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Successful rearing of a young Egyptian Vulture *Neophron percnopterus* by a single male after the death of his mate

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Abstract

The Egyptian Vulture *Neophron percnopterus* is critically endangered in Italy, with only 11–14 pairs censused in recent years, most of them in Sicily. Urgent conservation actions are therefore needed to prevent any mortality and increase the productivity of each pair. Here we present a case of supplementary feeding carried out in Sicily to sustain a breeding adult male Egyptian Vulture that lost his mate after hatching on May 19, 2023. The single male took advantage of the supplementary feeding right from the beginning and raised a chick until it fledged on July 26. He also formed a pair with a new adult female that was attracted by the food we provided. The new female showed aggressive behaviour towards the young immediately after fledging. However, five days after fledgling, the young was observed flying alongside the adults, suggesting that the breeding was successful.

Keywords: birds of prey conservation, illegal killing, pair formation, parental care, Sicily, supplementary feeding

INTRODUCTION

The Egyptian Vulture *Neophron percnopterus* is a migratory Old World vulture whose breeding range extends from north-western Africa and Portugal in the west to Central Asia and India in the east (Botha et al. 2017), and whose wintering areas are mainly located in the Sahel zone, East Africa, Arabian Peninsula and the Indian subcontinent (Botha et al. 2017, Buechley et al. 2021, Burnside et al 2023). Because of the rapid population decline in many parts of its range, the species is listed as globally endangered by the IUCN, with an overall population estimated between 12,400 and 36,000 mature individuals (BirdLife International 2025). The European population, totalling 3,000–4,500 breeding pairs, has declined by at least 10% over the last three generations (BirdLife International 2025).

The leading causes of this steady decline are human-related: poisoning (including lead-poisoning), electrocution, collision with overhead wires and wind turbines, poaching, disturbance and habitat changes (Donázar et al. 2002, Sarà & Di Vittorio 2003, Iñigo et al. 2008, Zuberogoitia et al. 2008, Hernández & Margalida 2009, Angelov et al. 2013, Grubač et al. 2014, Şen et al. 2017, Parvanov et al. 2018, Oppel et al. 2021, Ceccolini et al. 2023).

In Europe, the main strongholds of the species occur in the western Mediterranean (Portugal, Spain and France) whereas only small populations survive in the Balkans and Italy (EBCC 2022). In the latter country, the Egyptian Vulture was widely distributed on the mainland and in Sicily until the middle of the last century (Andreotti & Leonardi, 2009), but its breeding range and population are currently extremely reduced. In the 2019–2023 breeding seasons only 11–14 pairs have been recorded, 8–9 of which in Sicily, 2–4 in Southern Italy and 1 in Sardinia (Ceccolini et al. 2023, De Rosa et al. 2024, M Di Vittorio & WWF Italia raptors project pers. com.).

To counteract this situation, several conservation projects have been launched over the last two decades (see, for instance, LIFE Rupis in the Iberian Peninsula, LIFE Egyptian Vulture in Italy and the Canary Islands, Return of the Neophron and Egyptian Vulture New LIFE in the Balkans). In addition to the actions carried out to tackle threats menacing this species, the release of captive-bred individuals has been undertaken in Israel, Italy and Bulgaria (Arkumarev et al. 2020, Efrat et al. 2022, Ceccolini et al. 2023). Restocking has proved to be an effective measure to sustain small populations, but very expensive (Ferrer et al. 2018); furthermore, the low productivity of captive pairs in several cases hindered large-scale releasing programmes (Ceccolini & Cenerini 2023). Consequently, any action aimed at preventing adult and juvenile

mortality or supporting the breeding success of wild pairs, such as the insulation of electric power lines or the activation of supplementary feeding stations, becomes even more relevant to ensure the positive outcomes of the restocking efforts.

Here we present a case of supplementary feeding carried out to sustain a breeding adult male Egyptian Vulture that lost his mate after hatching (see Fig. 1 for the events timeline), with the aim of sharing our experience with other people working for the conservation of this species elsewhere.

