

Bearded Vulture European Endangered Species Programme (EEP): Annual report 2020

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SUMMARY

The restrictions decreed worldwide in 2020 because of the Covid19 pandemic had also a negative impact on the EEP, as it coincided exactly with the hatching period of the chicks, increasing the number of losses. Adoptions had to be done by unexperienced pairs. Staff reduction to a minimum by our Partners caused a deficit in the monitoring of the evolution of the chicks in the nests. Old rearing protocols adapted to the latest knowledge had to be implemented -Parco Natura Viva successfully implemented the Nest-Box rearing protocol, Green Balkans the double adoption protocol and Tallinn zoo both protocols-. And all that in the middle of the pandemic crisis, having to adjust it to the human and economic resources available by each institution! It has been the biggest crisis since the Bearded Vulture International captive breeding program was founded (1978).

However, thanks to the personal effort of many workers from different entities, the breeding season 2020 could finally become a good season. 41 bearded vulture breeding pairs laid 71 eggs, from which 38 hatched and 25 survived. From these 25 survived fledglings, 21 nestlings were released: eight in Andalusia, nine in the framework of the LIFE project GypConnect (five in Grands Causses, two in Vercors and two in Baronnies), two in Switzerland and two in Maestrazgo, and four were added to the breeding network (three males and one female). From these 25 fledglings, 14 came from the specialized captive breeding centres (18 breeding pairs), and 11 from Zoos, recovery centres and private collections (23 breeding pairs).

After 14 laying years the breeding pair from Berlin zoo produced for the first time a fledgling. Beauval zoo and one breeding pair in Asters produced for the first time a hatchling. Another pair laid for the 1st time (Frankfurt zoo). And two new pairs started to mate (MónNatura and one pair in Asters).

Seven birds from the 10 previewed transfers have been transferred (three males and four females) between four institutions with the goal to build five new pairs.

In 2020, three adult males and two adult females died.

Thanks to the financial support from EEP zoos and other organizations -despite the big pandemic crisis-, the VCF managed to establish an effective EEP coordination, which kept the specialized breeding centre Vallcalent in Catalonia open for 2019 - we thank you for your support, without this the future of the Bearded Vulture in Europe would look bleaker!

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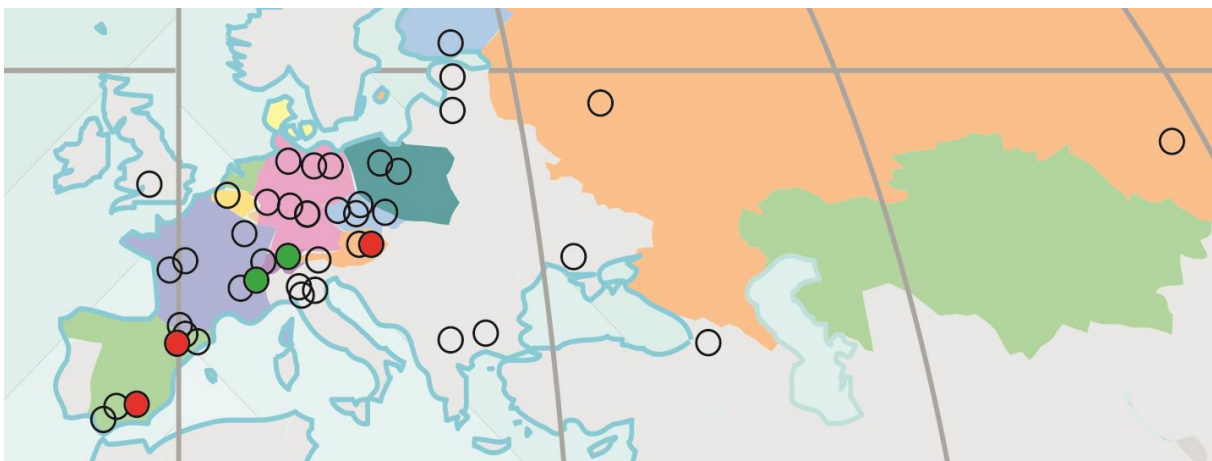
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INTRODUCTION

In 1978, the Bearded Vulture Reintroduction Project started in the Alps (FZG 832/78; WWF 1567/78) based on a captive breeding programme. This Bearded Vulture captive breeding network has been included in the European Endangered Species programme (EEP) since the EEP began, and is a VCF-coordinated network of zoos, animal parks, captive breeding centres and private collections aiming to breed this species in captivity for conservation purposes. In 1978, it was clear that only offspring from Zoos could be used, because the autochthonous populations were threatened. At that time nearly 40 Bearded Vultures were still distributed throughout European zoos, including only one successful breeding pair. From the beginning, it was possible to convince all European zoos to cede their birds for this conservation goal and to transfer most of these birds to the Richard Faust Centre in Austria. Paired birds and juveniles went back to the zoos, and so from 1978-1985 the European breeding network emerged and was a precursor of the later established EEP. The Vulture Conservation Foundation's final goal is to restore the species across its former range in Europe, and establish a European Bearded Vulture meta-population, with connections between the current European autochthonous isolated populations (Pyrenees, Corsica and Crete) with the reintroduced populations, in a continuum that goes from northern Africa (Morocco) to Asia (Turkey & the Caucasus).

The Bearded Vulture EEP network is composed of a vast number of different types of institutions: private and municipal Zoos, private collections, NGO and Governmental wildlife recovery centres, and several of them are not EAZA (European Aquaria and Zoo Association) members. That's why an international foundation structure (Vulture Conservation Foundation) was created to make sure that all partners accept, respect and follow the guidelines of the EEP.

By the end of December 2020, the EEP included 34 zoos (mainly European), 3 large (red spots) and 2 smaller (green spots) specialized captive breeding centres, 3 recovery centres and 2 private keepers, keeping a total of 178 birds. The VCF owns 87.6% of these (n= 156; 74 males & 82 females). From these 178 birds, 85 are males with an average age of 15.2 years old (range from 42 years to 1 year old) and 92 females with an average of 15.0 years old (range from 43 years to 1 year old). Additionally, the sex of one descendant from 2018 is still not determined (see table 1 & 2 in Annex).



The distribution of the captive stock over many Zoos lowers bulk risks, e.g. epidemic diseases (December 2019).

Bearded Vulture EEP: results for 2020

Because pair formation in Bearded Vultures can be complicated and dangerous, the EEP decided that it was necessary to create a distinction between centres dedicated exclusively to breeding (zoos and private centres) and centres dedicated to breeding and pair formation (Specialized Breeding Centres: SBCs). The role of the former is to house already established pairs and to breed the maximum number of offspring from them, while the latter, is where specialized staff are responsible for establishing new pairs, taking in new founders (injured birds from the wild), adopting chicks, housing problematic birds, and creating a genetic reserve by receiving specimens from all genetic lineages that make up the EEP.

Between 1978 and 2020, 585 juveniles were reared successfully as part of the programme, creating the possibility to broaden the initial goals, existing five on-going reintroduction/reinforcement projects. The reared offspring have been used for reintroduction projects in Europe: in the Alps (233), Andalucía (71), Grands Causses (25), Sardinia (3), Corsica (6), Maestrazgo (6) and for the captive breeding network (241).

BREEDING RESULTS 2020

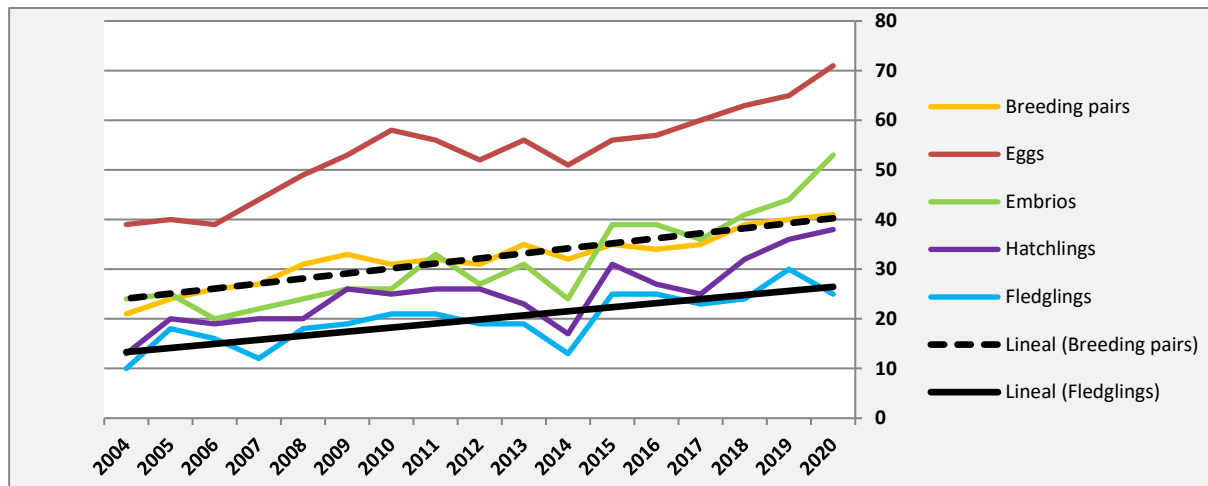
This year the restrictions that were decreed worldwide at the end of winter and beginning of spring, because of the Covid19 pandemic, had also a negative impact on the EEP. The mobility restrictions coincided exactly with the hatching period of the bearded vulture chicks. Staff reduction to a minimum had to be implemented what caused a deficit in the monitoring of the evolution of the chicks in the nests, significantly increasing the number of losses. Further, in other cases chicks had to be adopted in pairs without breeding experience, as it was not possible to transfer them to other centres where experienced pairs were available. That's why old rearing protocols adapted to the latest knowledge had to be implemented. And all that in the middle of the pandemic crisis, having to adjust it to the human and economic resources available by each institution! It was the biggest crisis since the Bearded Vulture International captive breeding program was founded (1978).

However, thanks to the personal effort of many workers from different entities, investing an indescribable number of hours in these difficult conditions, it was possible to implement these old protocols: Double Adoption and Nest-Box rearing protocol. In both protocols chicks had to be hand-reared in a longer period than usual (normally only 1 week) until they could be exposed to outside temperature (3-9 weeks depending on outside temperature). This extension of hand rearing made it necessary to invest additional human resources, which were carried out by the same people offering their own free time. For example, Berlin Zoo and Green Balkans Recovery Centre made double adoptions, making it necessary to build double nests in the middle of the breeding season. On the other hand, Parco Natura Viva in Italy had to implement the Nest-Box protocol, as the couple stopped incubating, making it impossible to make an adoption or transfer the chick to another zoo because of the pandemic mobility restrictions. Or Tallinn Zoo, which had to implement partially both protocols as they produced two hatchlings and there was no possibility to transfer them to another institution for adoption.

The breeding season 2019-20 could had been a record season as 38 chicks hatched from 71 laid eggs by 41 bearded vulture breeding pairs. But for the reasons already mentioned above, the loss of embryoned eggs (15) and chicks (13) has been higher than last season, surviving only 25 nestlings. 11 eggs aborted during incubation and four just before hatching. Two chicks died during the hatching process, three during the hand-rearing period, five during rearing by their own parents and three during the adoption -one of the most sensitive period where losses occur regularly-.

Bearded Vulture EEP: results for 2020

As mentioned above theoretically, 2020 could have been a record year, as the total number of eggs produced, like the total number of fertile eggs (53), had been a record. So was the number of hatchlings (38). But unfortunately, the pandemic took its toll... Nevertheless, the forecast for the coming years is very hopeful if we consider the positive trend in the number of breeding/laying pairs (see figure).



This positive trend is corroborated by the fact that this year again three new couples have produced a hatchling (in Asters Breeding centre, Beauval Zoo and Berlin Zoo) and Berlin Zoo breeding pair produced for the first time a fledgling. In addition, one pair has laid for the first time this year (Frankfurt Zoo) and two more have started nest building and mating (MónNatura and one pair in Asters).

From these 25 survived nestlings, 21 have been used for reintroduction projects: eight in Andalusia, nine in the framework of the LIFE project GypConnect (five in Grands Causses, two in Vercors and two in Baronnies), two in Switzerland and two in Maestrazgo, and four were added to the breeding network (three males and one female). From these 25 fledglings, 14 came from the specialized captive breeding centres (18 breeding pairs), and 11 from Zoos, recovery centres and private collections (23 breeding pairs).

