Bearded Vulture European Endangered Species Programme (EEP): Annual report 2021

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SUMMARY

One more year a high number of 25 chicks has been produced, reinforcing reintroduction projects. 44 Bearded Vulture laying pairs (one foster pair is included) laid 66 eggs, from which 31 hatched and 26 survived. From these 26 birds, 16 came from the specialized captive breeding centres (18 breeding pairs), and 10 from Zoos (25 breeding pairs).

A new record on chick's production could be stablished in Guadalentín: 10 produced juveniles.

A new record of released birds could be achieved. 23 Bearded Vultures (+ 1 wild recovered nestling from the Pyrenees) have been released in all 5 on-going reintroduction projects: seven (+1 wild nestling) in Andalusia, seven in the framework of the LIFE project GypConnect (five in Grands Causses and two in Vercors), four in the Alps (two in Switzerland and two in N.P. Berchtesgaden), two in Corsica and three in Maestrazgo, and three were added to the breeding network (three females).

Two nestlings died a few days after being released, due to intoxication with an EU approved disinfection product used to disinfect the transport crates, showing again that the species is very sensitive to drugs and any disinfection product.

Surprisingly, in this season 11 experienced pairs have not produced any chicks, and some have not even laid or produced only a single clutch. First signs of the ageing effect appear.

On the other hand, six new pairs have produced a chick (Puy du Fou, Beauval, Helsinki, and one pair in Asters, Guadalentín and RFZ respectively), three have laid a clutch for the first time (Novosibirsk, Parc Animalier des Pyrénées and one pair in Asters) and three have copulated (La Garenne, one pair in RFZ and Guadalentín respectively).

Six birds from the 11 previewed transfers have been transferred (three males and three females) between seven institutions with the goal to transfer two pairs and build three new breeding pairs.

In 2021, nine birds died (seven females and two males). Despite these high losses, it had low impact on the EEP, as only two females and one male were breeders or potential breeders. First time that a bird died showing a plasmodium infection.

First time that nestlings (Tallinn Zoo) couldn't be transferred at time to the release site (Andalusia) because of bird flu restrictions, being necessary to delay the release using acclimatization aviary.

To counteract the new infectious diseases that our birds are confronted with, due principally to climate change, Parc Animalier des Pyrénées started the construction of a new Bearded Vulture specialized breeding centre in the French Pyrenees, with the goal to have geographically an additional centre with the best climatological conditions for the species.

Thanks to the financial support from EEP zoos, other organizations, and European funds through LIFE projects, the VCF managed to establish an effective EEP coordination, which kept the specialized breeding centre Vallcalent in Catalonia open for 2021 - we thank you for your support, without this the future of the Bearded Vulture in Europe would look bleaker!

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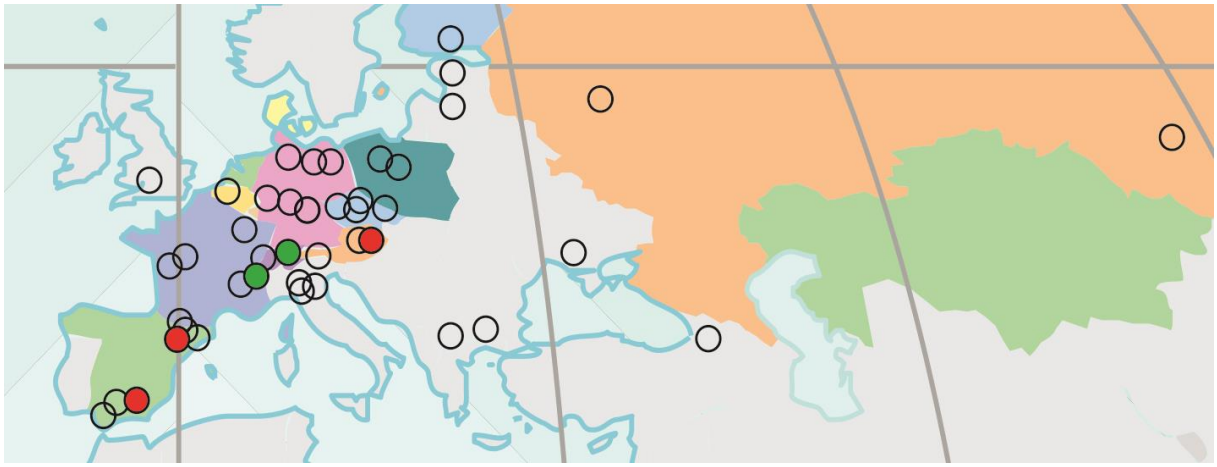
INTRODUCTION

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 2021, 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 173 birds. The VCF owns 88.4% of these (n= 153; 72 males & 81 females). From these 173 birds, 83 are males with an average age of 16.2 years old (range from 43 years to 2 years old) and 90 females with an average of 14.7 years old and with a range from 44 years to 1 year old (see table 1 & 2 in Annex).



The distribution of the captive stock over many Zoos lowers bulk risks, e.g. epidemic diseases (December 2021).

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 2021, 611 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 the captive breeding network (244) and for reintroduction projects in Europe (367): in the Alps (239), Andalucía (78), Grands Causses (30), Sardinia (3), Corsica (8), Maestrazgo (9).

BREEDING RESULTS 2021

In 2015 the barrier of 25 produced chicks was crossed and since then, it is being maintained. And so, it has also been in 2021, where 44 laying pairs laid 66 eggs and produced 26 fledglings. Additionally, five hatchlings died because of various reasons. One chick died 48 hours after assisted hatch. The chick showed hatching problems in the nest, and it was necessary to remove it. The chick was weak, and the yolk sack was still not absorbed. Three hatchlings died/disappeared a few hours after hatching, and the fifth died just before pecking the eggshell, due to aspiration of its own faeces in the air cell. From the produced 26 fledglings, 16 came from the specialized captive breeding centres (18 breeding pairs), and 10 from Zoos (25 breeding pairs). It is remarkable that 10 of these 26 chickens produced (38.5% of total chick production) were produced in the Guadalentín centre, setting a record on chick's production. This year, due to transport restrictions because of pandemic, Tallinn Zoo used again the Nest-Box rearing protocol to try to minimise human contact with the chicks during their rearing period.

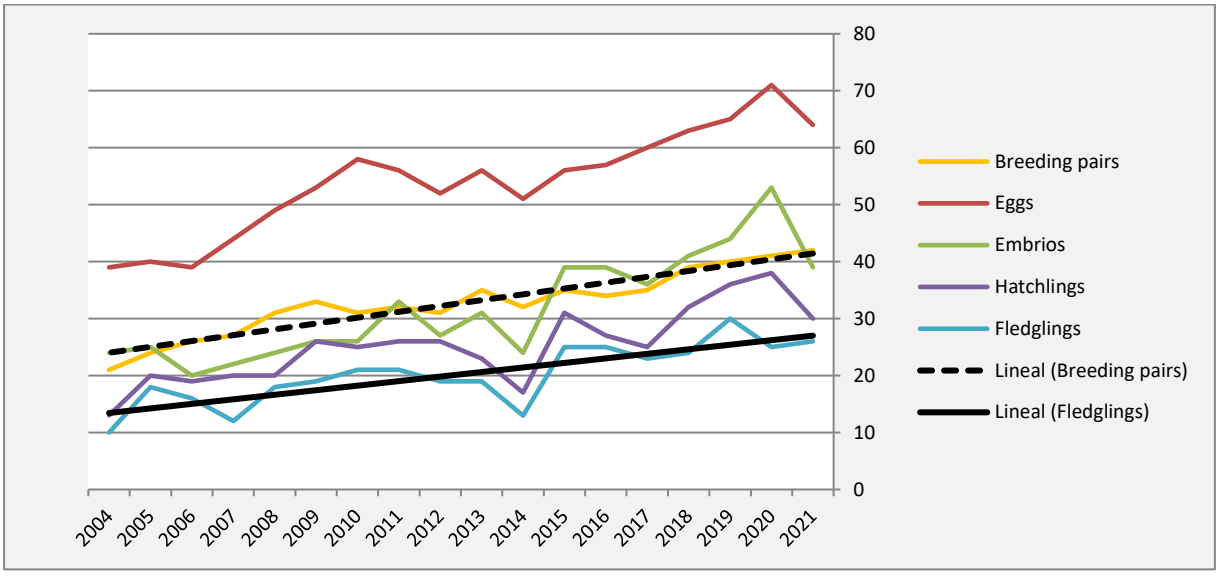
Being aware that the pandemic was still hampering our lives and negatively impacting our work, to ensure that all partners involved in the reintroduction projects could continue their in-situ conservation activities, it was determined that in 2021 releases should take priority over the breeding programme. Despite all the problems we had to face with the transport of nestlings from the different zoos/breeding centres to the release sites, crossing several countries, solving the specific restrictions established in each one of them, we were able to establish a new record of released birds. 23 Bearded Vultures could be released in all 5 on-going reintroduction projects: seven in Andalusia, seven in the framework of the LIFE project GypConnect (five in Grands Causses and two in Vercors), four in the Alps (two in Switzerland and two in N.P. Berchtesgaden), two in Corsica and three in Maestrazgo. This decision had a negative impact on the captive breeding network, since only three nestlings were added to the breeding network, not being able to mitigate the high loses that the captive breeding network suffered in 2021 (9 birds).