CASE DESCRIPTION

On May 19, 2023, an adult Egyptian Vulture was found dead in western Sicily, close to a breeding site monitored in the framework of the WWF Italia raptors project (Fig. 1). The autopsy carried out on May 21 revealed that it was a female shot by a poacher.

The project staff immediately began an intensive survey to ascertain whether the dead individual was one of the partners of the territorial pair monitored up to that point.

By May 21, it was clear that only one adult was visiting the nest and therefore that the shot individual was the breeding female from this nest. Furthermore, its behaviour suggested that in the nest cavity, not easily visible because very deep, there was at least one chick. Supplementary feeding was immediately provided on a ledge at the base of the rocky wall about 200 meters from the nest. This decision was taken to maximize the chances that the single male could raise the offspring, managing to find enough food without leaving the nest unattended. About an hour after the first supply of food, the male took a few pieces of meat and immediately brought them to the nest.

Since then, the nest has been regularly monitored for the following 70 days, during which supplementary feeding was provided 26 times by the volunteers of the Gruppo Tutela Rapaci, with the financial support of Stiftung pro Artenvielfalt, EBN Italia, LIPU and LIFE project Egyptian vulture. Initially, the food was supplied

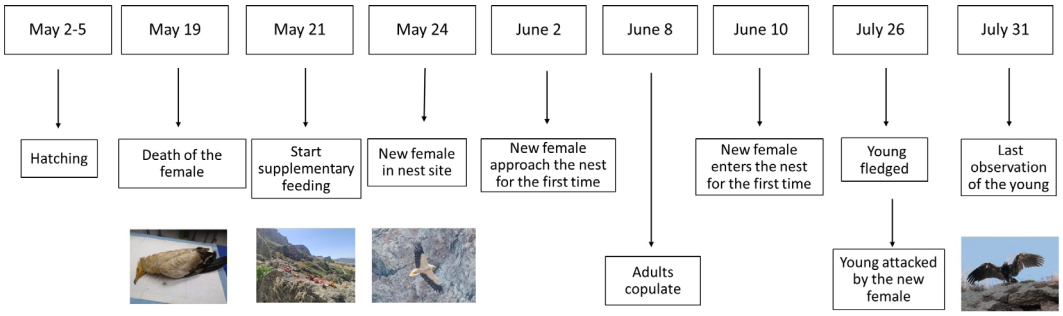

Figure 1. Timeline with the most important events recorded from hatching to the abandonment of the breeding territory.

daily in small quantities, then, as the breeding season progressed, the frequency decreased, and quantities increased (max interval: four days in the fledging period). Overall, around 350 kilograms of food were provided (daily min: 5 kg, daily max: 35 kg), mainly chickens, rabbits, eggs and slaughter waste purchased from local butchers.

On May 22 and 23, the site was visited by two other adult Egyptian Vultures, one of which began to eat the food supplied to support the single male. It cannot be ruled out that the two new adults were members of other nesting couples, as there were other breeding pairs in the surroundings—the closest of which was only 10 km away.

On the morning of May 24, an "intruder", easily recognizable by its plumage and already observed the day before, was attacked by the local male as soon as it approached the food. The mobbing behaviour continued for approximately ten minutes. However, after about one hour, both individuals were seen feeding together and the local male started bringing pieces of meat to the nest to feed the offspring. In the following days, the pattern described above was repeated. The intruder constantly visited the site and the male allowed it to feed but not to approach the nest (Fig. 2).

On June 2, the two adults were observed for the first time resting together on a ledge not far from the nest. On the morning of the next day, they were observed flying close each other and moving away towards the nearby valley. After about half an hour they returned

Figure 2. Active nest defence by the male on May 26 (Coco M.).

and perched together on the nesting cliff. However, when the new adult tried to approach the nest, it was immediately attacked by the local male and moved away from the site. On the same day, shortly after noon, the local male returned to the nest with food supplied by us and during the feeding of the offspring it was possible to ascertain the presence of a single chick, whose age was estimated at 25–30 days based on the plumage.

On June 4, the new adult was observed near the nest offering a piece of meat to the male, that seemed to accept it. In the following days, the two vultures fed together on the food provided to support the breeding and often moved away together. The local male showed no further aggressive behaviour towards the other adult.