Specialized captive breeding centres

- Richard Faust Bartgeier Zuchtzentrum (RFZ) - Eulen- und Greifvogelstation Haringsee (EGS).

The RFZ, headquarters of the EEP and with a captive stock of 34 birds on the 31st of December 2019, is specialized in the reproduction with founder birds.

Six pairs laid in the breeding season 2019/20. One of these pairs, BG594 x BG006, is composed on a very old female with the goal to use it as foster pair, as there is a very low probability that she could produce a descendant because of her age and the male mate on perches, as it could be observed during the last three breeding seasons with two different young females. Surprisingly, on the 13th of February it could be observed a successful matting on the ground and the pair produced a fertile egg, which unfortunately aborted in an early stage. Other three pairs are experienced old breeding pairs. A fifth is an adult pair which started to reproduce for the first time in 2013. And the last is a young pair composed by a founder male and a captive bred female.

Bearded Vulture EEP: results for 2020

All together produced seven eggs. Just four of them were fertile and only one chick hatched but did not survived. The chick was killed by the female of the young pair composed by a founder male and a captive bred female during the hatching process.



View of the Richard Faust Centre (Austria).

A second foster pair, BG212 x BG040, which started to lay the season before, surprisingly did not laid this season. Further, two new young pair bonding were tried. During this season none of these couples showed signs of bonding or aggression, being necessary to wait for the next breeding season to see the evolution of these two pairs.

On the 4th of July, at 6:00h the female BG381 was found on the ground on her back. After putting her on her feet, she showed severe balance problems. Immediately she was removed from the aviary and kept in a dark box with the suspicion that the female suffered on a collision with the fence. But during the day, six additional birds showed problems (BG547, BG278, BG040, BG107, BG857 x BG835) and a young White-tailed eagle. At late evening the White-tailed eagle died. The following day five of the seven birds were feeling much better or completely recovered. Only two birds still showed balance problems and were treated with antibiotics and anti-inflammatory drugs. Both birds at the following day were completely well. Nevertheless, one of the five birds, which were already well the next day showed a recurrence on 9th July. However, the symptoms disappeared again completely the following day. All the tests that were carried out could not clarify the cause of these symptoms. The only remaining suspicion was a roe deer from a butcher's shop that had been offered to the animals the day before, which showed some white spots the size of the head of a pinhead on the meat. Unfortunately, the whole roe deer was offered to the birds in its entirety and the white spots could not be analysed afterwards. Fortunately, we did not suffer any losses!

Bearded Vulture EEP: results for 2020

- Centro de Cría de Guadalentín (CCG)

The CCG, with a captive stock of 27 birds at the end of 2019, is the basis of the Andalusia Bearded Vulture reintroduction project. Six breeding pairs laid 13 eggs, from which 10 were fertile and one of these aborted just before pecking the air cell. The remaining nine hatched and all chicks survived (3 males and 6 females). One male has been included in the captive network and the remaining eight nestlings have been used for reintroduction projects. Because of the severe mobility restrictions at European level due to the pandemic, most of the birds were released in Andalusia, although for genetic criteria this was not the most appropriate (5 in Andalusia, 1 in Vercors in the framework of LIFE project GypConnect, 1 in Maestrazgo and 1 in Switzerland).



The first two chicks to be released in 2020 came from the Guadalentín breeding centre and were released in the Natural Parc of Castril (Andalusia).

Furthermore, in Guadalentín, as a centre specialized in double, triple and quadruple adoptions, three additional hatchlings have been successfully adopted. Two came from Centre de Fauna Vallcalent and one from Centre de Fauna de Torreferrussa. Both chicks from Vallcalent have been released, 1 in Andalusia and the other one in Maestrazgo. The chick from Torreferrussa has been released in Switzerland.



Reception of the Bearded Vulture chick BG1068 from Torreferrussa by the staff of the Guadalentín breeding centre, following all the safety standards established for COVID-19. The transfer was done just before state of isolation was decreed for Catalonia. It was necessary in a few hours to inform several administrations and to get all permits for crossing several Spanish Autonomous Communities. <https://4vultures.org/blog/operation-save-chick-ryan-transportation-of-bearded-vulture-before-spains-covid-19-lockdown/>



The first alive Bearded Vulture chick of the 2019-20 season, it hatched in Guadalentín Breeding Centre.

- Centre de Fauna Vallcalent (CFV)

This centre is one of the five rehabilitation stations from the Generalitat of Catalonia, located in Lleida (Spain), and has a Bearded Vulture captive breeding Unit, which is managed by the EEP species coordinator (staff from the Vulture Conservation Foundation). One of its priorities is to get offspring from difficult birds, which did not reproduce elsewhere, regardless of quantity as is the case of the Guadalentín Breeding Centre (Andalusia, Spain).

At the beginning of the breeding season, 13 birds were housed in CFV facilities (five of them are from the Pyrenees). Three pairs laid nine eggs, from which six were fertile and all hatched. Unfortunately, the fourth hatchling of one of those pairs, died at the age of 10 days with the suspicion of a yolk sack infection. The chick needed human help and from the 4th day onwards has every day vomited, especially late evening when the Antibiotics were no longer having any effect. A few hours after AB treatment the chick showed an improvement, but during the afternoon he was getting worse and worse, until he finally threw up.

This year, as in previous seasons, the seven laid eggs from the two experienced females with incubation problems have been removed from their nest almost since the laying day and incubated artificially. The six



Bearded Vulture EEP: results for 2020

that showed to be fertile were daily candled and among other studies, germinal disc growth was analysed in those eggs where the shell was not pigmented (see chapter Others/News).



BG1076 already hatched and BG1077 at the beginning of hatching (3rd eggs from BG115 and BG103 respectively).

The first two hatched chicks were reared at Vallcalent. The 3rd chick was transferred to Recovery centre Torreferrussa where it was successfully adopted, while their chick was transferred to Guadalentín for adoption. The remaining two chicks, BG1076 & BG1077, were transferred to Guadalentín for their adoption.

Again, the human imprinted male “Kazajo” was stimulated by their human keeper and used as foster male. He could rear the first hatched chick at Vallcalent Breeding Centre.

The third laying pair, thanks to observation, it was possible to confirm definitively that the male coming from Riga Zoo mated on the perches next to the female. It will be necessary to try with another experienced female.

All five chicks (1 male and 4 females) have been released (1 in Vercors -framework LIFE project GypConnect-, 3 in Andalusia and 1 in Maestrazgo).

- Breeding centre Asters (Conservatoire d’Espaces Naturels Haute Savoie)

Asters’ centre is located at 700m a.s.l. in Sallanches (near Montblanc, France), giving the best climatology conditions for the species, and has the function to house birds from less common blood lines inside the EEP. At the end of 2019 housed three pairs, from which only one laid. The breeding pair BG454 x BG502 produced 3 fertile eggs. The first two egg had to be removed the day after being laid because the male didn’t participate in incubation. Both eggs aborted after one-month artificial incubation. The third egg could be incubated by their progenitors without problems. Unfortunately, the chick had hatching problems, being necessary to intervene, as

Bearded Vulture EEP: results for 2020

was chirping with discomfort. There were still traces of membrane and part of the eggshell sticking to its head, being necessary to remove them manually. After leaving the chick in the nest, the male returned immediately and warmed it. But 35 minutes later suddenly he took the chick and pull up one leg, what caused the death of the chick.

One of the two young pairs started this season to mate successfully. The second young pair, as last season, only built nest.

- Bearded Vulture Breeding Centre in Natur und Tierpark Goldau

Before the breeding started the construction of the new breeding Unit was finished, being possible to move the two breeding pairs from the old breeding unit (outside from public exhibition) to this new breeding Unit. In this season two eggs were laid: one by the exhibit pair and one by one of the transferred pairs. Only the egg from the pair on exhibition was fertile, but unfortunately the chick died during hatching.



The new Bearded Vulture Breeding Unit outside exhibition at Tierpark Goldau constructed in 2019.

- ☞ **Summary** 18 laying pairs (included one foster pair) in the specialized captive breeding centres laid 34 eggs (1 egg from the foster pair included). From these 34 eggs, 18 chicks hatched and 14 fledged. From the 14 survived fledglings (4 males and 10 females) 13 have been released (2 in Vercors -framework LIFE project GypConnect-, 8 in Andalusia, 1 in Switzerland and 2 in Maestrazgo) and 1 male was kept for the EEP. Additionally, one new pair was observed mating for the first time.

Zoos, animal parks, recovery centres & private collections

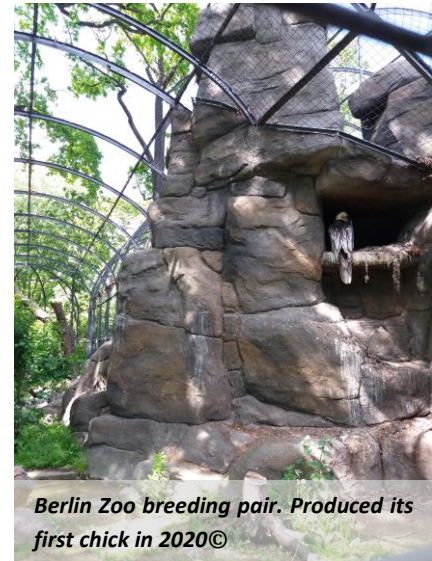
- Zoos & animal parks and recovery centres

The Zoos play a crucial role in the EEP and the conservation of Bearded Vultures. Although the success rate is on average lower than in the specialized breeding centres, they still contribute substantially to the number of young birds raised annually. Furthermore, by maintaining a captive stock distributed in several separate locations, we decrease the risks (for example, in case of epidemic diseases). In addition, by showing this species as well as publicizing the in-situ conservation efforts to large audiences in several countries, they contribute significantly to raise public awareness about the species. The zoos help to build core support for vulture conservation that would otherwise be impossible to achieve.

Bearded Vulture EEP: results for 2020

During the breeding season 2020 zoos and recovery centres (Berlin Zoo, Liberec Zoo, Parco Natura Viva and Schönbrunn zoos had respectively 1 chick, Tierpark Friedrichsfelde Berlin and Tallinn Zoo had 2 chicks each, and the recovery centres Torreferrussa and Green Balkans produced 1 and 2 chicks respectively) produced 11 fledglings (4 males and 7 females). The pair from Berlin Zoo produced in 2020 its first fledgling after 14 years laying. In the past the male was observed always mating on perches. Suddenly in 2020 the male started to mate correctly, and both eggs were fertile. Unfortunately, the second chick had to be euthanized a few days after hand-rearing because of severe weakness.

One of the most serious problems that we had to face this breeding season was the movement restrictions due to the pandemic, as it coincided exactly with the hatching period of the chicks. We suffered from staff reduction to a minimum what caused a deficit in the monitoring of the evolution of the chicks in the nests and additionally it was not possible to transfer chicks that required adoption in another institution, being necessary to adopt them by unexperienced pairs. This would lead to a significantly higher loss of hatchlings than other seasons. To minimize these losses it was necessary to use old rearing protocols (nest-box and double adoption protocols) adapted to the latest knowledge of the species (see chapter Others/News). The implementation of these protocols was necessary in the middle of the pandemic crisis and had to be adjusted to the available human and economic resources in each institution! It has been the biggest crisis since the Bearded Vulture International captive breeding program was founded (1978).



Berlin Zoo breeding pair. Produced its first chick in 2020©



Implementation of Nest-Box rearing protocol at Parco Natura Viva©

For all of the above, 9 chicks were lost because of different reasons:

1. At the Bear Rescue Centre from the Armenian FPWC foundation, the 2nd egg had hatching problems being necessary to remove it in the afternoon for assisted hatch. Since early in the morning, the egg already had a hole in it and during the day it showed no sign of hatching progress. The chick was extremely weak, and the yolk sack was not yet absorbed. The hatchling died during the night.
2. The chick from the old pair of Ostrava Zoo disappeared on the 17th of March 17 days after being successfully adopted (21 days old). Only a leg could be found in the nest. The day before the chick was still alive. It is suspected that the nestling had its eyes glued with hair and was unable to eat and probably died of starvation.
3. The chick from Chomutov Zoo, which hatched in the nest, died at the age of 11 days. By a nest control the chick was found with the whole beak, eyes and airways glued.
4. The 2nd chick from the first-time reproduced breeding pair of Berlin Zoo, which hatched in the incubator, had to be euthanized when it was three days old because of extremely weakness.

