a retained yolk sac, which may have been associated with bacterial contamination during incubation, the assisted hatching process or a pre-existing underlying disease condition, as has been found in other bird species (Dzoma & Dorrestein 2001).

Egg #4 hatched unaided on 3rd April 2016 (43 days after laying; Figure 1a and 1b) and the same process as detailed for egg #3 was followed in terms of housing and husbandry. Due to the lack of similarly aged conspecifics present in the facility at the time of initial intervention, it was not possible to co-house or expose the chick to other Egyptian Vultures, as had been performed for Lappet-faced Vultures described by Mendelssohn & Marder (1984).



Figure 1. (a) Egyptian Vulture egg in the incubator set up as a hatcher, 80% humidity, 37°C (pipping), (b) Egyptian Vulture just hatched in incubator (set up as a hatcher)

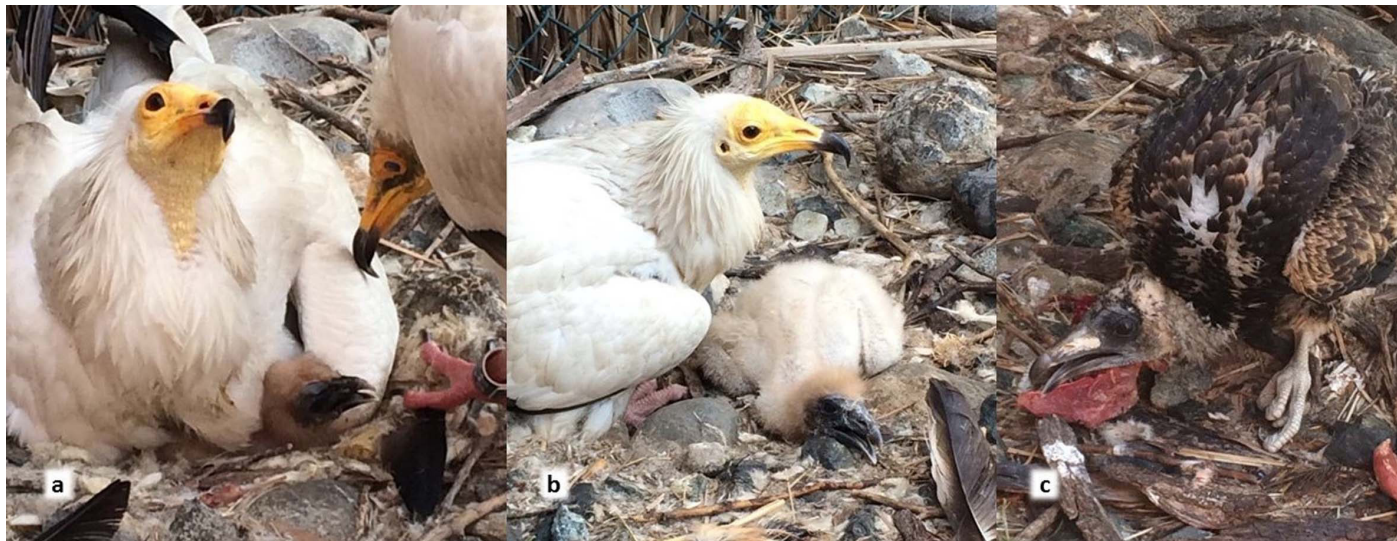


Figure 2. (a) chick returned to parents at 11 days of age (removed overnight), (b) chick at 22 days of age with a parent bird, (c) chick at 46 days old.

Likewise, the design of the adult parent birds' aviary was not amenable to providing visual access between parents and chick.

This chick weighed 60.5g on day 1 and fed for the first time 12 hours after hatching, by which stage it had lost weight (59.0g). The chick was markedly more interested in food and more active than the first chick of this season; the chick maintained a relatively stable body weight for the first 2 days, after which time it steadily gained an average of 16g per day for its first week (weighing 166g on day 11). Human contact was minimised, and involved only the handling necessary to weigh the chick at each feed. However, no hand-puppets or other methods of reducing the risk of imprinting were employed.