On June 8, the two adults copulated, and it became clear that the new individual was a female that had therefore replaced the dead mate.

On June 10, the female visited the nest for the first time, without any aggressive reaction from the male. However, the female did not approach the chick that, at the sight of the female, moved away to the innermost part of the nest.

On June 13, the two adults left the breeding site and returned at around 7:00 pm, the female carrying the hind end of a rabbit in her beak. When they landed close to the nest, the male took possession of the rabbit, then both vultures entered the nest. The female, however, flew away almost immediately and the chick was fed by the male.

In the following days the two adults always remained together, and several times entered the nest together. However, no interactions were observed between the female and the chick, that was only fed by the male. Furthermore, sometimes the female was observed entering the nest and feeding inside it, but without ever offering food to the chick, that at that moment appeared very developed, completely feathered and capable of feeding itself with the food brought only by the male.

The young continued to be supplied with food by the male and began to spend a lot of time outside the nest, until it fledged on July 26. About two hours after fledging, the young, perched on a rock not far from the nest, was attacked by the female, who grabbed it with her claws and threw it to the ground, while the male was absent. After the attack, the juvenile was seen missing at least two secondary feathers from the left wing.

On July 27, the three birds were seen perched together on the nesting cliff (Fig. 3).

On July 31, the young was observed flying alongside the adults near the nesting site.

On August 2, the two adults were observed in flight and subsequently perching inside a cavity in the nesting cliff, but the juvenile was not observed. No Egyptian Vulture was spotted in the following two surveys on August 3 and 18.

Supplementary feeding was regularly utilised by both adults throughout the period, but as the chick grew up, the food we provided contributed to a lesser extent to its diet, most likely because the male was able to leave the nest unattended to look for prey in his hunting territory.

In the following 2024 breeding season, the same nest cavity was occupied on March 14 by a pair that successfully raised two chicks. It was not possible to ascertain if the two adults were the same observed in 2023.

Figure 2. The two adults and the young perched together on July 27 (Coco M.).

CONCLUSIONS

The recovery of an adult Egyptian Vulture shot dead in May confirms that illegal killing still represents one of the major threats to birds of prey in Italy.

The prompt supply of supplementary food, immediately utilised by the male, supported him in raising the chick until fledging. This highlights the importance of the feeding stations as a conservation tool for this endangered species.

The sudden turnover of the female suggests the presence of a number of floaters, a positive sign of the local population viability. Sicily therefore proves to be crucial for the conservation of this species in Italy.

The chick was fed only by the male, while the new female never provided food or any parental care, even after the pair formed. The female's poor propensity to take care of the offspring is consistent with what reported by Ceccolini & Cenerini (2023) regarding the reproduction of the Egyptian Vulture in captivity. They noted, in fact, that a single female does not incubate the eggs but eats them within one day the removal of the mate from the aviary, whereas a single male usually incubates the eggs and often rears the chicks successfully.

The time of fledging was in line with what is normally observed in Sicily, as well as the time in which the adult birds leave the nesting site.

The female showed aggressive behaviour towards the young soon after fledging, probably because she did not recognise the young as her offspring and considered it an intruder. Although aggressiveness of adults towards the offspring has been observed in other species of birds of prey at the end of the post-fledging period (see, e.g. Newton 1979, Alonso et al. 1987), this behaviour is unusual in the Egyptian Vulture, because territorial adults are tolerant towards newly fledged juveniles (Ceballos & Donázar 1990, Cortone & Mordente 1997, Corsange et al. 2005).

Our observations do not allow to exclude that the female continued to be aggressive after we stopped detecting the birds near the nest, to the point of preventing the young from accessing parental care and supplementary feeding. However, the fact that five days after fledgling the young was observed in flight together with the adults suggests that the breeding was successful. Indeed, observations carried out in the post-fledging period (Donázar & Ceballos 1990) and the experience gained with first-calendar-year captive-bred individuals released by the hacking method (Ceccolini et al. 2023) revealed that Egyptian Vultures can start migrating very soon, without any support by adults and independently of them after a short dependence period, even nine days after fledging, or six days after the release in the wild.