Bearded Vulture EEP: results for 2020

5. The nest hatched chick from the young pair of Ostrava Zoo disappeared at the age of 3 days. Early in the morning adults were outside of the nest, what quickly urged to carry out a nest control: only one leg of the chick was found in the nest.
6. The seven days old chick from the breeding pair of Beauval Zoo disappeared from the nest. It was their 1st hatchling.
7. The 1st hatchling from the young breeding pair of Tiergarten Friedrichsfelde Berlin was found dead on the eighth day of artificial rearing. He had aspirated vomit.
8. The 2nd hatchling from the young breeding pair of Tiergarten Friedrichsfelde Berlin disappeared from the nest the day after its adoption. It was the 1st double adoption of this pair. The older bird was transferred to the secondary nest and the younger bird placed in the main nest during the adoption. After the adoption it was fed by the parents. But unfortunately, the following day the nest was completely empty.



The Bearded Vulture aviary at Beauval Zoo was rebuilt in summer 2017. In winter the new pair started to breed, and this season produced its first hatchling, which unfortunately disappeared with 7 days old from the nest (France).

This year, because of the covid, transfers for adoption between zoos could not be done, being necessary to implement special rearing protocols. Parco Natura Viva implemented the Nest-box rearing protocol. Green Balkans implemented the double adoption protocol in young chicks. Double/triple/quadruple adoptions are usually carried out when the chick to be adopted is about three weeks younger than the smallest chick already adopted. This was not the case in Green Balkans as there were only seven days difference. In Tallinn Zoo it was necessary to use the Nest-box rearing protocol since the parents stopped incubating. Tierpark Friedrichsfelde Berlin tried for the first time a double adoption which unfortunately failed (for more details see chapter News/Others). All these zoos required directly support from the EEP coordinator, who gave them daily instructions on how to proceed according to the evolution of each case.

The pairs in Alpenzoo Innsbruck, Beauval, the young breeding pair from Tierpark Friedrichsfelde Berlin, Chomutov, Frankfurt, Helsinki, the old breeding pair from Liberec, Novosibirsk, Nuremberg, both pairs in Ostrava and Prague zoos failed to produce a young. The same with the breeding pair from the foundation FPWC (Armenia). Nevertheless, the pair from Frankfurt produced for the first time an egg, Helsinki for the first time a

Bearded Vulture EEP: results for 2020

fertile egg, Beauval Zoo for the first time a hatchling and Berlin Zoo for the first time a fledgling. And finally, mating was observed for the first time by the pair from MónNatura (Spain).

- ✉ **Summary** 22 breeding pairs in the zoos/recovery centres laid 36 eggs. From the 36 eggs, 19 hatched and 11 offspring were successfully reared. From these 11 survived chicks (7 males and 4 females), eight have been released (2 in Baronnies and 5 in Grands Causses in the framework LIFE project GypConnect and 1 in Switzerland). The other three (2 males and 1 female) have been kept for the EEP. Additionally, one new pair produced their first clutch, another its 1st fertile egg and one its first hatchling. And finally, by one pair first time mating was observed.

- Private collections:

Only the pair from Monticello (Italy) private collection laid a clutch. Since 2012, when the first clutch was laid, no chicks have been obtained from this pair. That's why this year it was decided again to remove the single clutch immediately after being laid for artificial incubation. The egg showed to be fertile, and a chick hatched. Unfortunately, when the chick was adopted being nine days old, it was killed by its father after two hours of adoption. The male showed at the beginning interest for the chick and tried to feed it. Later he showed more interest for the dummy egg and suddenly took the chick and killed it. The female was removed the day before adoption since she stopped incubating.

In conclusion in 2020, 41 laying pairs (one foster pair is included) produced 71 eggs, from which 25 chicks survived from the 38 hatchlings (see Table 3 in Annex - Breeding pairs in 2020). From the remaining 25 nestlings, 21 have been released, and 4 were added to the breeding network (see Table 4 in Annex – Offspring in 2020).

Out of the 33 not hatched eggs, three broke unknowing the real status, another broke after a fight between the breeding pair and showed to be fertile, 14 were removed infertile from the nest and 15 aborted. From these 15, three aborted in the first half of incubation, five in the second half of incubation, three before internal pick, one before external pick because aspirated his own faeces as it was malpositioned and three unknown when aborted as they were already smelly when they were removed.



Three of the nine Bearded Vulture chicks produced in this breeding season at the Guadalentín Breeding Centre (Andalusia, Spain).



Release site Cazorla-Guadalest, Andalusia reintroduction project (Spain, 2020). Between 1986 and 2020, 344 nestlings have been released in five on-going reintroduction projects.

TRANSFERS / INCREASES / LOSSES

Transfers

The final goal of bird transfers is to increase the genetic variability of the captive stock, and at the same time assure in the long term a minimum number of chicks produced per year to satisfy the ex-situ (captive breeding network, EEP) and in-situ (birds release) needs. Therefore, the number of breeding pairs must at least be maintained, and this can be only achieved by building continuously new pairs for replacing potential future loses or breeding failures and assure a yearly minimum production of chicks. In general, the pair bonding scheme is drafted at the same time when the destination of the descendants is determined; genetics and location are the most important criteria to be considered.

In 2020, 7 birds from the 9 previewed transfers have been successful transferred (three males and four females) between four institutions with the goal to build five new breeding pairs.



Bearded Vulture EEP: results for 2020

On the 13th of September, staff from Prague Zoo were so kind to carry out the transfer of four birds between Richard Faust Zentrum (Austria), Prague Zoo (Czech Republic), Asters breeding centre (France), Centre de Fauna Vallcalent (Spain) and Guadalentín breeding centre (Spain) traveling almost 5000km. An immature male from Richard Faust Zentrum, BG1039 (2019), was transferred to Asters breeding centre. The old experienced female BG142 (1991) from Prague Zoo was transferred to Vallcalent to try pair bonding with the male BG327 which is mating on perches. Last year this male received the female BG398 (2002) from Richard Faust Zentrum. The male again mated on perches as he did with his first female BG381. We hope that with the presence of an experienced female his altered behaviour can be redirected. From Guadalentín the Corsican immature female BG1045 (2019) was transferred to Asters for the male coming from Richard Faust Zentrum. And finally, a young male BG1065 from Guadalentín (2020) was transferred to Prague Zoo.

On the 23rd of October Prague Zoo received the young female BG1072, descendant from the 1st egg from the Tallinn Zoo breeding pair, to be paired with the young male BG1065.

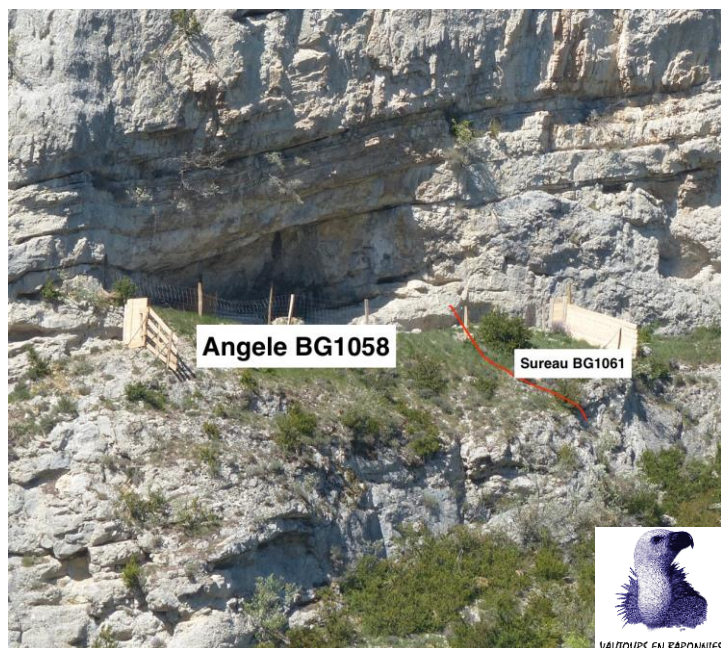
On the 16th of October the adult male BG145 (1991) coming from Tierpark Goldau (Switzerland) was sent to Richard Faust Zentrum as her female died, with the goal to try pair bonding with the female BG453 from 2005.

And the last transfer was done on the 26th of December, the female BG456 (2005) was sent to Vallcalent to try pair bonding with the male BG371 as his female died a week before because of a duodenum perforation. The female BG456 lost her male on the 13th of August because of a West Nile Virus infection (see chapter losses).

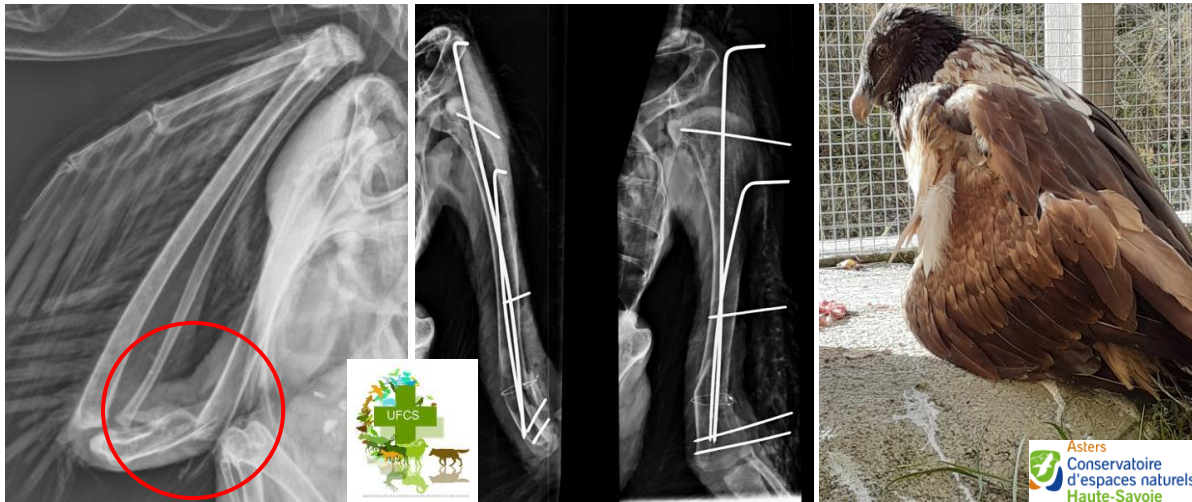
Increases:

During 2020, additionally to the four young descendants coming from the EEP, one recovered released male in Baronnies (France) and one wild recovered immature Pyrenean male have been additionally included in the captive network. In total six birds have been included in the EEP (5 males and 1 female).

On the 2nd of June the nestling male BG1061, named "Sureau" and released in Baronnies, fell from the hacking cave at 13:00, during a light rain. Immediately was removed from the hacking cave and transferred to the acclimatization aviary. The following day Sureau was transferred to the recovery centre Centre Aquila, held by Michel Phisel, to make Xray. Blood was discovered on the left wing and the back: there was an open humerus fracture. On the 6th surgery was done to fix the fracture at the recovery centre Goupil Connexion held by Vet Marie-Pierre Puech and afterwards received physiotherapy during several months. Unfortunately, the bird could never extend the wing properly and finally the wing was left dangling, being not possible to return it to the hacking cave and it had to be included in the captive breeding network.



Bearded Vulture EEP: results for 2020



The male "Sureau" released in Baronnie suffered an accident in the hacking cave, breaking the humerus of his left wing. After surgery and months of physiotherapy, the wing was left dangling and could not be released. The bird has been incorporated into the EEP and is currently housed at Asters breeding centre (France).

On the 14th of May a wild immature Pyrenean male, named "Urrobi", was recovered in Pyrenean French National Park and transferred to Hegaldia recovery centre. This bird was tagged in Navarre in 2019 when as nestling jumped out of the nest and crashed into the water. He was recovered with a problem with his leg and loose tail feathers. Was transferred to a recovery centre and released late October 2019. Mid-November was found with hypothermia. Spent the winter in a recovery centre and was released on 1st of May 2020. In Hegaldia it could find out that the two central rectrices were pushed upside down, being not able to fly in perfect conditions. Further, observing that the bird was already released twice and in short time had to be recovered because of weakness since was not able to adapt in the new environment as results of spending its juvenile period in captivity (lack of adaptation capacity), was decided to include him in the captive network.