However, the decision that releases should take priority over the breeding programme could be taken because of the good EEP evolution observed during breeding, although several experienced couples failed in 2021. In 2021, 11 experienced pairs didn't produce a chick and several of them only laid a single clutch. Both breeding pairs from Tierpark Friedrichsfelde, the pair from Nuremberg and Parco Natura Viva pair laid a double clutch but didn't hatch. The young pair from Ostrava Zoo, the pair from Schönbrunn and from Chomutov, and one pair from Tierpark Goldau produced only a single clutch, but no chicks hatched. And two pairs in Richard Faust Zentrum and one pair in Vallcalent didn't lay. This dynamic was well reflected in the total number of eggs produced, 65 of the 71 produced in 2020 -with two more breeding pairs than in the previous cycle-, as old females produce single clutches and first-time females the same during their first reproducing years. This shows that in the coming years,

several experienced and quite old breeding females will stop laying fertile eggs, and we have faced with the first signs of the ageing effect appear in our breeding stock. 22 birds, which represents 12.6% of total captive population, are > 30 years old. 16 birds of these 22 are breeding birds and part from 10 breeding pairs, representing 23.3% of total breeding pairs in 2021 (44 breeding pairs).

On the other hand, a high number of new pairs started to reproduce in 2021, perfectly counteracting the failures of experienced breeding pairs. In 2021 six new pairs produced for the first time a chick (Puy du Fou, Beauval, Helsinki, and one pair in Asters, Guadalentín and RFZ respectively). Furthermore, three pairs laid a clutch for the first time (Novosibirsk, Parc Animalier des Pyrénées and one pair in Asters) and three new pairs started to mate during the breeding season (La Garenne, one pair in RFZ and Guadalentín respectively).

These numbers, shows that the Bearded Vulture EEP has a solid base and, even if several experienced couples fail, it has a positive trend, with forecasts for the coming years being very encouraging (see figure).



And finally, this solid basis is corroborated by their ability to additionally adopt chicks that have been recovered from the wild. At the beginning of April, in the Catalan Pyrenees a chick had to be removed from the nest, as one of the adults had disappeared, and because of its small size there was a danger that it would be predated. The chick was transferred to Vallcalent for its observation and once it was determined that the chick could be transferred, it was taken to Guadalentín for its adoption and afterwards released in Andalucía.

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 2020, is specialized in the reproduction with founder birds. Further RFZ was responsible to establish the guidelines for captive breeding of this species and to determine the best release method for Bearded Vultures.

In the breeding season 2020/21 was expected an increase on laying pairs, but unfortunately two experienced pairs didn't lay. On the other hand, a new pair laid, totalling five pairs with clutches. One of these five pairs, BG594 x BG006, is composed of a very old female with the goal to use it as foster pair, and a male that mate on

perches, but surprisingly last season on the 13th of February it could be observed for the first time a successful matting on the ground. In this season he started to mat successfully from the beginning. Other three pairs are experienced breeding pairs. One of them is the oldest breeding pair inside the EEP, BG017 x BG070 and until now has produced 38 fledglings. The fifth and last pair, BG468 x BG381, in 2019 they were paired for the first time but no signs of pair bonding or aggressions could be observed. The pair is composed by a male that after reproducing with success during the first four years with a female, suddenly they started to show aggressions between them breaking the clutches, being necessary in 2019 to break up definitively pair bonding. His actual female is an old bird coming from Riga Zoo. She was paired in Riga Zoo with a male that showed also mating problems.

The five pairs produced seven eggs. The egg from the very old foster female BG006 disappeared. The egg was extremely small on size and there was little chance that it would be viable. From the remaining six eggs 6 chicks hatched and five survived. The single egg from the old pair, BG017 x BG070 had to be removed on the 25th of February because there were no signs of hatching. At the same time the adoption of the chick BG1096 from single clutch of breeding pair BG199 x BG278 was carried out. The removed egg contained a chick, BG1101, that stuck in the egg-membrane with no chance for normal hatching. After assisted hatch and six days hand-rearing, the chick could be successful raised by a foster pair. It was the 39th descendant from the old pair! The remaining two pairs - one experienced pair, BG108 x BG175, and the new pair, BG468 x BG381- made a double clutch, and all four eggs were fertile. Unfortunately, the chick from the second egg of the new pair, disappeared during the night after hatching in the nest of foster pair BG594 x BG006.

In total five chicks could be produced in RFZ (3 males and 2 females). Because of genetic criteria, the female from the new pair has been included in the captive network and the remaining four nestlings have been used for reintroduction projects (3 in the framework of LIFE project GypConnect -2 in Grands Causes and 1 in Vercors-, and 1 in Corsica).

View of the Richard Faust Centre (Austria).

This season the foster pair, BG212 x BG040, for the second consecutive year did not lay, showing that the female is very old (41 years old), with little chance to produce a clutch and to be used as foster pair. In the two pair bonding that last year were tried, BG087 x BG547 and BG080 x BG518, several signs of pairing could be observed, and a six-year-old pair, started in 2021 to build nest, being necessary to wait one season more for a possible reproduction success of these three potential breeding pairs.

- Centro de Cría de Guadalentín (CCG)

The CCG, with a captive stock of 26 birds at the end of 2020, is the basis of the Andalusia Bearded Vulture reintroduction project. In addition to the six experienced breeding pairs, a seventh new pair formed by an experienced male and a young female, BG286 x BG580, produced a clutch. The seven pairs together produced 12 eggs, from which 10 were fertile and from all of them a chick could be reared with success. It has been a new record on number of chicks produced in one centre!

All chicks are hatched artificially in the brooder being the clutches removed a few days two weeks before hatching and exchanged with dummy eggs or receive a chick for adoption. Artificial incubation is carried out according to the protocol established for the species, one of its peculiarities is the exposition of the eggs four times a day for 5 minutes at an outside temperature (see picture above).

All 10 nestlings (3 males and 7 females) have been used for reintroduction projects (3 in Andalusia, 2 in Grands Causses in the framework of LIFE project GypConnect, 2 in Maestrazgo-Els Ports, 1 in Switzerland and 2 in N.P. Berchtesgaden, the new release site in the framework of the Alpine reintroduction project).

Three of the 10 hatched chicks in Guadalentín Breeding Centre during their 7 days hand rearing process.

Furthermore, in Guadalentín, as a centre specialized in double, triple and quadruple adoptions, this year again three additional chicks have been successfully adopted. One came from the Breeding Centre Asters. The second was a chick hatched in Centre de Fauna Vallcalent coming from an egg laid by the pair from Beauval Zoo (France). And the third and last chick, a 30-day old Pyrenean wild recovered nestling, where one of the adults of the pair had disappeared, leaving the nestling in the night without parental care. The descendant from Beauval Zoo, a female, was included in the EEP, as it was the first descendant from its founder father. The other two nestling were released in different projects. Asters' chick, a male, was released in Switzerland, and the Pyrenean nestling, also a male, released in Andalusia.