In summary, this case demonstrates that a single adult can successfully raise a chick if supported by supplementary feeding, but also that the aggressiveness of a new partner towards the offspring could potentially compromise the breeding outcome. Therefore, in similar

circumstances, the option of reallocating the chicks to captive breeding and/or restocking programmes should be considered on a case-by-case basis.

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REFERENCES

1. Alonso J.C., Gonzalez L.M., Heredia B. & Gonzalez J.L. 1987. Parental care and the transition to independence of Spanish Imperial Eagles *Aquila (heliaca) adalberti* in Doñana National Park. Ibis 129(S1): 212–224. https://doi.org/10.1111/j.1474-919X.1987.tb03202.x
2. Angelov I., Hashim I. & Oppel S. 2013. Persistent electrocution mortality of Egyptian vultures *Neophron percnopterus* over 28 years in East Africa. Bird Conservation International 23(1): 1–6. https://doi.org/10.1017/S0959270912000123
3. Andreotti A. & Leonardi G. 2009. Piano d'azione nazionale per il Capovaccaio *Neophron percnopterus*. Min. Ambiente – ISPRA, Quaderni di Conservazione della Natura 30: 1–115.
4. Arkumarev V., Dobrev V., Klisurov I., Petrov R., […] & Nikolov S.C. 2020. Develop and pilot a restocking strategy for the Egyptian Vultures on the Balkans: Integrated report on the release of captive-bred Egyptian Vultures in the Eastern Rhodopes, Bulgaria in 2020. Technical report under action C3 of the LIFE project "Egyptian Vulture New LIFE" (LIFE16 NAT/BG/000874). BSPB & Green Balkans, Bulgaria. doi: 10.13140/RG.2.2.25846.42564
5. BirdLife International 2025. Species factsheet: Egyptian Vulture *Neophron percnopterus*. Downloaded from https://datazone.birdlife.org/species/factsheet/egyptian-vulture-neophron-percnopterus on 10/01/2025
6. Botha A.J., Andevski J., Bowden C.G.R., Gudka M., […] & Williams N.P. 2017. Multi-species Action Plan to Conserve African-Eurasian Vultures. CMS Raptors MOU Technical Publication No. 5. CMS Technical Series No. 35. Coordinating Unit of the CMS Raptors MOU, Abu Dhabi, UAE.
7. Buechley E.R., Oppel S., Efrat R., Phipps W.L., […] & Marra P.P. 2021. Differential survival throughout the full annual cycle of a migratory bird presents a life history trade-off. Journal of Animal Ecology 90(5): 1228–1238. https://doi.org/10.1111/1365-2656.13449
8. Burnside J.B, Ten A., Soldatov V., Dobrev V. 2023 Vulture News 85(1): 15–24. http://dx-.doi.org/10.4314/vulnew.v85i1.2
9. Ceballos O. & Donázar J.A. 1990. Parent-offspring Conflict during the Post-fledging Period in the Egyptian Vulture *Neophron percnopterus* (Aves, Accipitridae). Ethology 85(3): 225–235. https://doi.org/10.1111/j.1439-0310.1990.tb00402.x
10. Ceccolini G. & Cenerini A. 2023. Technical handbook – Management of captive Egyptian vultures and release of captive-bred individuals. 2023 LIFE Egyptian vulture project, LIFE16 NAT/IT/000659, E.5 action, www.lifegyptianvulture.it.
11. Ceccolini G., Cenerini A., Aradis A., Ferri A., […] & Andreotti A. 2023. LIFE Egyptian