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Losses:

In 2020 five birds died: one adult female at Tierpark Goldau (Switzerland), one imprinted male at Richard Faust Zentrum (Austria), one adult male at ZooBotánico de Jerez (Spain), and one founder injured male and the old breeding female at Centre de Fauna Vallcalent (Spain).

On the 21st of July, the 23 years old female BG276, named “Jacqueline”, died at Tierpark Goldau because her beak stuck in the ring and drowned in the water basin. This female born in 1997 in Richard Faust Zentrum, arrived in 1998 at Tierpark Goldau and firstly paired with the male BG060. Because of the low breeding success (only two chicks hatched and both died, the 2nd killed by the male), in 2006 was paired with BG145. With this male produced seven hatchlings, but all birds hatched in their nest were killed by the adults (n= 3). The other four were adopted by foster pairs and reared successfully. Unfortunately, one of them, BG1000, died after a collision with the aviary structure after leaving the nest. Another was released in Switzerland and the remaining to descendants included in the EEP.

On the 25th of July, the 5 years old imprinted male BG1011 died at Richard Faust Zentrum because of a severe air sac and organ aspergillosis. Usually always comes to the keeper to pick up the food, but on the 22nd of July the bird was filmed and he stayed up in the platform. Nevertheless, he was interested in the events and also played with a bone the presenter gave him. The following day he was quite normal and also coloured himself with mud. But on the 24th he slept on the ground, came to the keeper for feeding, took food too, but without any desire and with breathing difficulties. The bird was transferred immediately to the Vet. Med. University of Vienna and the preliminary findings were an aerosacculitis and stomach distended. Immediately the bird was treated with voriconazole, Baytril and Metacam. On the morning of the 25th his breathing was better, and he came to keeper again to take food, but he did not swallow it. In the afternoon his breathing deteriorated rapidly and died a bit later. This male was born in 2015 at the private collection from M. Hochlenert (Oberflörsheim, Germany). But unfortunately, was hand reared and in September sent to Parc Pairi Daiza Zoo. In July 2018 the bird was sent to Aachen Zoo and almost one year later, on the May 2019, to Richard Faust Zentrum with the goal to use it as foster male.

On the 13th of August, the six years old male BG789 died at ZooBotánico de Jerez because of a severe West Nile Virus infection lineage 1. The bird hatched in 2014 is a descendant from the old breeding pair from Liberec Zoo and was transferred to ZooBotánico de Jerez on March 2015 to be paired with the female BG456. During the breeding season 2018/19 both birds were already observed building nest. On the 11th of August the male was found weak with the suspicion of a West Nile Virus infection. Immediately the bird received a treatment against WNV: Metacam 2mg/Kg /2 day and lactulosa. At the beginning there was a low improvement, but finally the bird died on the 13th afternoon.

On the 28th of November the adult founder male BG1051, named “Issac”, died at the Bearded Vulture Breeding Unit from the Recovery Centre of Vallcalent because of a visceral gout. This male was recovered on the 18th of July 2018 by Environment Agents in Montseny mountain chain (Catalonia) and transferred to the recovery centre of Torreferrusa. The bird showed an osteomyelitis with osteolytic process on the left metatarsus-phalanx joint (for more details see EEP annual report 2019). Unfortunately his inflammatory process could never be 100% controlled, being regularly necessary to treat with antibiotics. That’s why at the beginning of 2020 it



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was decided to amputate the foot and fit it with a prosthetic device as it was done with the Bearded Vulture named "Mia" before (see EEP annual report 2018). On the 23rd of January the bird was transferred to the Vet Hospital Ars Veterinària (Barcelona) for a computer axial tomography to determine the size of the bone cavity where the future intramedullary nail must be implanted for a prosthetics. The entire Ars Veterinària



"Issac" during the computer axial tomography by the Vet Hospital of Ars Veterinària carried out in a selfless way. Many thanks for their collaboration!

examination is carried out on a selfless basis. Unfortunately, because of the covid it could not be proceed with the surgery and the bird had to be treat regularly with antibiotics, what could be the cause of this visceral gout.

On the 11th of December the 32 years old breeding female BG103, named "Dama", died at the Bearded Vulture Breeding Unit from the Recovery Centre of Vallcalent because of a cellomitis caused by a perforation of the duodenum. On the 18th of November after eating was observed hanging the head and with the feathers puffed up. Around 45min later the bird showed again normal behaviour. The following three days she showed the same behaviour after eating. But later was observed mating and nestbuilding. On the 4th of December the bird was less active and a general control, extraction of blood samples and X-rays (also with contrast) were done. Nothing abnormal was detected, only a very low haematocrit (23%) and the female was continuing mating. A treatment was started based on her symptoms (Hydration, Antibiotics and anti-inflammatory). As the female was not eating



and becoming weaker, on the 9th of December an endoscopy at the Vet clinic Anadón (Lleida, Spain) was done, which also generously carried out the procedure for free. And again nothing abnormal was detected. In this day, before the female was transferred to the Anadón clinic, a successful mating was observed by the pair. Unfortunately, the bird was found dead two days later. By

the necropsy a perforation at the duodenum just after the stomach was found which provoked a cellomitis.

"Dama" was born in 1988 at the Richard Faust Bearded Vulture Specialised Captive Breeding Centre in Austria (RFZ). Her Father, BG065, came from Crete and her mother, BG040, was a descendant from the old La Garenne breeding pair BG034 x BG035. At the early stages of her life, there was a mistake in Dama's sex determination, and she was considered male, and was housed with another male until 1992 when she was not of breeding age.

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Following that, they paired her with a female until 1995. Because of their behaviour, it was tested her sex again, and it was discovered that she was a female. Between July 1995 and November 2003, she was paired with four different adult males but with no success. She was a very aggressive bird and did not accept to be paired with adult males. That's why it was decided to try a new pair bonding technique, to pair her with a young bird still in dark plumage. This method was implemented thanks to the observed behaviour of released birds in the wild, where juvenile birds were always dominant to adult birds when feeding (Llopis A. 1996, Studies of the feeding habits of the reintroduced Bearded Vulture (*Gypaetus barbatus*), Doctoral Thesis p.p. 314). Now the Network continues to use this technique when dealing with difficult and aggressive birds. In November 2003 Dama received the immature male BG371 from 2001. The male showed from the beginning its dominance, and she finally accepted him as her partner. To make it more complicated, additionally she was very nervous when she laid a clutch and buried most of her eggs under the wool, which threatened the chances of a chick hatching. So, it was necessary to remove all clutches a soon have been laid and incubate them by other pairs or artificially. Furthermore, she reacted very aggressive against hatchlings/chicks, being impossible to use her as a foster female to rear her own or other chicks. Nevertheless, during her shortly breeding life, she produced 39 eggs and thanks human help, 26 chicks hatched from these 39 eggs and 24 survived, becoming one of the most reproductive females inside the EEP.

Additionally in 2019 an adult female in Nikolaev zoo died on the 5th of October with a minimum age from 18 years. The cause of dead is unknown. The bird arrived at Nikolaev zoo through Erevan Zoo on the 20th of March 2003.

STATUS BEARDED VULTURE EEP

On the 31st of December 2020, there were 178 birds included in the EEP. From them, 85 were males and 92 females and one bird still unknown its sex. The average age between males and females is almost the same (15.2 and 15.0 years old respectively). This shows the existence of a high number of young specimens (≤ 7 years old), what represents the 29.21% of the total captive population (26 males, 25 females and 1 sex unknown). Further, the distribution of specimens in each age class are between males and females almost the same (see annex table 2) what gives a pyramid shape on age distribution and reflects demographically a very healthy and stable captive population. The actual Bearded Vulture EEP population structure makes possible to guarantee a stable yearly production on chicks covering the EEP needs the on-going reintroduction projects as well.

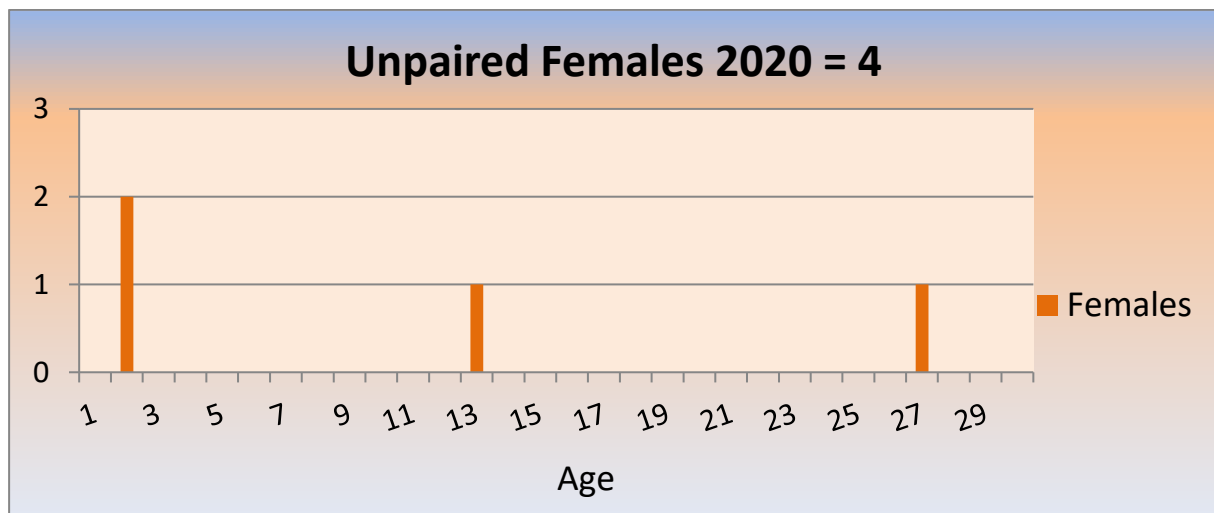


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To maintain this dynamic population, it is necessary to regularly retain a minimum number of produced chicks, and this will ensure that every year new couples start to breed, substituting the possible annual leave for old age. This strategy has made possible that during the last years the number of potential pairs which can produce a chick has been stable around 25 pairs (see table on the right). Also, the number of pairs classified into high, medium, and low probability to breed with success has remained stable.

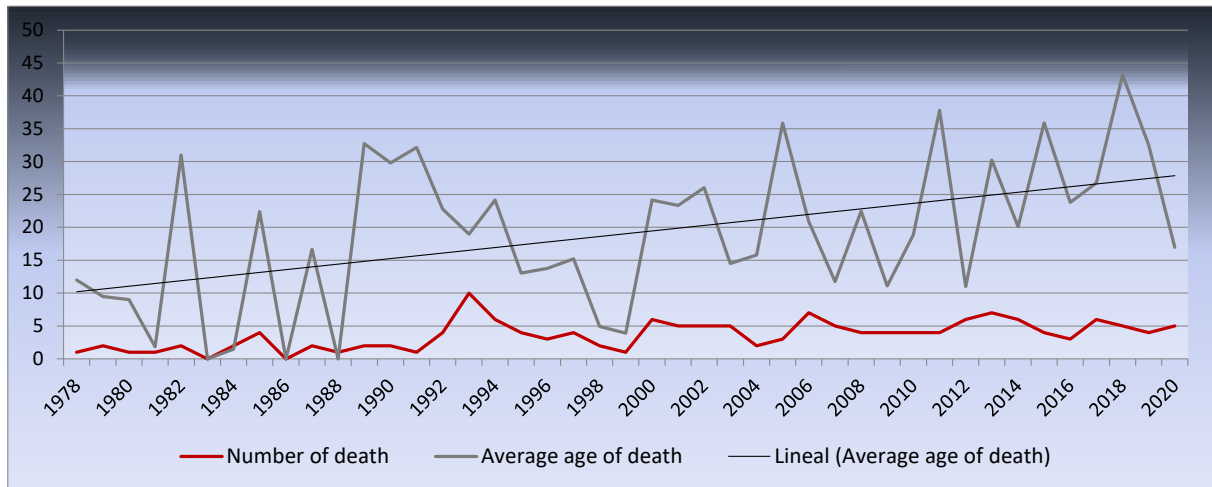
Potential breeding pairs		2016	2017	2018	2019	2020
High probability	Number	7	6	8	7	10
	clutch	6	5	8	7	10
	hatchling	2	1	4	5	5
	fledgling	1	0	2	3	1
Medium probability	Number	13	12	11	10	6
	clutch	3	2	3	5	0
	hatchling	1	1	0	0	0
	fledgling	1	1	0	0	0
Low probability	Number	5	8	8	8	10
	clutch	0	2	2	1	1
	hatchling	0	0	0	0	0
	fledgling	0	0	0	0	0
Total potential pairs		25	26	27	25	26
N. pairs reaching sexual maturity in 1-2 years					10	10

This year the number of included birds is 6 birds (5 males and 1 female) only one more as the number of deaths during the year (3 males and 2 female). The surplus of only one copy, will require that in the coming year the needs of the EEP will have to be considered. On the other hand, the number of included birds males is a bit higher as the number of lost males, giving us the possibility to counteract a little bit the sex imbalance in favour to females.