Left picture: *Transfer from Centre de Fauna Vallcalent to Guadalentín Breeding Centre of the three adopted chicks.* ***Right picture:*** *reception and hand-rearing process in Guadalentín. On the left BG 1119 from Asters, in the middle BG 1120 descendant from Beauval Zoo and on the right, BG 1121, the wild recovered Pyrenean chick.*

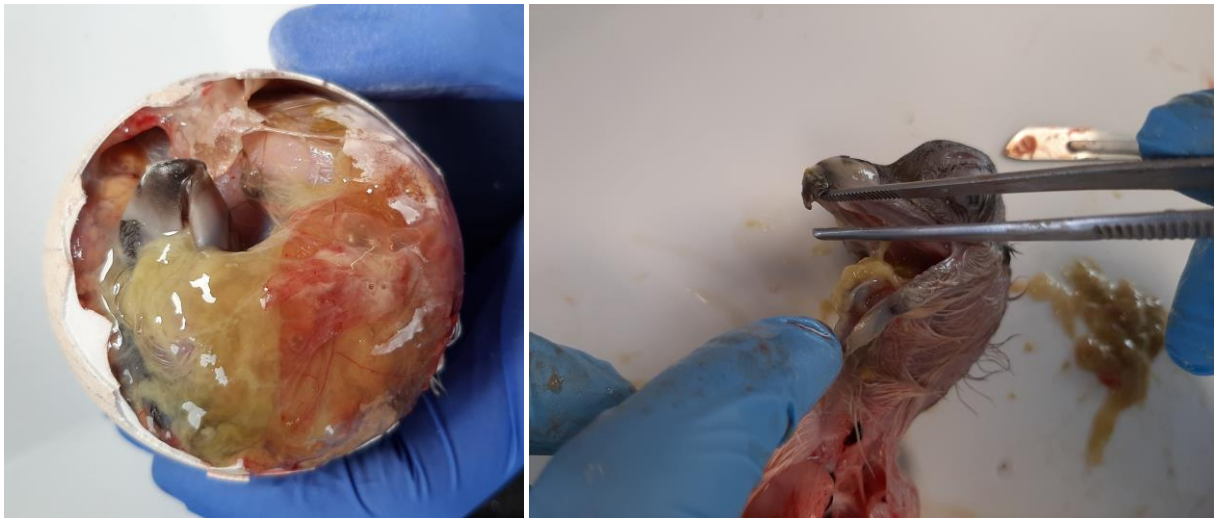
BG1103, the fourth chick hatched in the Guadalentín Breeding Centre in the 2020-21 breeding season.

And finally, the young pair BG590 x BG658 started to mate for the first time in this breeding season.

- 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). Furthermore, other objectives of this centre are to treat wild recovered injured birds and to conduct studies/analyses of new treatments as well as prophylaxis.

At the beginning of the breeding season, 12 birds were housed in CFV facilities (five of them are from the Pyrenees). Only one pair laid three eggs, from which only one was fertile, but unfortunately, the chick died after having done the internal pick. On the 3rd of March at 8:30h, four days before hatching date, the chick had already pecked the air cell but was not chirping. X-rays were done confirming its correct position; however, the whole day could never hear sounds of the chick. Likewise, by using the "Buddy devise" it could observe that the heard rates varied greatly. Nevertheless, as the hatching date was still four days away, it was decided not to intervene. Unfortunately, the following morning no movements could be registered. Immediately the egg was opened and it could be found that the beak was in the air cell but the whole head and beak were covered with meconium and remains of the egg contents. By the necropsy it could be confirmed that the chick died because of aspiration.



Left picture: *BG1105 by opening the egg. The whole head and beak were covered with meconium and remains of the egg contents.* ***Right picture:*** *by the necropsy meconium and remains of the egg contents could be found in chick's beak, trachea, and bronchi, confirming that the chick died because of aspiration.*

- 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 2020 the centre was keeping four pairs and a ninth recovered injured bird, that has been released in 2020 in Baronnies. Of the four pairs, three consisted of adults' birds and the fourth of a pair of juveniles. All three adult pairs laid (four eggs), but only two mate with success. The pair which didn't mate successfully, the male was from 2015, a subadult bird, which mate on perches near the female (born in 2010).

Of the two remaining pairs, the old pair, BG 454 x BG 502, laid a single clutch. After 44 days incubation, suddenly they started to incubate irregularly: the egg was removed from the bowl, and they laid in the empty bowl during different periods. As this anomalous situation was repeated several times over the next few days, it was finally decided to remove the clutch on the 3rd of January. The egg was completely rotten and smelled bad. The pair received dummy eggs which were immediately adopted.

The third pair, BG 700 x BG 627, which last season started to mate successfully on the 5th of February 2020 but didn't lay, this year from the beginning they mated with success and laid a double clutch. Both eggs showed to be fertile. Nest hatching was tried by the 1st egg without success. During the hatching process of BG1115 it seemedthat there were problems. On the 18th of March hatching process started at 12:38h, a hole in the egg-shell could be observed through the video camera. 14 hours later, at 2:30h, the chick hatched, but the adult only incubated the 2nd egg, leaving the hatchling out of the nest bowl. At 6:00h the male took the chick with its beak and moved beside of the nest bowl. Immediately the chick had been removed. The chick was already dead with blood on its head. Immediately the remaining egg was removed, and the pair received dummy eggs, which were immediately accepted and incubated. The chick from the 2nd egg, BG1119, hatched in the incubator on the 27th of March. Due to the doubt that one of the adults had not handled the first chick properly, it was decided to transport it to the CC Guadalentín for adoption (10th of April), previously passing through CF Vallcalent to pick up 2 additional chicks for adoption (see above point *Centro de Cría de Guadalentín (CCG)*). Four days later the chick was adopted by the foster pair BG337 x BG317 in the main nest, transferring previously the older nestling BG1113, who was in their charge, into the secondary nest.

The nestling BG1119, a male, has been released in Switzerland.

- Bearded Vulture Breeding Centre in Natur und Tierpark Goldau

At the end of 2020 the centre was keeping two pairs, and both laid a single clutch. Only the egg from the pair in the public exhibit aviary was fertile. Unfortunately, the hatchling died a few hours after hatching.

☞ **Summary** 18 laying pairs (included one foster pair) in the specialized captive breeding centres laid 28 eggs (1 egg from the foster pair included). From these 28 eggs, 20 chicks hatched and 16 fledged. From the 16 survived fledglings (7 males and 9 females), 15 have been released (1 in Vercors and 4 in Grands Causses -framework LIFE project GypConnect-, 3 in Andalusia, 2 in Switzerland, 2 in Maestrazgo, 2 in the new release side Berchtesgaden and 1 in Corsica) and 1 female was kept for the EEP. Furthermore, the wild recovered Pyrenean nestling has been released in Andalusia. And finally, two new pairs, one in RFZ and one in CCG, started to mate.

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.

During the breeding season 2021 zoos and recovery centres (Berlin Zoo, the young pair from Liberec Zoo, Ostrava, Beauval, Helsinki and Puy du Fou zoos had respectively 1 chick, Tallinn Zoo had 2 chicks, and the recovery centres Torreferrussa and Green Balkans produced 1 chick respectively) produced 10 fledglings (4 males and 6 females). Beauval, Helsinki, and Puy du Fou zoos produced for the 1st time a fledgling. Tallinn zoo, for the second consecutive year, due to difficulties in transferring the chicks for adoption to another centre, has been reared again following the Nest-Box protocol established in 2020 during the pandemic. On the other hand, in this season only one hatchling died. The pair from the Bear Recovery Centre (CWR) in Armenia, managed by the foundation FPWC, produced a double fertile clutch. The chick from the first egg died just before hatching. The chick from the second showed hatching problems, being necessary to remove it from the nest in the afternoon before getting dark and to extract it from the egg. Unfortunately, the chick died the following day at midday. The yolk sack was still not 100% reabsorbed.

In the case of the Puy du Fou pair, close collaboration between the Zoo staff and the EEP coordinator was necessary for the pair to successfully raise their first chick. It is well known that in the case of bearded vulture chicks it is them who take the food from their parents' beaks. This requires the adults to prepare the food in a size appropriate to the age of the chick and to hold it in the beak in the right way (head turned head slightly tilted to one side; see picture) so that the chick can pick it up. In unexperienced pairs, it can take several days before they learn to do it properly, which is too long for the chick to survive. This is why in unexperienced pairs, it usually takes several rearing seasons before they learn how to do it properly. In captivity, thanks to human intervention, this learning time can be reduced by supplementary feeding depending on the needs of the chick and how quickly the adults learn to feed the chick correctly. In the case of the Puy du Fou pair, weight checks were carried out daily during the first days and informed the coordinator, and depending on the weight, the coordinator determined the number of supplementary feedings the chick should receive and the quantity of each one. This required very close teamwork, in order to calculate the daily needs of the chick. The pair needed almost 10 days human support before they were able to feed the chick properly alone (see the table on the right for the process of supplementary feedings carried out).

BG 1122	Weight		Puy Du Fou
Date	Morning	Evening	supplementary feedings
12/04/2021		141	1
13/04/2021	136	137	2
14/04/2021		142	3
15/04/2021	141	147	3
16/04/2021			
17/04/2021		183	3
18/04/2021	181	214	3
19/04/2021	203	245	2
20/04/2021		255	2
21/04/2021	255	309	1
22/04/2021	313	373	
23/04/2021			
24/04/2021		490	
25/04/2021			
26/04/2021			
27/04/2021			
28/04/2021		603	

In the case of Beauval Zoo breeding pair, as last year they failed to rear the chick, it was agreed to remove the clutch just before hatching and transfer it to the Vallcalent centre for hatching in incubator. On the 26th of March the egg has been transferred by car by the team of the VCF from Vallcalent. Four days later, the chick hatched at

13:25h with human assistance. The weight was 145.7g. On the 10th of April, the chick, BG1120, was transferred together with two other chicks to Guadalentín Breeding Centre for adoption. The chick could be successful adopted 4 days later by foster female BG 330 in the main nest. The chick that was already reared by the female, BG 1116, was transferred to the secondary nest. It was a double adoption for the female.