Following careful consideration by the experienced rearing team, the parent birds were assessed to be behaviourally receptive to human activity during their nesting activities, and the decision was taken to attempt to return the chick to the parent birds. On day 11, the surviving chick was not fed in the morning, but instead returned to the parents (Figure 2a). At this point, the replica egg was removed from the nest and the chick placed in the nest. The parents were fed at this time and a staff member was stationed inside the aviary to monitor their behaviour towards the newly-introduced chick. Both parent birds immediately investigated the chick and began passing food to it. No aggressive or undesirable behaviours were observed, and after a short period of feeding, the female bird began brooding the chick in the nest. The male also participated in the brooding during the morning. The chick was temporarily removed from the nest at midday for weighing, at which point it was 194g, providing evidence of successful feeding by the parent birds. The chick spent the remainder of the day with the parents, under supervision of a staff member and was then returned to the artificial brooder in the evening, as overnight monitoring for predators in the aviary was not feasible. No food was offered by keepers whilst the chick was removed from the parents. This pattern continued up until the chick was 27 days of age (with the exception of

the midday weighing, which was excluded from day 12 onwards; Figure 2b).

From 28 days of age, when the chick weighed 859g and was fledging, the chick was left with the parents full-time. No problems were experienced (Figure 2c); at 89 days of age the chick was removed from the parent's aviary and housed with an unrelated juvenile Egyptian Vulture in order to encourage normal flight behaviour and muscle development since the parents' injuries prevented them from flying normally.

## Conclusion

At the time of writing, the chick is now 518 days of age, weighing 1582g, and has been successfully trained for flight displays as part of the KBOPC's education programme. The bird displays characteristics of a good dual-imprint (i.e. having established an attachment to both the parent birds, and human caretakers). To this end, the bird is relatively shy of human approach, but still tolerant of necessary handling without apparent signs of distress. Upon maturity, the bird will be included in our captive breeding programme.

Given the endangered status of the Egyptian Vulture, successful captive breeding programmes are an important conservation measure, undertaken by a number of facilities around the world, with varying methods and outcomes. The vulture group at KBOPC are integral to our education programme, and future breeding efforts are planned, whereby the maintenance of bonded-pairs is critical for future breed-to-release programmes. The artificial rearing of chicks during their vulnerable early days was deemed necessary in order to eliminate the risk of predation. Unlike traditional methods of hand-rearing, no puppet or mock parent bird was utilised whilst the chick was being handled by humans. We followed the method described by Mendelsohn & Marder (1984) for Lappet-faced Vultures, and successfully implemented a modified version of this method with Egyptian Vultures in order to avoid the use of unwieldy puppets. To our knowledge, this







is the first report of this rearing method for this species. Due to the lack of similarly aged conspecifics during the initial rearing period of this Egyptian Vulture, a degree of human imprinting occurred.

Although apparently successful (i.e. the bird is healthy and not solely imprinted on humans), by interfering with parent birds to this extent during the incubation and rearing process, the method reported here poses a risk of detrimentally influencing parenting behaviours (e.g. potentially resulting in aggression towards the chick or egg). However, these birds were carefully evaluated for their response to human activity around the nest prior to egg-laying, and throughout the reintroduction, and no aggressive or otherwise unwanted behaviours were observed.

By providing a replica egg, and then later re-introducing the chick to the parents, we were able to successfully maintain normal parenting behaviours in the adult birds. Likewise, despite initial human-assisted rearing, the offspring has maintained a natural shyness of humans, although it must be acknowledged that imprinting was not completely prevented, and therefore this objective was not met. Nonetheless, as a primarily parent-reared chick, it is hoped that the bird will be better suited to future breeding and reintroduction programmes.

Other facilities considering this method should ensure parent birds are behaviourally suited to this type of intervention. Although initial breeding seasons were unsuccessful, we consider this method of dual-imprinting to have been effective, and will continue to evaluate this strategy in future breeding seasons with this (and potentially other) breeding pairs.

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