Thanks to the new advisor service that the VCF has offered to the EEP Bearded Vulture Partners, the average age of death at the zoos has decreased significantly, being nowadays similar to that of the specialized breeding centres (25.4 years old). This new service offers all EEP partners the possibility to ask for help and support from the EEP coordinator regarding any question related to keeping and taking care of the Bearded Vultures. The positive effect of this service is reflected in the following table where it can be seen that the average age at death within the EEP is significantly higher and that the number of dead birds per year has remained very stable, while the captive stock has grown significantly at the same time (n= 178 individuals in 2020).

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This significant trend has made it possible to increase constantly the number of breeding pairs and initiate new reintroduction projects.

NEW BREEDING CENTRES

During 2020, supposedly because of the pandemic, no new zoos expressed their wish to join the Bearded Vulture EEP. Nevertheless, two Partners expressed their wish to be more involved in the Bearded Vulture EEP, building additional aviaries during 2021: Nuremberg and Parc Animalier des Pyrénées zoos.

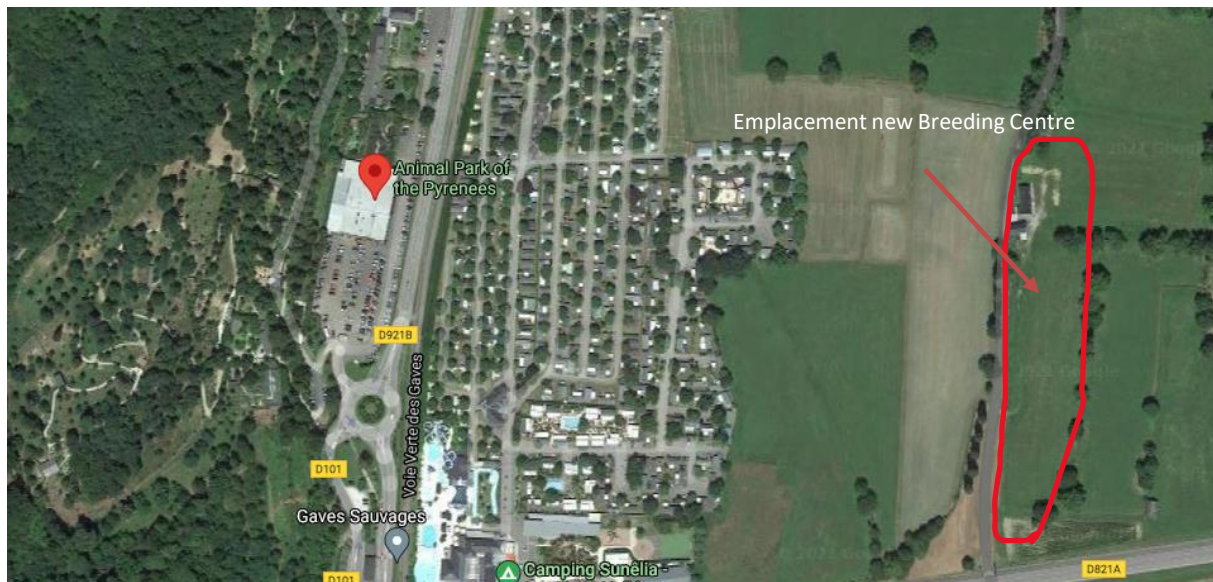
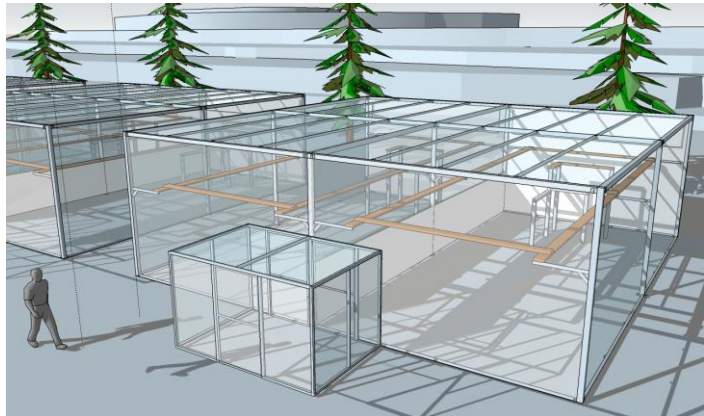
Nuremberg Zoo would like to build two additional aviaries outside the exhibit area at the quarantine station located on their agricultural estate (see map below).



Potential location of two additional aviaries at Nuremberg Zoo at their quarantine station (Germany).

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Parc Animalier des Pyrénées would like to build a middle-large Bearded Vulture specialized breeding centre near the zoo (less than 500m), closed for the public. This centre would have four double aviaries including all infrastructures necessary for the operation of the centre. The centre will be in the middle of the French Pyrenees, ensuring the best geographical/meteorological conditions for the species, free from aspergillosis and West Nile Virus infections, two very sensitive diseases for the species.



Location of the new Breeding Centre at the Parc Animalier de Pyrénées, with the goal to build 4 double aviaries (France).

OUTLOOK / NEWS

BEARDED VULTURE EMBRYONIC EVOLUTION

By artificial incubation it is very important to recognize as soon as possible any infertile or aborted egg to discard and avoid contamination of fertile eggs. In the last Bearded Vulture EEP annual report (2019) we described that by candling fertile eggs with unpigmented or almost unpigmented shell, we can observe that the shadow of the yolk doubles its size when it has six days of incubation (see pictures below).

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In this season our studies on the embryonic evolution continued and we could determine the **Germinal disk evolution**. As in previous seasons the seven laid eggs from the two experienced females with incubation problems have been removed from their nest almost since the laying day and incubated artificially. The six that showed to be fertile in Bearded Vulture Captive Breeding Unit at the Recovery Centre Vallcalent were daily candled and among other studies, germinal disk growth was analysed in those eggs where the shell was not pigmented. At seven days of incubation was the first time we could appreciate the germinal disk and it has been possible to monitor its growth until day 13, a time when the curvature of the egg made it impossible to monitor its growth (see below).

Incubation day	6th		7th		8th		9th		10th		11th		12th		13th	
Germinal disk	wide	large	wide	large	wide	large	wide	large	wide	large	wide	large	wide	large	wide	large
Size in cm	Not visible		1,67	2,07	2,77	3,30	3,70	4,50	4,35	5,60	5,18	6,45	5,83	7,10	6,10	6,30



Left: germinal disk evolution from the 8th to the 13th incubation day (3rd egg from BG103)

Right: germinal disk evolution from the 7th to the 12th incubation day (4th egg from BG103)

NEST-BOX AND DOUBLE/TRIPLE ADOPTION PROTOCOLS

As previously mentioned, the restrictions decreed worldwide in 2020 because of the Covid19 pandemic had a negative impact on the Bearded Vulture EEP.

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Each year a huge efforts are invested to ensure that all chicks are natural reared, being necessary to transfer chicks between EEP partners where foster/experienced pairs are available. Please have in mind that hand-reared Bearded Vultures are not able to reproduce with their conspecifics when they reach their sexual maturity, being also useless for releases.

With the restrictions of the pandemic, the borders were closed, the movement of people between municipalities, regions and countries were forbidden, making it impossible to move chicks. In addition, the restrictions were changing daily according to the evolution of the pandemic, making it impossible to plan in advance. This exceptional situation made it necessary to draft **special emergency plans**, and following Plans B, C, etc. Under this context, it was also necessary to use unexperienced pairs/birds on chick rearing or on double/triple adoptions. This led to the need to develop different protocols:

- In the case where the couple had no experience on rearing and/or stopped to incubate being no possible to try an adoption, the **Nest-Box protocol** was implemented. This requires a longer period of artificial rearing without human contact.
- In the case where the couple had no experience in rearing two chicks, the **double/triple adoption protocol** was implemented, requiring also a longer period of artificial rearing without human contact.

Nest-Box protocol

This protocol was drafted for pairs not able to adopt a chick for different reasons (has stopped to incubate in advance, no rearing experience, react aggressively against the chick, etc.).

A box with a nest inside is built in the nest platform with the goal that the chick have always visual contact with its parents, promoting the imprinting on their species. To avoid that adults have physical contact with the chick and injure it, the box itself has to be covered with a welded wire mesh with a hole size not bigger than 2.5cm. Further the mesh has to be installed in both sites, as in the past two chicks have been killed by an adult not breeding bird because the holes were too big and there was not a double mesh. The back should be closed and through a small door the chick can be fed without human visual contact. Inside the box, a nest has to be installed and filled with wool for keeping the chick warm.

How to proceed is as follows:

1. During the first 7-10 days (depending on outside temperature) the chick has to be kept indoors and has to be fed without human contact.
2. Afterwards the chick has to be put in the box during the day and feed from behind. At the beginning during the hottest hours, and as the chick grows, the hours outside get longer. With 3 weeks, if outside temperature are not under 5°C, the chick can stay 24h outside. It's recommended to cover the chick with wool to keep it enough warm, particularly during the night. In case the temperature drops, a heating lamp or a heating mat should be installed to keep the chick warm. It's very important to ensure the chick cannot nibble on the wire and be electrocuted.
3. The number of feedings has to be reduced as maximum as possible. This implies that the feedings must be bigger in quantity (with 3 weeks 2-3 feedings per day). That requires to calculate each day the needed food on a theoretically basis. During the period where the chick spends the night indoor weight control has to be done to follow its growth. As soon the chick spends 24 hours outside, weight controls has to be avoided as much as possible to reduce human contact. At this stage, the estimated food

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requirements is calculated on the basis of the Bearded Vulture EEP growth tables (see table below extracted from *Guidelines for feeding Bearded Vultures in captivity 1st version October 2015*).

Average weight of Bearded vulture chicks (in grams) and average daily food requirements (in % of body weight)

DAY	1	2	3	4	5	6	7	8	9	10	14	21	28	40	60	120
Weight	155	148	151	161	174	188	208	228	250	275	420	980	1500	2300	5000	5500
%	1	11	19	20	25	25	25	27	27	27	25	25	25	25	10	10

- From the 3rd-4th week, chicks had to be feed from a plate giving them the possibility to learn to eat on their own. Generally up to 35-40 days old, they are able to eat chopped food without help.

Double/triple adoption protocols

This protocol was drafted for pairs without experience on rearing two chicks at the same time. Generally by double clutches, the 1st chick hatch in the nest, being reared by its parents, and the 2nd in the incubator and adopted by a foster pair with 7-10 days old. Because of movement restrictions was not possible to transfer the 2nd chick being necessary to be reared also by its parents. To avoid human imprinting, as soon the 2nd chick is >7 days old, chicks are exchanged daily until the 1st chick is 3-4 weeks old, time for a definitively double adoption.

For that a secondary/supplementary nest has to be built near the main nest or one big nests to divide it in two (e.g. with a wooden trunk).

How to proceed is as follows:

- During the first 7-10 days (depending on outside temperature) the 2nd chick has to be kept indoors and has to be fed without human contact.
- As soon the 2nd chick is already 7-10 days old, chicks are daily exchanged, keeping always one in the nest and the other indoor alternatively. **The daily exchange takes place** as soon as the chick in the nest has been fed by the adults. At the same time, the chick that is indoors in the morning, before transferring to the nest, is not artificially fed, even if it chirps for food. This reduces the number of artificial feedings.
- As soon the 1st chick is 3-4 weeks old (depending on outside temperature), the 1st chick is moved to the supplementary nest and the 2nd chick introduced in the main nest.
- This is the crucial moment where the adults must be very well monitored, to ensure that they feed both chicks sufficiently. In several cases as soon chicks are around 40-45 days old, chopped food can be offered in a plate. At that age they are able to start to eat alone and this ensures that the amount of daily ingested food is appropriate to the age of the chicks in case the adults do not feed them enough.
- It's very important to install a wooden plank between both nests as soon nestlings start to move (between 40-50 days old) to avoid fight between them. The height of the wood is adapted to the chicks' ability to move. Remember "cainism" lasts for the entire duration of the stay in the nest.