Chick BG1120 from Zoo Parc de Beauval breeding pair. From left to right. Transfer of the egg by car by the team of the VCF from Vallcalent. Assisted hatch at Vallcalent Breeding Centre. One day old chick.

Both breeding pairs from Tierpark Friedrichsfelde Berlin, Alpenzoo Innsbruck, Belgrade, Chomutov, the old pairs from Liberec and Novosibirsk, Nuremberg, the young pair from Ostrava, Parco Natura Viva, Prague and Schönbrunn zoos failed to produce a young. The same with the breeding pair from the foundation FPWC (Armenia), where the chick died after hatching. Furthermore, on the 23rd of January, the pair of Frankfurt Zoo stopped to mate and did not lay because the aviary had to be covered with a netting, to prevent the entry of passerines due to avian influenza. On the other hand, the young pair from Novosibirsk Zoo, the pair from Pairi Daiza and the pair from Parc Animalier des Pyrénées produced a clutch for the first time, and mating was observed for the first time by the pair from La Garenne zoo.

- ☞ **Summary** 25 breeding pairs in the zoos/recovery centres laid 37 eggs. From the 37 eggs, 11 hatched and 10 offspring were successfully reared. From these 10 survived chicks (4 males and 6 females), eight have been released (1 in Vercors and 1 in Grands Causses in the framework LIFE project GypConnect, 1 in Corsica, 1 in Maestrazgo and 4 in Andalusia). The remaining two (2 females) have been kept for the EEP. Additionally, three pairs produced for the first time a fledgling, three new pairs produced their first clutch and finally, by one pair first time mating was observed.

- Private collections:

Only the pair from Monticello (Italy) private collection laid a single clutch. Unfortunately the embryo died in the middle of the incubation period.

In conclusion in 2021, 44 laying pairs (one foster pair is included) produced 66 eggs, from which 26 chicks survived from the 31 hatchlings (see Table 3 in Annex - Breeding pairs in 2021). From the remaining 26 nestlings, 23 have been released, and 3 were added to the breeding network (see Table 4 in Annex – Offspring in 2021).

Out of the 35 not hatched eggs, 6 broke unknowing the real status, 14 were infertile, 2 putrefied, 1 unknown (broken and disappeared in the nest) and 12 aborted.

One of our protagonists photographed by Hansruedi Weyrich.

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 2021 six birds from the 11 previewed transfers have been transferred (three males and three females) between seven institutions with the goal to transfer two pairs and build three new breeding pairs.

On the 29th of April Richard Faust Breeding Center received the adult male BG 327 from Centre de Fauna Vallcalent. This male originally came from Riga Zoo to Vallcalent with his partner to find out why all laid eggs were infertile. After two breeding seasons and changing female, it could definitively determine that the male was not able to jump on the back of both females for mating, even though both females were willing. He always mated close to the females on perches. The aim of his transfer is to pair him with a very old female, BG006, who was able to help a young male that copulated on perches, to learn how to perform copulation well.

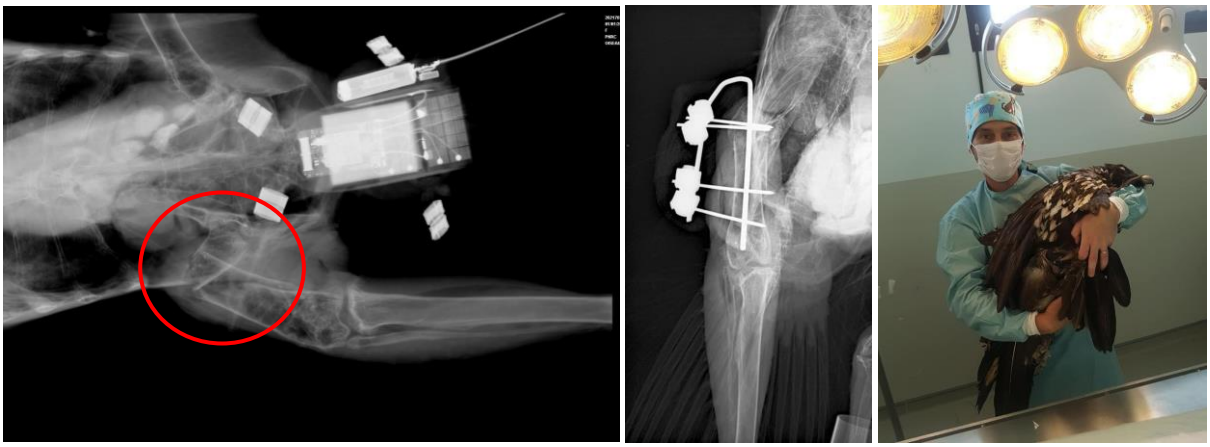
Tierpark Goldau received on the 21st of July the male BG1066 from Berlin Zoo and on the 23rd of June the female BG1028 from Guadalentín Breeding Centre (Spain) to build a new pair. Pair bonding was done on the 27th of July. Furthermore, Tierpark Goldau received the young female BG1106 from Helsinki zoo on the 25th of November.

And on the 25th of April Jerez Zoo received a young adult pair from Richard Faust Breeding Centre.

Increases:

In 2021 in addition to the three young females coming from the EEP, one bird reintroduced in Corsica has been recovered and included into the EEP.

The female released in Corsica (France), BG1096, named Spinella, suffered a femur fracture of its right leg and because of the extremely long period of recovery it has not been possible to re-release it again. The bird fledged from the hacking cave on the 29th of June and two days after several flights it moved to within 1.5 km of the hacking site. Since the 6th of July an adult wild bird was always with the fledgling, similar like it happened by the last release in 2019 when an adult adopted both released birds. On the 15th the bird had to be recovered as it was limping on one food. The X-rays showed that the bird had suffered a femur fracture.



The female "Spinella" released in Corsica suffered a femur fracture. Surgery was performed to fix the fracture with nails. The bird has been incorporated into the EEP because the extremely long rehabilitation period being impossible to re-release it again due to climate condition (already beginning winter).

Losses:

Nine birds died this year, four females in Richard Faust Breeding Centre (Austria), one male at the Tierpark Goldau (Switzerland), one female in Bear recovery centre in Armenia (CWR) from the FPWC foundation, a female at the Centre de Fauna de Vallcalent (Spain), one male at Córdoba Zoo (Spain) and one female in Novosibirsk Zoo. Four because of aspergillosis, two due to senility, one because of carcinoma, one mostly blind bird because of collision and one suffered from plasmodium and WNV infection. Although this is a high number of losses, it has a small impact on the EEP, as only one female from RFZ, the female from CWR and the male from the Cordoba Zoo were breeders or potential breeders. Nevertheless, West Nile Virus and aspergillosis infection continues to be one of the most serious problems for this species in captivity. Furthermore, this year for the first time Plasmodium could be detected in two birds inside the EEP. Both birds became sick and one of them died. The most relevant is that both tested serologically positive for West Nile Virus.

On the 5th of April, the 21 years old female BG352 died at the Richard Faust Breeding Centre because of a Cirrhotic squamous cell carcinoma. In 2006 the female located at Jerez Zoo started to show feather problems, losing the flight feathers during their growth. This problem recurred in the following years, and the cause of this feather loss could never be determined. In 2009 it was decided to change female and was transferred to Richard Faust Breeding Centre. The female was lifelong with this feather problem and never paired up.

On the 4th of Mai the 12 years old blind female BG600 died at the Richard Faust Breeding Centre because of collision with a perch. The bird, born in Almaty Zoo, arrived with 1.5 years old at RFZ, where it could be determined that the bird was almost blind. The day when she died was very windy and it is assumed that in one of her jumps, due to the wind, she was unable to control her distance and collided with the perch.

On the 1st of July 38.5 years old male BG060 died at Tierpark Goldau because of senile decay. This male has been paired with four different females, with whom he had six offspring, but none of them have been reared by him, as he always showed an aggressive behaviour against chicks, killing a seventh chick.

On the 13th of August, the 16 years old breeding female BG453 died in Richard Faust Breeding Centre because of aspergillosis. The female was paired with a male of her age, with whom there had always been frictions. They never harmonised well, often resulting in the death of the embryo, egg breakage or disappearance. Only one chick could be obtained from this female, as the chick hatched in the incubator and was reared by a foster male.

The founder breeding female BG828 from Bear recovery centre in Armenia (CWR- FPWC) died on the 14th of August on an aspergillosis infection. The female arrived at Yerevan Zoo in 2002 unknowing her age. She started to reproduce in 2015 and six offspring could be obtained from her. Unfortunately, none of her descendants could be included in the EEP, as the authorities from Armenia didn't allow to export them.