vulture – Main results of actions carried out in Italy. European Vulture Conference, Cáceres, 14–17 November 2023.
12. Corsange M., Perennou C. & Gallardo M. 2005. Observation d'un cas d'adoption temporaire chez le Vautour percnoptère *Neophron percnopterus*. Alauda 73(1): 21–24.
13. Cortone P. & Mordente F. 1997. Osservazioni sul comportamento e sulla biologia riproduttivi del Capovaccaio*, Neophron percnopterus*, in Calabria. Rivista italiana di. Ornitologia 67(1): 3–12.
14. De Rosa D., Cerri J., Fozzi I, Muzzeddu M., […] & Berlinguer F. 2024 First breeding of Egyptian vulture (*Neophron percnopterus*) in Sardinia and temporal and environmental factors affecting its frequentation of a supplementary feeding station. Ethology Ecology & Evolution 36(4): 400–411. https://doi.org/10.1080/03949370.2023.2301310F
15. Donàzar J.A. & Ceballos O. 1990. Post-fledging dependence period and development of flight and foraging behaviour in the Egyptian Vulture *Neophron percnopterus*. Ardea 78: 387–394.
16. Donázar J.A., Palacios C.J., Gangoso L., Ceballos O., […] & Hiraldo F. 2002. Conservation status and limiting factors in the endangered population of Egyptian vulture (*Neophron percnopterus*) in the Canary Islands. Biological Conservation, 107(1): 89–97. https://doi.org/10.1016/S0006-3207(02)00049-6
17. EBCC 2022. European Breeding Bird Atlas 2 website. European Bird Census Council. Accessed from http://ebba2.info on 10/01/2025
18. Efrat R., Hatzofe O., Miller Y., Mueller T., […] & Berger-Tal O. 2022. Postrelease survival of captive-bred Egyptian Vultures is similar to that of wild-hatched Egyptian Vultures and is not affected by release age or season. Ornithological Applications 124(2). https://doi.org/10.1093/ornithapp/duab065
19. Ferrer M., Morandini V., Baguena G. & Newton I. 2018. Reintroducing endangered raptors: A case study of supplementary feeding and removal of nestlings from wild populations. J. Applied Ecol. 55(3): 1360–1367. https://doi.org/10.1111/1365-2664.13014
20. Grubač B., Velevski M. & Avukatov V. 2014. Long-term population decrease and recent breeding performance of the Egyptian vulture *Neophron percnopterus* in Macedonia. North-western Journal of Zoology 10(1): 25–35.
21. Hernández M. & Margalida A. 2009. Poison-related mortality effects in the endangered Egyptian vulture *Neophron percnopterus*) population in Spain. European Journal of Wildlife Research 55: 415–423. https://doi.org/10.1007/s10344-009-0255-6
22. Iñigo A., Barov B., Orhun C. & Gallo-Orsi U. 2008. Action plan for the Egyptian vulture *Neophron percnopterus* in the European Union. BirdLife International for the European Commission.
23. Newton I. 1979. Population ecology of raptors. T & AD Poyser, Berkhamsted, UK.
24. Parvanov D., Stoynov E., Vangelova N., Peshev H., […] & Iliev Y. 2018. Vulture mortality resulting from illegal poisoning in the southern Balkan Peninsula. Environmental Science and Pollution Research, 25(2): 1706–1712. https://doi.org/10.1007/s11356-017-0594-x
25. Oppel S., Arkumarev V., Bakari S., Dobrev V., […] & Nikolov S.C. 2021. Major threats to a migratory raptor vary geographically along the eastern Mediterranean flyway. Biological Conservation 262: 109277. https://doi.org/10.1016/j.biocon.2021.109277
26. Sarà M. & Di Vittorio M. 2003. Factors influencing the distribution, abundance and nest-site selection of an endangered Egyptian vulture (*Neophron percnopterus*) population in Sicily. Animal Conservation 6(4): 317–328. https://doi.org/10.1017/S1367943003003391

27. Şen B, Tavares JP, Bilgin CC. 2017. Nest site selection patterns of a local Egyptian Vulture *Neophron percnopterus* population in Turkey. Bird Conservation International 27(4): 568–581. https://doi.org/10.1017/S0959270916000411
28. Zuberogoitia I., Zabala J., Martínez J.A., Martínez J.E. & Azkona A. 2008. Effect of human activities on Egyptian vulture breeding success. Animal Conservation 11(4): 313–320. https://doi.org/10.1111/j.1469-1795.2008.00184.x

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