Zoos' experiences which implemented these protocols:

- *Parco Natura Viva (Italy)*

Parco Natura Viva zoo implemented successfully the Nest-Box rearing protocol.

The pair produced the year before its first chick, which was reared by the female alone. The male was removed from the aviary just before the adoption, because fights between the pair were observed as soon the chick pecked the air-cell and started to chirp, being necessary to remove the hatching egg.

In 2020 after one month of incubation, fights between the pair apaired, damaging the 2nd fertile egg. Consequently on the 26th of February -two days after the fights-, the 1st egg was removed for artifical incubation. The chick hatched on the 12th of March and until the 25th was reared indoors without human visual contact.



On the 25th of March, when the chick was already 13 days old, at midday it was introduced in the Box for 3 hours. The following days from 10:00 to 16:00 o'clock and from the 29th, when the chick was already 17 days old, it spent all daylight hours in the Nest-Box and was only fed there (three times per day).

As soon the chick was 24 days old, it spent for the first time 24h outside. And on the 26th of May, when the chick was 75 days old, the Nest-Box was removed and the chick was introduced directly in the nest. One hour later the chick started to ask for food and it took one hour more before the female started to feed it.



It should be noted that since the chick was introduced in the box the chick was always asking for food and the female eating near the box.



Picture right top: Staff from Parco Natura Viva installing the Nest-Box on the nest platform. Picture left: as soon the chick was introduced in the Nest-Box, the female was always attentive to the chick and ate in front of it, trying several times to feed

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the chick through the mesh. *Picture middle:* Until the chick was not able to take food by itself, it was fed three times a day with a puppet and with no visual contact with human. *Picture right:* with 75 days old, the Nest-Box was removed and the female took care of the chick.

- *Green Balkans Recovery Centre (Bulgaria)*

Green Balkans Recovery Centre implemented successfully the double adoption protocol.

In 2016 the breeding pair from Green Balkans produced for the first time a double clutch and both eggs were fertile. The pair reared the 1st chick successfully. The second was sent to RFZ for adoption. Since then they have reared a chick every year, having enough experience in rearing a single chick. 2nd chicks were always sent to another centre for adoption.

In 2020 the pair laid a double clutch. On the 9th of March the 1st egg had to be removed because of hatching problems (chick BG1067). On the 16th, when the chick was already 7 days old, it was adopted by its parents and the 2nd egg was removed for artificial hatching. The egg had already a big hole, showing again hatching problems, being necessary human intervention (chick BG1078).

On the 25th of March, when the 2nd chick was already 9 days old, in the early afternoon it was transferred to its parents' nest and the older chick removed and transferred indoors. From this moment on, every day the chick in the nest was removed after being fed by its parents and replaced by the indoors' chick, which received its first feeding of the day by its parents. The chick indoors was placed in a brooder and fed with a simple puppet without visual contact with the staff.



Picture right top: between the 25th of March and the 3rd of April daily chick exchange. *Pictures left and right:* the indoors chick fed with a simple puppet in a brooder without human contact.

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On the 3rd of April, when the 1st chick was 25 days old and the 2nd 18 days, both chicks spent the whole day outside. The older chick was introduced in the supplementary nest and the younger in the main nest. During the night only the younger was removed, but no more fed by the staff inside. On the 18th of April, when the 2nd chick was 33 days old and with a weight of 2kg, it spent the first night outside. At that time the parents didn't warmed any more the chicks, but they were still feeding both chicks.



On the 11th of May, the older chick jumped over the wooden plank which separated the two nests. The next day the older chick was moved to the right platform where a third nest was urgently built.

- *Tierpark Friedrichsfelde Berlin (Germany)*

At Tierpark Friedrichsfelde Berlin a double adoption was tried, but unfortunately it failed.

In 2020 both breeding pairs produced a double clutch of which all four eggs hatched. The double clutch from the older pair was laid around one month before the clutch from the younger pair. On the 12th of March the chick from the 1st egg hatched in parents' nest (BG1070). It was at this time that the 2nd egg was removed and adopted by the young pair. At the same time the double clutch of the young pair was removed for artificial hatching. On the 15th of March the chick (BG1079) from the 2nd egg of the older pair hatched in the nest of the young pair. Unfortunately, the chick from the 1st egg of the younger pair died at the age of 8 days (BG1087). But on the 12 of April the 2nd chick (BG1089) hatched and at the age of 7 days it was adopted in parents' main nest. The chick BG1079 had to be removed firstly to the secondary nest. In the afternoon BG1089 was fed by the adult birds without problems. However, next day in the morning the nest was completely empty, not knowing the cause of the chick's disappearance during the night.

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It should be noted that as soon the double clutch from the younger pair was removed and confirmed that both eggs were fertile, two additional nests were built in the aviary of the younger pair with the goal to have the possibility to rear all potential chicks in their installations. Each supplementary nest was built around 50cm lower than the other, not being necessary to install a wooden plank between each nest. The pair is housed outside of exhibition.



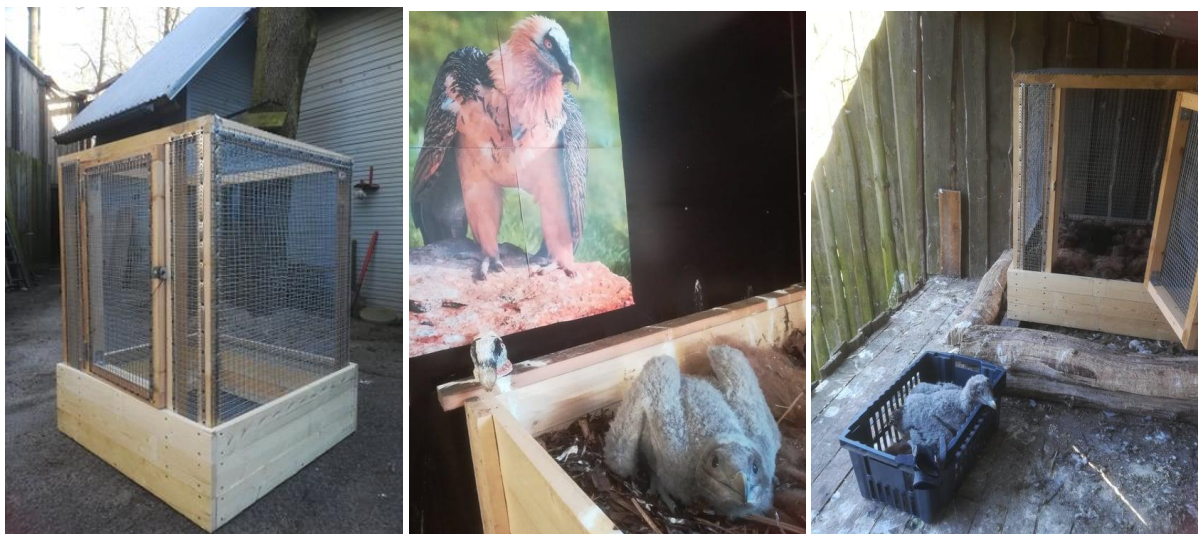
- *Tallinn zoo (Estonia)*

Tallinn zoo implemented Nest-Box protocol and double adoption protocol, but only partially as the outside temperatures made it impossible to carry out the protocols to the letter.

The breeding pair from Tallinn zoo has the peculiarity that stops to breed after 40 incubation days, being always necessary to remove the clutch before this period to artificial incubation and the potential chicks have to be transferred to another institution for adoption.

In 2020 the pair laid the 1st egg on the 20th of January. Seven days after was removed for artificial incubation. One month and one week later, on 29 February, the pair laid their second egg. After 40 natural incubation, the egg was removed. The pair received two dummy eggs which were adopted immediately by the male, but 5 minutes later were destroyed by the female. Consequently the pair stopped to incubate and was not possible to try any adoption. The 1st chick, BG1072, hatched on the 13th of March. Because of the extrem low temperatures, it was not possible to introduce during the day in the Nest-Box until the 27th of April, when it was already 45 days old. The 2nd chick, BG1090, which hatched on the 23rd of April, it was introduced in the NestBox during the day on the 17th of May, when it was 24 days old.

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ASPERGILLOSIS VERSUS WEST NILE VIRUS INFECTION

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VCF, BV Captive Breeding Technical Assistant, CF Vallcalent

Since the beginning of the International Bearded Vulture captive breeding program, 1978, until 2020 included, 155 birds died because of different causes. 26 birds died because of an aspergillosis infection, representing 16.8% of the total number of deaths. In contrast, only 7 (4.5%) suffered West Nile Virus infection (WNV). But if we consider the period since the first WNV infection was detected (2008), it represents 11.3% of the total number of deaths (n= 62 deaths), an impact two and a half times higher.

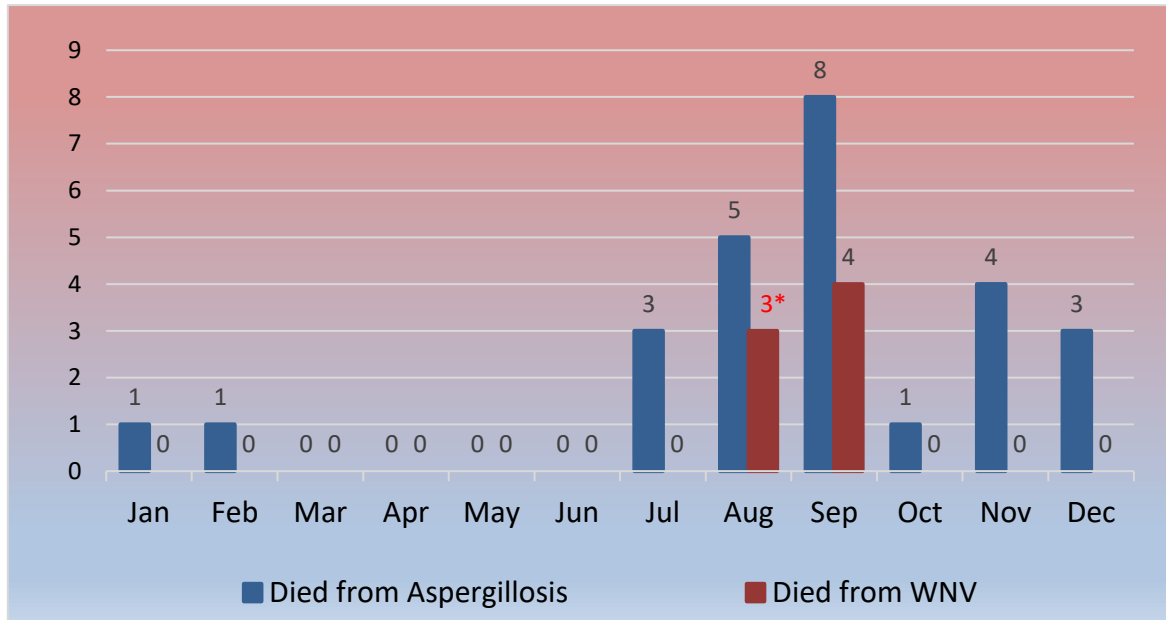
By analysing the real cause of death by the seven birds which suffered a WNV infection, only one (male BG789, Jerez Zoo) died on a severe acute WNV infection. The remaining six birds died from other causes: one on a bacterial fibrinous to diphtheroid enteritis and five on a severe aspergillosis infection, which could have masked the initial cause of their illness if additional tests had not been performed. This proves the negative impact of WNV infection on the immune system (see table below).