On the 20th of August the 41.5 years old female BG040 from Richard Faust Breeding Centre died because of senility. She was the first descendant from the old famous most successful breeding pair within the EEP of La Garenne zoo. During her lifespan she produced 43 eggs with two different males, from which 16 hatched and 12 survived. From these 12, 10 have been used for reintroduction projects and 2 included in the EEP.

On the 17th of October the 30-year-old female BG142 died CF Vallcalent (Spain) because of plasmodium infection (bird malaria). This female in all her lifespan has produced only a single chick, as most of her eggs were of poor quality. On the 14th of August the female showed a severe respiratory dyspnoea. The first suspicion was an aspergillosis infection, and she was treated for 21 days. The female recovered completely and started again to eat, to gain weight and breath normally. During the treatment, Plasmodium was detected in one of the many tests that were carried out and that she was additionally serology positive to West Nile virus infection. Within a month of her recovery, the female showed respiratory problems again. The same treatment against aspergillosis was done, but unfortunately the female died after a week. The big surprise of the necropsy was to find no alterations in the air sacs associated with an aspergillosis infection. A second female in CF Vallcalent BG398 also showed a dyspnoea but medium grade. Further, she was also serology positive to West Nile virus infection and plasmodium and was treated with success against aspergillosis. Once the necropsy of BG142 was done, immediately an air sacks endoscopy was done to BG398 and it could be determine that she was not suffering from an aspergillosis infection. This confirmed that the female BG142 become sick of a Plasmodium infection. It was the first time that Plasmodium has been detected within the EEP. It should be noted that both females were the last birds to join the captive stock of Vallcalent, and the first contact with the Nile virus probably weakened them, making them more susceptible to become ill with plasmodium.

On the 5th of November the founder female BG1009 from Novosibirsk Zoo died because of an aspergillosis infection. This wild female arrived in 2017 at Novosibirsk Zoo through Almaty Zoo, coming from Duschanbe Zoo. She was paired with a founder male and started laying in 2019. Unfortunately, the male was not able to mate properly with the female, having no descendants from this founder female.

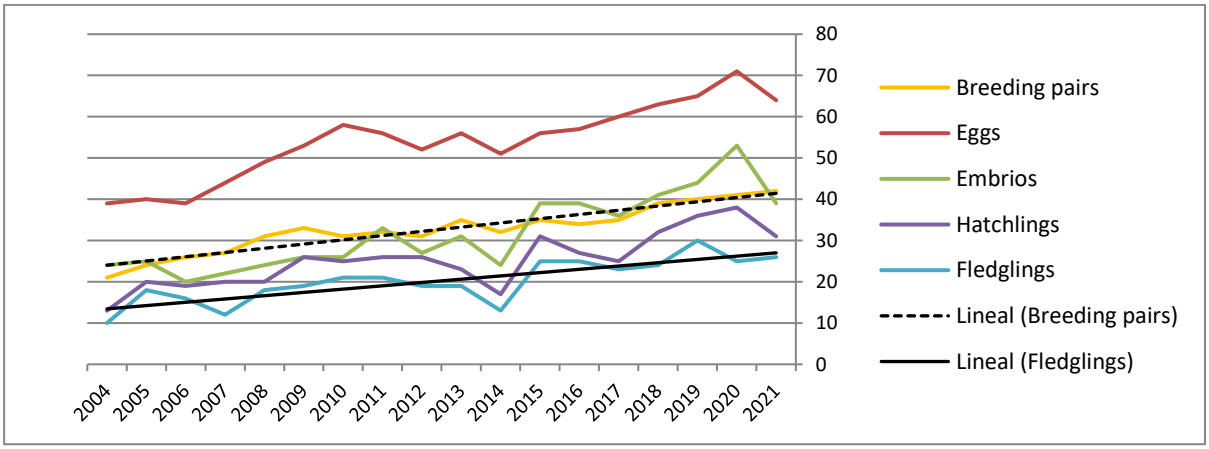
The last bird, BG846, died on the 7th of November. It's a six years old male from Córdoba zoo, which started last season with nest building and allopreening, and mutual feedings could be also observed. This bird also died of a chronic aspergillus spp. infection of air sacs and lungs.

STATUS BEARDED VULTURE EEP

On the 31st of December 2021, there were 173 birds included in the EEP. From them, 83 were males and 90 females. The average age between males and females is almost the same (16.2 and 14.7 years old respectively). This shows the existence of a high number of young specimens (<7 years old), what represents the 31.21% of the total captive population (25 males and 29 females). 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.

But, as it has been previously mentioned, during this breeding season, 11 experienced breeding pairs didn't produce a single fledgling and even some of them did not lay or had a single clutch. In contrast, 2021 was a record year for the number of new pairs that produced a chick for the first time. This dynamic was well reflected in the total number of eggs produced, 65 of the 71 produced in 2020 -with two more breeding pairs than in the previous cycle-, as old females produced single clutches just as first-time females during their first years. This shows that in the coming years, several experienced and quite old breeding females will stop laying fertile eggs.

On the other hand, the number of breeding pairs has increased continuously, thanks to the fact that every year a minimum number of produced fledglings have been included in the breeding programme, and this makes it feasible to replace old females that have stopped breeding and even increase the total number of breeding pairs. Consequently, the annual number of produced chicks has been positively affected, with a current number of 25 fledglings/year, and even with a record of 30 fledglings in 2019 (see graphic below).



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	2021	2022
High probability	Number	7	6	8	7	10	10	9
	clutch	6	5	8	7	10	10	9
	hatchling	2	1	4	5	5	5	3
	fledgling	1	0	2	3	1	2	?
Medium probability	Number	13	12	11	10	6	9	11
	clutch	3	2	3	5	0	4	2
	hatchling	1	1	0	0	0	3	0
	fledgling	1	1	0	0	0	3	?
Low probability	Number	5	8	8	8	10	16	9
	clutch	0	2	2	1	1	3	0
	hatchling	0	0	0	0	0	0	0
	fledgling	0	0	0	0	0	1	0
Total potentail pairs		**25**	**26**	**27**	**25**	**26**	**35**	**29**
N. pairs reaching sexual maturity in 1-2 years					10	10	3	6

On the other hand, the EEP was created as a basis for the reintroduction projects approved by the VCF/EEP, which entails a commitment on the part of the EEP to supply a minimum number of birds annually for all current projects. Nevertheless, the supply of birds for the projects must never jeopardize the future of the EEP and a balance has always been sought between both sides, giving priority to projects for some years and to the breeding programme for others. Following this dynamic, the number of birds included in the EEP during the period 2009-2021 was as follows:

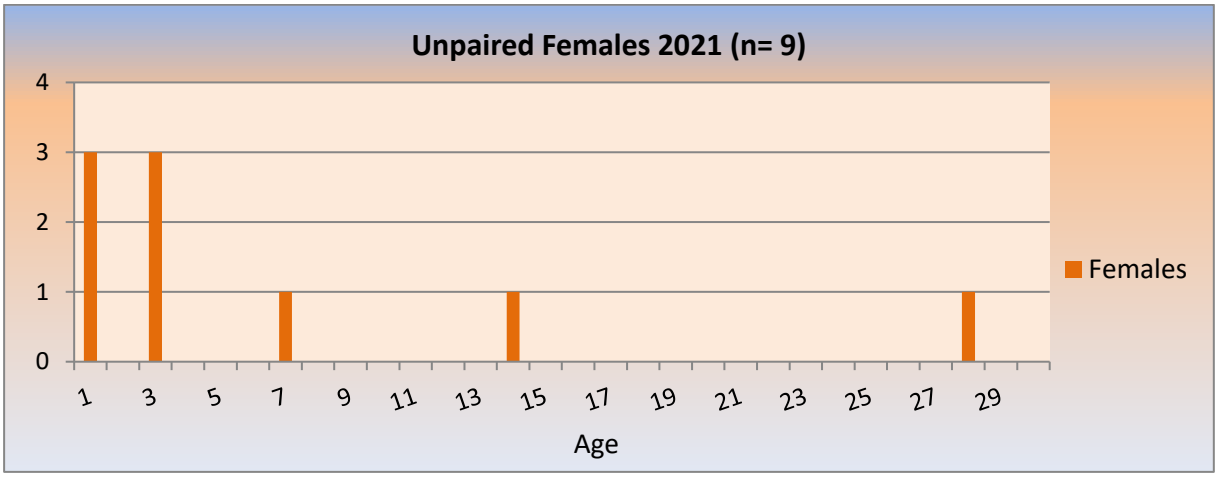
- During the EEP priority years, the average number of birds included in the breeding programme has been 10.29 individuals.
- During the reintroduction projects priority years, the average number of birds included in the breeding programme has been only 4.33 individuals, below the average number of individuals dying per year 5.07 birds, not being able to compensate the annual loss, and resulting in a negative deficit to the EEP.

Thanks to this dynamic incorporation of birds, the number of potential breeding pairs -including pairs which will arrive their sexual maturity in 1-2 years-, has been able to be maintained between 30-35 pairs, and the number of included birds into the EEP has been higher than the number of deaths (98 to 66 respectively; period 2009-2021). However, it should not be forgotten that the number of individuals from native European populations incorporated into the project has had a significant influence on the total number of birds incorporated into the EEP (10 birds; 10.2% of the total number of incorporations). However, half of them are handicapped individuals, putting in doubt on their ability to reproduce.

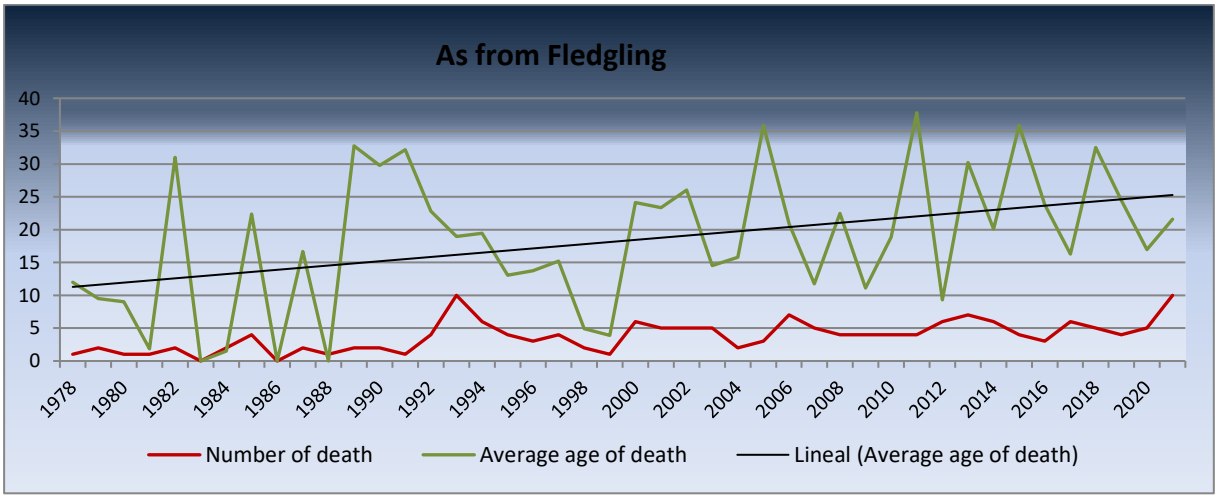
During the last two years, because of the Covid-19 restrictions, the priority to projects was further strengthened, releasing a higher number as the theoretical number assigned in a good breeding year (44 birds have been released instead the 34 agreed) and a few of them were descendants from new breeding pairs, completely against the established guidelines of the EEP. Therefore, no more than 9 birds have been included, and only 4

are males, from which two of them have a big question mark if they will be able to reproduce, with a great need to incorporate males in the coming years.

Particularly in 2021 only four birds have been included in the EEP and all four are females. On the one hand this has increased the sex imbalance inside the EEP in favour to females (see graphic below), and on the other hand, could not counteract the loses that the EEP has suffered during 2021 (n= 9 birds), neither to counteract average annual losses (5.07 birds/year). Under this scenario, if we don't want to jeopardize the future of the EEP, it will be necessary to pay special attention to the needs of the EEP.



And finally, 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 increased significantly, being nowadays similar to that of the specialized breeding centres (25.4 years old). Between 1978-2011, the average age of death at the zoos was 15,1 years (n= 69 dead birds). In contrast, between 2012-2021 the average has increased to 23,5 years (n= 33 dead birds). 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 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= 173 individuals in 2021).



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

NEW BREEDING CENTRES

The same as the previous year, during 2021, because of the pandemic consequences, no new zoos expressed their wish to join the Bearded Vulture EEP. Nevertheless, Parc Animalier des Pyrénées zoo was able to start to construct the new middle-large, specialized breeding centre. The centre is located 500m from the zoo, closed to the public, and with the goal to house descendants from less common bloodlines inside the EEP, since its location, in the middle of the French Pyrenees, ensures the best geographical/meteorological conditions for the species, free from aspergillosis and West Nile Virus infections, two very sensitive diseases for the species.

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

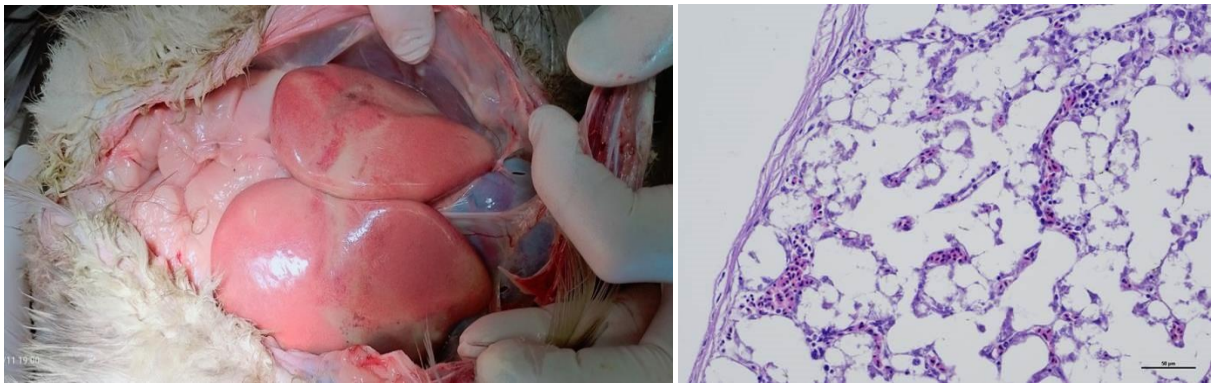
OUTLOOK / NEWS

DEATH OF TWO NESTLINGS AFTER TRANSPORT TO THE RELEASE SITE

The first release in 2021 it took place in Grands Causses on the 24th of April, where three nestlings were released, two coming from the RFZ centre. Both nestlings from RFZ died in a short time. One was killed by a predator (supposedly by a fox) after 5 days of being introduced in the hacking cave and the second 17 days after its release. At necropsy both specimens showed severe liver steatosis (see pictures below), which in the short term the predated bird would also have died within a few days due to hepatic pathology.

Immediately an attempt was made to determine the possible causes of steatosis in both birds. The first suspicion that a diet failure-intoxication could happened during their rearing was discarded, since both nestlings have been reared by different pairs/foster pairs, and the biochemical and haematological blood results of two additional younger nestlings still in their rearing process in the centre showed no alterations.

After consulting with the Department of Pathology of the Veterinary University of Vienna, Prof. Dr. Dr. Martin Reifinger, it was confirmed that a high-grade fatty degeneration of the liver due an intoxication can occur **"within a few hours"** (e.g. in case of phosphorus poisoning).



Necropsy and pathohistological section of the liver of one of the dead nestlings coming from Richard Faust Zentrum and released in Grands Causses (France) with a liver steatosis.

As intoxication was the only cause of this hepatopathy, the international transport company that has already transported several Bearded Vultures through Europe was consulted on how the process of disinfection of the carriers was performed in this case. Our surprise was that the creates were disinfected a few hours before the nestlings were collected, due to the fact that before the creates were used to transport other bird species. Both nestlings were kept almost for 3 days in these freshly disinfected carriers, giving them the possibility of inhaling continuously the disinfecting product. The enterprise has immediately excluded this product from its list of disinfection products. We must emphasize that the used product is an EU approved disinfection product used to disinfect the transport crates.

This experience shows us again how sensitive Bearded Vultures are to drugs and any disinfection products. That's why we always advise not to use disinfection products to clean carriers/rooms where our birds must remain locked up, especially if they could not be rinsed carefully with water. For this reason, we recommend cleaning the carriers with a simple dishwasher and then rinsing with plenty of water.

AVIAN INFLUENZA AFFECTS THE RELEASE SCHEDULE OF BIRDS

In 2021 the last two nestlings coming from Tallinn Zoo could not be transferred at time to the release site in Andalusia, because of the death of a waterfowl in Tallinn Zoo due to avian influenza. Fortunately, no other cases occurred in the following days and the waterfowl exhibit enclosure is located far away from the vulture's installation and with a closed roof, being impossible that birds could move to the vultures.

Consequently, birds could not be moved until they had passed quarantine and tested negative on avian flu after the quarantine period, being necessary to delay the release. Since one of them would arrive at the age when he could already fly, it was necessary to quickly change the method of release and to release them by acclimatization aviary.