BG	Month	Centre	Cause
104	Sep	RFZ	West-Nile virus infection / finally died because bacterial fibrinous to diphtheroid enteritis
554	Sep	RFZ	West-Nil virus infection / finally died because severe aspergillosis infection
178	Aug	RFZ	West-Nil virus infection / finally died because severe aspergillosis infection
966	Sep	RFZ	West-Nil virus infection / finally died because severe aspergillosis infection
968	Sep	RFZ	West-Nil virus infection / finally died because severe aspergillosis infection
135	Aug*	Prague Zoo	West-Nil virus infection (linage 1) (died in February -senile decay- but WNV symptoms in August)
789	Aug	Jerez Zoo	West-Nil virus acute infection (linage 1)

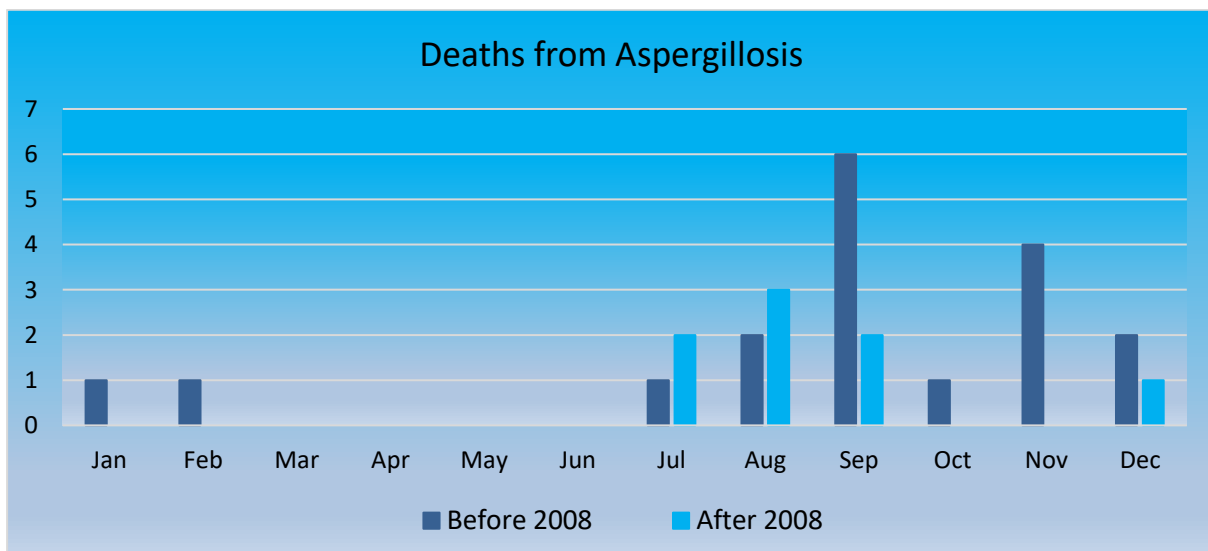
The same happens if we consider the period when the most infections of aspergillosis occurred (August and September). It matches completely with all WNV cases and may have come to completely wrong conclusions in

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the 5 cases that died on aspergillosis but initially suffered a WNV infection and finally died on an aspergillosis infection as their immune system was already weak (see table below).



We also analysed the aspergillosis infection dividing the period before and after when the 1st case of WNV infection was detected (2008), showing that the incidence pattern of aspergillosis infection in these two periods are mostly the same (see table below). We detected that the highest incidences on aspergillosis infection occurs during the summer period, and that those cases of aspergillosis infection up to 2008 could be real and not masking a WNV infection - unfortunately not all birds that died on aspergillosis in summer were tested for WNV -, as before this period there was already a high incidence of aspergillosis at this time of the year.



The results show that any bird that dies during the summer months, where there is the highest concentration of mosquitoes responsible for WNV transmission, there is a need to always carry out an analysis on WNV.

EVOLUTION OF THE FIRST BEARDED VULTURE WITH AN ARTHRODESIS



In the report from 2019 we informed about the Pyrenean wild Bearded Vulture named Flamadel which on the 15th of December 2019 an arthrodesis of the left tibio-tarsal joint had to be done at AMUS recovery (see left picture).

On the 19th of September 2020 the definitively arthrodesis was done at AMUS recovery centre (see right picture). Now we must wait a few months before we can see the final results.



Thanks to the good cooperation in the Bearded Vulture EEP, the goal to re-establish an European meta-population is getting closer.

We would like to thank our sponsors:



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Bearded Vulture EEP: results for 2020

ANNEX I

 Table 1: EEP stock and its distribution as on 31st December 2020

N. ♂	N. ♀	LOCATION	COUNTRY	Age ♂	Age ♀	PARENTAGE {m/f} / {m/f}	GENERATION ♂	GENERATION ♀	REMARKS
1024	982	Aachen zoo	Germany	2	3	{500/513} / {410/290}	F1 / F2/F3	F2	
753	653	Acad. Puy du Fou	France	8	10	{371/103} / {124/041}	F3/F2 / F2/F3	F2	
912	889	Amnéville Zoo	France	5	5	{461/483} / {286/153}	F2/F3 / F3-F4/ F3	F1	
454	502	ASTERS	France	16	15	{108/175} / {179/281}	F2/F3 / F2	F2	
700	627			9	11	{286/153} / {371/103}	F1	F3-F2/F2-F3	
860	622			6	11	{500/513} / {371/103}	F1 / F2/F3	F3-F2/F2-F3	
1039	1045			2	2	{681/560} / founder	F1 / F4-F3/F3-F4	F0	
1061				1		{201/044}	F1/F2		
763	635	Beauval Zoo	France	8	11	{129/482} / {159/270}	F3/F1	F1	
611	634	Beozoo	Serbia	11	11	{199/107} / {034/130}	F1/F2	F1/F2	
298	320	Berlin Zoo	Germany	23	22	{122/118} / {018/272}	F2	F2	
1066				1		{298/320} /	F3		
124	329	CC Guadalentín	Spain	31	22	{131/132} / {043/040}	F1	F1	
286	580			31	12	founder / {201/044}	F0	F1/F2	
313	330			22	22	{009/006} / {108/119}	F1/F2	F2-F3/F2	
337	317			22	22	{201/044} / {017/070}	F1/F2	F2	
362	389			21	19	{080/081} / {199/107}	F2	F1/F2	
391	360			19	21	{124/041} / {018/272}	F2	F2	
410	290			18	23	{286/153} / {134/135}	F1	F1	
590	658			12	10	{223/329} / {199/107}	F2/F3	F1/F2	
947	908			4	5	{223/725} / founder	F2/F1	F0	
1006	987			3	3	{681/560} / {500/513}	F1 / F4-F3/F3-F4	F1 / F2/F3	
973	1010			4	3	{GT099/493} / {GT099/493}*	?/ F2/F3	?/ F2/F3	Feather problems
1050	911			2	5	founder / {431/436}	F0	F1 / F3/F2	
	976				3	/ {362/389}		F3 / F2/F3	Cataracts
1028				2		{371/103} /	F3-F2/F2-F3		
500	513	CF Torreferrussa	Spain	15	14	founder / {009/006}	F0	F1/F2	
297	115	CF Vallcalent	Spain	23	32	{086/104} / {019/021}	F2	F1	
327	142			22	30	{105/178} / {009/041}	F2/F1	F1/F2	
371	456			20	16	{105/178} / {286/153}	F2/F1	F1	
551	398			13	19	founder / {159/270}	F0	F1	
	588				12	/ {371/103}		F3-F2/F2-F3	
652	680			12	12	founder / founder	F0	F0	
972				4		founder /	F0		
398				21		{159/270} /	F1		Handraised
1091				2		founder /	F0		
340	338	Chomutov Zoo	Czech Rep.	22	22	{018/272} / {134/135}	F2	F1	
846	859	Córdoba Zoo	Spain	6	6	{722/723} / {018/336}	F2	F2 / F2/F3	

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N. ♂	N. ♀	LOCATION	COUNTRY	Age ♂	Age ♀	PARENTAGE {m/f} / {m/f}	GENERATION ♂	GENERATION ♀	REMARKS
826	828	FPWC - CWR	Armenia	21?	26?	founder / founder	F0	F0	
978				3		{826/828}	F1		sex unknown
672	576	Frankfurt Zoo	Germany	10	12	{337/317} / {108/175}	F2/F3 / F3	F2/F3 / F2	
788	281	Helsinki Zoo	Finland	7	24	{297/115} / {131/132}	F3/F2	F1	
804	801	Alp. Innsbruck	Austria	7	7	{340/338} / {371/103}	F3/F2	F3-F2/F2-F3	
847	829	La Garenne Zoo	Zwitzerland	6	6	{313/330} / {108/175}	F2/F3 / F3-F4/F3	F2/F3 / F2	
180	274	Liberec Zoo	Czech Rep.	36	35	{161/162} / founder	F1	F0	
654	656			10	10	{108/175} / {180/274}	F2/F3 / F2	F2/F1	
662	668	MónNatura	Spain	10	10	{371/103} / {172/290}	F3/F2 / F2/F3	F2/F3 / F2	
748	832	Moscow Zoo	Rusia	8	6	{108/175} / {180/274}	F2/F3 / F2	F2/F1	
	726	Nikolaev Zoo	Ucraina		13	/ founder		F0	
744	657	Novosibirsk Zoo	Rusia	25	10	founder / {223/329}	F0	F2/F3	
1008	1009			22	21	founder / founder	F0	F0	
18	336	Nuremberg Zoo	Germany	42	22	{019/021} / {201/044}	1	F1/F2	
993	896	Oasi Sant' Alessio	Italy	3	5	{199/107} / {399/278}	F1/F2	F2 / F2/F3	
325	322	Ostrava Zoo	Czech Rep.	22	22	{017/070} / {152/153}	F2	F1	
207	233			27	26	{017/070} / {122/118}	F2	F2	
850	747	P. Animalier Pyrénées	France	6	8	{223/725} / {286/153}	F2/F1	F1	
894	598	Parc des Oiseaux	France	5	12	{286/153} / {145/276}	F1	F2 / F2/F3	
664	659	Parc Pairi Daiza	Belgium	10	10	{391/360} / {017/070}	F3	F2	
451	469	Parco Nat. Viva	Italy	16	16	{108/175} / {018/272}	F2/F3 / F2	F2	
914	903	Plock Zoo	Poland	5	5	{461/483} / {174/118}	F2/F3 / F3/F4 / F3	F2	
328	561	Posen Zoo	Poland	22	13	{080/081} / {313/330}	F2	F2/F3 / F3-F4/F3	
511	519	Prague Zoo	Czech Rep.	14	14	{108/175} / {105/178}	F2/F3 / F2	F2/F1	
1065	1072			1	1	{410/290} / {431/436}	F2	F1 / F3/F2	
234	397	Priv. Montowl	Italy	26	19	{086/104} / {201/044}	F2	F1/F2	
830	620			6	11	{034/130} / {172/290}	F1/F2	F2/F3 / F2	
591	636	Priv. B. Sloman	England	12	12	{080/081} / {722/723}	F1	F2	
461	483	RC Green Balkans	Bulgaria	16	15	{199/107} / {108/175}	F1/F2	F2/F3 / F2	
1035	956			2	4	{654/656} / {174/118}	F3/F4 / F3 / F3/F2	F2	
1034	999			2	3	{399/278} / {340/338}	F2 / F2/F3	F3/F2	
17	70	Richard Faust Centre	Austria	42	37	{019/021} / {022/023}	F1	F1	
594	6			12	43	{172/290} / {019/020}	F2/F3 / F2	F1	
108	175			32	29	{065/040} / {152/153}	F1/F2	F1	
199	107			35	33	founder / {150/151}	F0	F1	
399	278			19	24	{159/270} / {065/074}	F1	F1/F2	
468	381			16	20	{223/132} / {159/270}	F2/F1	F1	

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N. ♂	N. ♀	LOCATION	COUNTRY	Age ♂	Age ♀	PARENTAGE {m/f} / {m/f}	GENERATION ♂	GENERATION ♀	REMARKS
87	547			35	13	{014/010} / {105/178}	F1	F2/F1	
681	560			13	13	founder / {371/103}	F0	F3-F2/F2-F3	
844	673			6	10	{337/317} / {313/330}	F2/F3 / F3	F2/F3 / F3-F4/F3	
857	835			6	6	{468/453} / {399/278}	F3/F2 / F2	F2 / F2/F3	
212	40			27	41	{152/153} / {034/035}	F1	F1	
80	518			36	14	{019/021} / {087/054}	F1	F1	
145	453			30	16	{131/132} / {286/153}	F1	F1	
	352				21	/ {086/104}		F2	
	600				12	/ {159/270}		F1	
	619				11	/ {297/115}		F3/F2	
	892				5	/ {223/725}		F2/F1	
	969				4	/ {145/276}		F2 / F2/F3	
	1044				2	{431/436} /		F1 / F3/F2	
	1048				2	{431/436} /		F1 / F3/F2	
977	1007	Riga Zoo	Letonia	3	3	{297/115} / {108/175}	F3/F2	F2/F3 / F2	
201	44	Schönbrunn Zoo	Austria	33	41	founder / {002/003}	F0	F1	
431	436	Tallinn Zoo	Estonia	21	17	founder / {180/274}	F0	F2/F1	
1090				1		{431/436} /	F1 / F3/F2		
294	292	Tier. Friedrichsfelde	Germany	23	23	{017/070} / {199/107}	F2	F1/F2	
437	503			17	15	{180/274} / {294/292}	F2/F1	F3 / F2/F3	
174	118	Tier. Goldau	Zwitzerland	29	32	{134/135} / {154/155}	F1	F1	
60	91			38	35	{034/035} / {005/006}	F1	F2	
	209	Walsrode	Germany		27	/ {150/151}		F1	