The release team from Andalusia rapidly constructed an acclimatization aviary adapted to the circumstances, where the nestlings could never see the keepers when they were being fed, installing a feeding tube where daily food could be offered to the birds. Further, to avoid fights between the nestling the aviary had to be divided in two but giving visual contact between them to ensure social contact. And additionally, to give them a soft release experience, a remote device was installed giving the team the possibility to open the cage without having to access to it. All was done in a record time and the birds could be released with success and currently they are

flying in the mountains from the Natural Park of Cazorla, Segura y Las Villas. Congratulations to our Andalusian team!

The Andalusian monitoring team installing the acclimatisation cage for the release of the two birds from Tallinn Zoo. The nestlings could not be transferred in time to join the hacking cave due to the outbreak of avian influenza at the zoo, making it necessary to postpone the release and use the acclimatisation cage as the release method (pictures from the Junta de Andalucía).

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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Facebook https://www.facebook.com/vultureconservationfoundation
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ANNEX I

Table 1: EEP stock and its distribution as on 31st December 2021

N. ♂	N. ♀	LOCATION	COUNTRY	Age ♂	Age ♀	PARENTAGE {m/f} / {m/f}	GENERATION ♂	GENERATION ♀	REMARKS
1024	982	Aachen zoo	Germany	3	4	{500/513} / {410/290}	F1 / F2/F3	F2	
753	653	Acad. Puy du Fou	France	9	11	{371/103} / {124/041}	F3/F2 / F2/F3	F2	
912	889	Amnéville Zoo	France	6	6	{461/483} / {286/153}	F2/F3 / F3-F4/ F3	F1	
454	502	ASTERS	France	17	16	{108/175} / {179/281}	F2/F3 / F2	F2	
700	622			10	12	{286/153} / {371/103}	F1	F3-F2/F2-F3	
860	627			7	12	{500/513} / {371/103}	F1 / F2/F3	F3-F2/F2-F3	
1039	1045			3	3	{681/560} / founder	F1 / F4-F3/F3-F4	F0	
1061				2		{201/044}	F1/F2		
763	635	Beauval Zoo	France	9	12	{129/481} / {159/270}	F3/F1	F1	
611	634	Beozoo	Serbia	12	12	{199/107} / {034/130}	F1/F2	F1/F2	
298	320	Berlin Zoo	Germany	24	23	{122/108} / {018/272}	F2	F2	
124	329	CC Guadalentín	Spain	32	23	{131/132} / {043/040}	F1	F1	
286	580			32	13	founder / {201/044}	F0	F1/F2	
313	330			23	23	{009/006} / {108/119}	F1/F2	F2-F3/F2	
337	317			23	23	{201/044} / {017/070}	F1/F2	F2	
362	389			22	20	{080/081} / {199/107}	F2	F1/F2	
391	360			20	22	{124/041} / {018/272}	F2	F2	
410	290			19	24	{286/153} / {134/135}	F1	F1	
590	658			13	11	{223/329} / {199/107}	F2/F3	F1/F2	
947	908			5	6	{223/725} / founder	F2/F1	F0	
1006	987			4	4	{681/560} / {500/513}	F1 / F4-F3/F3-F4	F1 / F2/F3	
973*	1010*			5	4	{GT099/493} / GT099/493}	?/ F2/F3	?/ F2/F3	Feather problems
1050	911			3	6	founder / {431/436}	F0	F1 / F3/F2	
	976				4	/ {362/389}		F3 / F2/F3	Cataracts
	1120				1	/ {763/635}		F4/F2 / F2	
500	513	CF Torreferrussa	Spain	16	15	founder / {009/006}	F0	F1/F2	
297	115	CF Vallcalent	Spain	24	33	{086/104} / {019/021}	F2	F1	
371	456			21	17	{105/178} / {286/153}	F2/F1	F1	
551	398			14	20	founder / {159/270}	F0	F1	
652	680			13	13	founder / founder	F0	F0	
972				5		founder /	F0		
368				22		{159/270} /	F1		Handraised
1091	588			3	13	founder / {371/103}	F0	F3-F2/F2-F3	

Bearded Vulture EEP: results for 2021

N. ♂	N. ♀	LOCATION	COUNTRY	Age ♂	Age ♀	PARENTAGE {m/f} / {m/f}	GENERATION ♂	GENERATION ♀	REMARKS
340	338	Chomutov Zoo	Czech Rep.	23	23	{018/272} / {134/135}	F2	F1	
	859	Córdoba Zoo	Spain		7	/ {018/336}		F2 / F2/F3	
826		FPWC - CWR	Armenia	22?		founder /	F0		
978				4		{826/828}	F1		sex unknown
672	576	Frankfurt Zoo	Germany	11	13	{337/317} / {108/175}	F2/F3 / F3	F2/F3 / F2	
788	281	Helsinky Zoo	Finland	8	25	{297/115} / {131/132}	F3/F2	F1	
804	801	Alp. Innsbruck	Austria	8	8	{340/338} / {371/103}	F3/F2	F3-F2/F2-F3	
847	829	La Garenne Zoo	Zwitzerland	7	7	{313/330} / {108/175}	F2/F3 / F3-F4/F3	F2/F3 / F2	
180	274	Liberec Zoo	Czech Rep.	37	36	{161/162} / founder	F1	F0	
654	656			11	11	{108/175} / {180/274}	F2/F3 / F2	F2/F1	
662	668	MónNatura	Spain	11	11	{371/103} / {172/290}	F3/F2 / F2/F3	F2/F3 / F2	
748	832	Moscow Zoo	Rusia	9	7	{108/175} / {180/274}	F2/F3 / F2	F2/F1	
	726	Nikolaev Zoo	Ucraina		14	/ founder		F0	
744	657	Novosibirsk Zoo	Rusia	26	11	founder / {223/329}	F0	F2/F3	
1008				23		founder /	F0		
18	336	Nuremberg Zoo	Germany	43	23	{019/021} / {201/044}	1	F1/F2	
993	896	Oasi Sant' Alessio	Italy	4	6	{199/107} / {399/278}	F1/F2	F2 / F2/F3	
325	322	Ostrava Zoo	Czech Rep.	23	23	{017/070} / {152/153}	F2	F1	
207	233			28	27	{017/070} / {122/118}	F2	F2	
850	747	P. Animalier Pyrénées	France	7	9	{223/725} / {286/153}	F2/F1	F1	
894	598	Parc des Oiseaux	France	6	13	{286/153} / {145/276}	F1	F2 / F2/F3	
664	659	Parc Pairi Daiza	Belgium	11	11	{391/360 / {017/070	F3	F2	
451	469	Parco Nat. Viva	Italy	17	17	{108/175} / {018/272}	F2/F3 / F2	F2	
914	903	Plock Zoo	Poland	6	6	{461/483} / {174/118}	F2/F3 / F3/F4 / F3	F2	
328	561	Posen Zoo	Poland	23	14	{080/081} / {313/330}	F1	F2/F3 / F3-F4/F3	
511	519	Prague Zoo	Czech Rep.	15	15	{002/003} / {105/178}	F1	F2/F1	
1065	1072			2	2	{410/290} / {431/436}	F2	F1 / F3/F2	
234	397	Priv. Montowl	Italy	27	20	{086/104} / {201/044}	F2	F1/F2	
830	620			7	12	{034/130} / {172/290}	F1/F2	F2/F3 / F2	
591	724	Priv. B. Sloman	England	13	12	{080/081} / {722/723}	F1	F2	
461	483	RC Green Balkans	Bulgaria	17	16	{199/107} / {108/175}	F1/F2	F2/F3 / F2	
1035	956			3	5	{654/656} / {174/118}	F3/F4 / F3 / F3/F2	F2	
1034	999			3	4	{399/278} / {340/338}	F2 / F2/F3	F3/F2	