*Wild born descendant from released birds

MALE

FEMALE

[illegible]

Bearded Vulture EEP: results for 2020

Table 3: Breeding pairs and their results in 2020

COUNTRY	PAIR	LAY DATE	HATCH DATE
ARMENIA			
FPWC (CWR)	BG 828 x BG 826	1 st : 29 th Nov 2 nd : 02 nd Dec	Aborted (just before hatching) 26 th Jan (died 27 th Jan)
AUSTRIA			
Alpenzoo Innsbruck	BG 804240338 x BG 801371103	1 st : 17 th Jan	Broken (11 th Feb)
Tiergarten Schönbrunn	BG 201 x BG 044002003	1 st : 04 th Jan	27 th Feb
Richard Faust Zentrum	BG 108065040 x BG 175152153	1 st : 02 nd Dec 2 nd : ?08 th Dec	Infertile Infertile
	BG 017019021 x BG 070022023	1 st : 05 th Jan	Aborted
	BG 199 x BG 107150151	1 st : 06 th Jan	Infertile
	BG 594172290 x BG 006019020	1 st : 18 th Mar	Aborted (beginning incubation)
	BG 399159270 x BG 278065074	1 st : 27 th Dec	Aborted (just before hatching)
	BG 681 x BG 560371103	1 st : 30 th Jan	22 nd Mar (died 22 nd Mar)
BULGARIA			
Rescue Centre Green Balkans	BG 461199107 x BG 483108175	1 st : 15 th Jan 2 nd : 22 nd Jan	9 th Mar 16 th Mar
ESTONIA			
Tallinn Zoo	BG 431 x BG 436180274	1 st : 20 th Jan 2 nd : 29 th Feb	13 th Mar 23 rd Apr
FINLAND			
Helsinki Zoo	BG 788297115 x BG 281131132	1 st : 22 nd -23 rd Jan	Aborted (last incubation 1/3)
FRANCE			
Beauval Zoo	BG 763129482 x 635159270	1 st : ?28 th Jan 1 st : ?03 th Feb	24 th Mar (disappeared 31 st Mar) Infertile
Asters Breeding centre	BG 454 x BG 502	1 st : 20 th Dec 2 nd : 29 th Dec 3 rd : 03 rd Feb	Aborted Aborted 26 th Mar (disappeared 26 th Mar)
GERMANY			
Tierpark Friedrichsfelde Berlin	BG 294017070 x BG 292199107	1 st : 17 th Jan 2 nd : 24 th Jan	12 th Mar 15 th Mar
	BG 437180274 x BG 503294292	1 st : 16 th Feb 2 nd : 22 nd Feb	07 th Apr (died 15 th Apr) 12 th Apr (died 19 th Apr)

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Berlin Zoo	BG 298122118 x BG 320018272	1 st : 16 th Jan 2 nd : ? Jan	07 th Mar 14 th Mar (died 17 th Mar)
Nuremberg Zoo	BG 018019021 x BG 336201044	1 st : 23 rd Jan 2 nd : ?30 th Jan	Aborted (Beginning incubation) Disappeared (08 th Mar)
Frankfurt Zoo	BG 672337317 x BG 576108175	1 st : 16 th Feb	Broken (19 th Feb)
ITALY			
Centre Monticello (M. Albertini)	BG 234086104 x BG 397201044	1 st : 28 th Jan	22 nd Mar
Parco Natura Viva	BG 451108175 x BG 469018272	1 st : 19 th Jan 2 nd : 26 th Jan	12 th Mar Broken (24 th Feb fertile)
SERBIA			
Belgrade Zoo	BG 611199197 x BG 634034130	1 st : 01 st Feb	Infertile
SPAIN			
Centro de Cría Guadalentín	BG 313009006 x BG 330108119	1 st : 01 st Jan 2 nd : ?07 th Jan	22 nd Feb 28 th Feb
	BG 391124041 x BG 360018272	1 st : 20 th Jan 2 nd : 31 st Jan	13 th Mar Infertile
	BG 337201044 x BG 317017070	1 st : 09 th Feb 2 nd : 15 th Feb	02 nd Apr 09 th Apr
	BG 362080081 x BG 389199107	1 st : 18 st Dec 2 nd : 25 th Dec	Aborted (just before hatching) Infertile
	BG 410286153 x BG 290134135	1 st : 07 th Jan 2 nd : 12 th Jan 3 rd : 20 th Jan	Infertile 05 th Mar 12 th Mar
	BG 124131132 x BG329043040	1 st : 08 th Dec 2 nd : 14 th Dec	30 st Jan 05 th Feb
Centre de Fauna Vallcalent	BG 371105178 x BG 103065040	1 st : 31 st Dec 2 nd : 10 th Jan 3 rd : 23 rd Jan 4 th : 03 rd Feb	21 st Feb 03 rd Mar 15 th Mar 26 th Mar (died 05 th Apr)
	BG 327105178 x BG 398159270	1 st : 30 th Jan 2 nd : 08 th Feb	Infertile Infertile
	BG 297086104 x BG 115019021	1 st : 21 st Dec 2 nd : 08 th Jan 3 rd : 21 st Jan	11 th Feb Infertile 15 th Mar
Centre de Fauna Torreferrussa	BG 500 x BG 513009006	1 st : 03 rd Jan 2 nd : 20 th Jan	Infertile 11 th Mar

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SWITZERLAND

Breeding Centre Goldau/Rigi

BG 174134135 x 118154155

1st: 27th Dec

19th Feb (died by hatching)

BG 060034035 x BG 091005006

1st: 28th Dec

Infertile

BG 145131132 x BG 276199107

-

TS-REPUBLIC

Liberec Zoo

BG 180161162 x BG 274

1st: 21st Dec

Aborted

2nd: 30th Dec

Aborted (died during hatching)

BG 654108175 x BG 656180274

1st: 30th Dec

21st Feb

2nd: 07th Jan

Aborted (died during hatching)

Chomutov Zoo

BG 340018272 x BG 338134135

1st: 02nd Jan

Aborted

2nd: 08th Jan

02nd Mar (died 13th Mar)

Ostrava Zoo

BG 207017070 x BG 233122118

1st: ?26th Dec

Aborted (just before hatching)

2nd: ?05th Jan

25th Feb (died 17th Mar)

BG 325017070 x BG 322152153

1st: 28th Jan

20th Mar (died 23rd Mar)

Prague Zoo

BG 511108175 x BG 519105178

1st: 10th Jan

Infertile

RUSSIA

Novosibirsk Zoo

BG 1008 x BG 1009

1st: 23rd Jan

Infertile

Bearded Vulture EEP: results for 2020

Table 4. Destination Offspring in 2020

STUDBOOK	PARENTAGE	SEX	BREEDING	DESTINATION
BG 1052 ¹⁾	BG 826 x BG 828		FPWC	DIED
BG 1053	BG 124 x BG 329	m	CC Guadalentín	RELEASE (P.N. Castril, Andalusia, SPAIN)
BG 1054	BG 124 x BG 329	f	CC Guadalentín	RELEASE (P.N. Castril, Andalusia, SPAIN)
BG 1055	BG 297 x BG 115	f	CF Vallcalent	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1056 ²⁾	BG 174 x BG 118		Tierpark Goldau	DIED
BG 1057	BG 371 x BG 103	f	CF Vallcalent	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1058	BG 654 x BG 656	m	Liberec zoo	RELEASE (Léoux Valley, Baronnies, FRANCE)
BG 1059 ³⁾	BG 313 x BG 330	f	CC Guadalentín	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1060	BG 207 x BG 233		Ostrava zoo	DIED
BG 1061	BG 201 x BG 044	m	Schönbrunn zoo	RELEASE (Léoux Valley, Baronnies, FRANCE)
BG 1062	BG 313 x BG 330	m	CC Guadalentín	RELEASE (Vercors, FRANCE)
BG 1063	BG 371 x BG 103	f	CF Vallcalent	RELEASE (Vercors, FRANCE)
BG 1064 ⁴⁾	BG 340 x BG 338		Chomutov zoo	DIED
BG 1065	BG 410 x BG 290	m	CC Guadalentín	BREEDING (Prague zoo)
BG 1066	BG 298 x BG 320	m	Berlin zoo	BREEDING (Berlin zoo → Tierpark Goldau)
BG 1067	BG 461 x BG 483	f	Green Balkans	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1068	BG 500 x BG 513	m	Torreferrussa	RELEASE (Melchsee-Frutt, SWITZERLAND)
BG 1069	BG 451 x BG 469	f	Parco Natura Viva	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1070	BG 294 x BG 292	m	Tierpark Berlin	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1071	BG 410 x BG 290	f	CC Guadalentín	RELEASE (Melchsee-Frutt, SWITZERLAND)
BG 1072	BG 431 x BG 436	f	Tallinn zoo	BREEDING (Prague zoo)
BG 1073	BG 391 x BG 360	f	CC Guadalentín	RELEASE (P.N. Tinença, Valencia, SPAIN)
BG 1074 ⁵⁾	BG 722 x BG 723		Private M. Horstmann & B. Sloman	DIED (No EEP)
BG 1075 ⁶⁾	BG 298 x BG 320		Berlin zoo	DIED
BG 1076	BG 297 x BG 115	m	CF Vallcalent	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1077	BG 371 x BG 103	f	CF Vallcalent	RELEASE (P.N. Tinença, Valencia, SPAIN)
BG 1078	BG 461 x BG 483	m	Green Balkans	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1079	BG 294 x BG 292	f	Tierpark Berlin	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1080 ⁷⁾	BG 325 x BG 322		Ostrava zoo	DIED
BG 1081 ⁸⁾	BG 234 x BG 397		Monticello (Montowl)	DIED
BG 1082 ⁹⁾	BG 681 x BG 560		Richard-Faust-Zentrum	DIED
BG 1083 ¹⁰⁾	BG 763 x BG 635		Beauval zoo	DIED
BG 1084 ¹¹⁾	BG 454 x BG 502		Asters	DIED
BG 1085 ¹²⁾	BG 371 x BG 103		CF Vallcalent	DIED
BG 1086	BG 337 x BG 317	f	CC Guadalentín	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1087 ¹³⁾	BG 437 x BG 503		Tierpark Berlin	DIED
BG 1088	BG 337 x BG 317	f	CC Guadalentín	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1089 ¹⁴⁾	BG 437 x BG 503		Tierpark Berlin	DIED
BG 1090	BG 431 x BG 436	m	Tallinn zoo	BREEDING (Tallinn zoo → Richard-Faust-Zentrum)

1) removed from the nest because hatching problems. Died 10 hours after assisted hatch. Yolk sack still not reabsorbed.

2) died during hatching in the nest.

3) died 17 days after adoption. Only a leg could be found in the nest.

4) died in the nest with 12 days old. It had the whole beak, eyes and airways glued.

5) died 2 days old after assisted hatch. Yolk sack still not reabsorbed (no EEP).

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- 6) euthanasia with an age from 3 days because of extreme weakness. Assisted hatch because of hatching problems.
- 7) died with an age from 3 days. Nest hatched. In the morning only a leg could be found in the nest.
- 8) died during adoption with an age from 11 days. Male at the beginning showed interest for the chick. But afterwards showed more interest for the egg and killed the chick. Female was removed the day before from the aviary.
- 9) killed by the female during hatching.
- 10) disappeared from the nest with 7 days old.
- 11) killed by the male 35 minutes after returned it into the nest. Chick had hatching problems being necessary to remove it from the nest for ½ hour. After being returned into the nest the male immediately warmed it. 35 minutes later the male pulled up one leg from the chick
- 12) died with an age from 10 days. Suspicion yolk sack infection.
- 13) died with an age from 8 days. In the morning was found dead with lot of vomited food.
- 14) died with an age from 7 days. Disappeared during the night after adoption.