Bearded Vulture EEP: results for 2021

N. ♂	N. ♀	LOCATION	COUNTRY	Age ♂	Age ♀	PARENTAGE {m/f} / {m/f}	GENERATION ♂	GENERATION ♀	REMARKS
17	70	Richard Faust Center	Austria	43	38	{019/021} / {022/023}	F1	F1	
108	175			33	30	{065/040} / {152/153}	F1/F2	F1	
199	107			36	34	founder / {150/151}	F0	F1	
594	892			13	6	{172/290} / {223/725}	F2/F3 / F2	F2/F1	
399	278		Austria	20	25	{159/270} / {065/074}	F1	F1/F2	
468	381			17	21	{223/132} / {159/270}	F2/F1	F1	
87	547			36	14	{014/010} / {105/178}	F1	F2/F1	
681	560			14	14	founder / {371/103}	F0	F3-F2/F2-F3	
857	835			7	7	{468/453} / {399/278}	F3/F2 / F2	F2 / F2/F3	
212	619			28	12	{152/153} / {297/115}	F1	F3/F2	
80	518			37	15	{019/021} / {087/054}	F1	F1	
145				31		{131/132} /	F1		
327	6			23	44	{105/178} / {019/020}	F2/F1	F1	
	969				5	/ {145/276}		F2 / F2/F3	
	1020				3	/ {180/274}		F2/F1	
	1044				3	/ {431/436}		F1 / F3/F2	
	1048				3	/ {431/436}		F1 / F3/F2	
	1108				1	/ {468/381}		F3/F2 / F2	
977	1007	Riga Zoo	Letonia	4	4	{297/115} / {108/175}	F3/F2	F2/F3 / F2	
201	44	Schönbrunn Zoo	Austria	34	42	founder / {002/003}	F0	F1	
431	436	Tallinn Zoo	Estonia	22	18	founder / {180/274}	F0	F2/F1	
1090				2		{431/436} /	F1 / F3/F2		
294	292	Tier. Friedrichsfelde	Germany	24	24	{017070} / {199/107}	F1	F1/F2	
437	503			18	16	{180/274} / {294/292}	F2/F1	F3 / F2/F3	
174	118	Tier.Goldau	Zwitzerland	30	33	{134/135} / {154/155}	F1	F1	
	91				36	/ {005/006}		F2	
	1106				1	/ {788/281}		F4/F3 / F2	
1066	1028			2	3	{298/320} / {371/103}	F3	F3-F2/F2-F3	
	209	Walsrode	Germany		28	/ {150/151}		F1	
844	673	Zoobotanic Jerez		7	10	{337/317} / {313/330}	F2/F3 / F3	F2/F3 / F3-F4/F3	
	1096	Recovery Centre Corsica	France		1	/ {399/278}		F2 / F2/F3	

**Wild born descendant from released birds*

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Table 2: Age distribution of bearded vulnerables within the EEP as on 31st December 2021

minimum age

* founder

MALE								FEMALE						
						44	6							
				17	18	43								
						42	44							
						41								
						40								
						39								
						38	70							
				80	180	37								
				87	199*	36	274*	91						
						35								
					201*	34	107							
					108	33	118	115						
				124	286*	32								
					145	31								
					174	30	175							
						29								
				207	212	28	209							
					234	27	233							
					744*	26								
						25	281	278						
			294	297	298	24	292	290						
313	325	327	328	337	340	1008*	23	338	336	330	329	322	320	317
			362	368	431*	826*	22	360						
						371	21	381						
					391	399	20	398	397	389				
						410	19							
						437	18	436						
			451	454	461	468	17	456	469					
						500*	16	503	502	483				
						511	15	519	518	513				
					551*	681*	14	726*	561	560	547			
			590	591	594	652*	13	680*	598	588	580	576		
						611	12	724	635	634	627	622	620	619
			654	662	664	672	11	673	668	659	658	657	656	653
						700	10							
				748	753	763	9	747						
					788	804	8	801						
	830	844	847	850	857	860	7	859	835	832	829			
				894	912	914	6	911	908*	903	896	892	889	
				947	972*	973	5	969	956					
				977	993	1006	4	1010	1007	999	987	982	978	976
1024	1034	1035	1039	1050*	1091*	3	1048	1045*	1044	1028	1020			
		1061	1065	1066	1090	2	1072							
						1	1120	1108	1106	1096				

Table 3: Breeding pairs and their results in 2021

COUNTRY	PAIR	LAY DATE	HATCH DATE
ARMENIA			
FPWC (CWR)	BG 828 x BG 826	1st: 29th Nov 2nd: 02nd Dec	21st Jan (23rd died) Aborted
AUSTRIA			
Alpenzoo Innsbruck	BG 804240338 x BG 801371103	1st: 16th Jan	Aborted (0.5cm embryo)
Tiergarten Schönbrunn	BG 201 x BG 044002003	1st: 04th Jan	Infertile
Richard Faust Zentrum	BG 594172290 x BG006019020	1st: 04th Jan	Infertile (13th Mar disappeared)
	BG 108065040 x BG 175152153	1st: 30nd Nov 2nd: ?06th Dec	23rd Jan 01st Feb
	BG 017019021 x BG 070022023	1st: 03rd Jan	25th Feb
	BG 399159270 x BG 278065074	1st: 22nd Dec	16th Feb
	BG 468223132 x BG 381159270	1st: 14th Jan 2nd: 20th Jan	07th Mar 15th Mar (disappeared 16th Mar)
BELGIUM			
Pairi Daiza	BG664391360 x BG659017070	1st: ?in Mar	Infertile
BULGARIA			
Rescue Centre Green Balkans	BG 461199107 x BG 483108175	1st: 30th Dec	20th Feb
ESTONIA			
Tallinn Zoo	BG 431 x BG 436180274	1st: 02nd Feb 2nd: 17th Mar	26th Mar 09th May
FINLAND			
Helsinki Zoo	BG 788297115 x BG 281131132	1st: 09th-11th Feb	05th Mar
FRANCE			
Beauval Zoo	BG 763129482 x 635159270	1st: 06th Feb	30th Mar
Asters Breeding centre	BG 454108175 x BG 502179281	1st: 17th Dec	Putrefied
	BG 700286153 x BG 627371103	1st: 23rd Jan 2nd: 02nd Feb	19th Mar (died after hatching) 27th Mar
	BG 860500513 x BG 622371103	1st: 09th Jan	Putrefied (26th Feb exploited)
Parc Animaliers des Pyrénées	BG 850223725 x BG 747286153	1st: 02nd Jan 2nd: 10th Jan	Infertile Broken (27th Jan)
Puy du Fou	BG 753371103 x BG653124041	1st: 20th Feb	10th Apr

GERMANY			
Tierpark Friedrichsfelde Berlin	BG 294017070 x BG 292199107	1st: 08th Feb	Aborted
		2nd: 15th Feb	Aborted
	BG 437180274 x BG 503294292	1st: 18th-20th Jan	Broken
		2nd: 25th Jan	Broken/Infertile
Berlin Zoo	BG 298122118 x BG 320018272	1st: 14th Jan	?06th Mar
Nuremberg Zoo	BG 018019021 x BG 336201044	1st: 07th-08th Jan	Broken
		2nd: 17th Jan	Aborted (just before hatching)
ITALY			
Centre Monticello (M. Albertini)	BG 234086104 x BG 397201044	1st: 10th Feb	Aborted
Parco Natura Viva	BG 451108175 x BG 469018272	1st: 09th Jan	Broken (30th Jan)
		2nd: 15th Jan	Broken (30th Jan)
RUSSIA			
Novosibirsk Zoo	BG 1008 x BG 1009	1st: 10th Jan	Infertile
		2nd: 18th Jan	Infertile
	BG 744 x BG 657223329	1st: 31st Jan	Aborted (end of incubation period)
SERBIA			
Belgrade Zoo	BG 611199197 x BG 634034130	1st: 24th Feb	Infertile (laid on the ground)
SPAIN			
Centro de Cría Guadalentín	BG 286 x BG 580201044	1st: 29Th Jan	24th Mar
	BG 313009006 x BG 330108119	1st: 20th Jan	14th Mar
		2nd: 27th Jan	21st Mar
	BG 391124041 x BG 360018272	1st: 03rd Jan	26th Feb
		2nd: 10th Jan	04th Mar
	BG 337201044 x BG 317017070	1st: 11th Jan	04th Mar
		2nd: 17th Jan	11th Mar
	BG 362080081 x BG 389199107	1st: 01st Jan	24th Feb
	BG 410286153 x BG 290134135	1st: 02nd Jan	Infertile
		2nd: 10th Jan	06th Mar
		3rd: 19th Jan	Infertile
	BG 124131132 x BG329043040	1st: 07th Dec	29th Jan
Centre de Fauna Vallcalent	BG 297086104 x BG 115019021	1st: 17th Dec	Infertile
		2nd: 25th Dec	Infertile
		3rd: 12th Jan	Aborted (internal pick done)

Centre de Fauna Torreferrussa	BG 500 x BG 513009006	1st: 31st Dec 2nd: 06Th Jan	23rd Feb Putrefied
SWITZERLAND			
Breeding Centre Goldau/Rigi	BG 174134135 x 118154155	1st: 30th Dec	19th Feb (died a few hours old)
	BG 060034035 x BG 091005006	1st: 10th Jan	Infertile
TS-REPUBLIC			
Liberec Zoo	BG 180161162 x BG 274	1st: 08th Dec 2nd: 16th Dec	Aborted (20th Jan already aborted) Aborted (20th Jan already aborted)
	BG 654108175 x BG 656180274	1st: 07th Jan 2nd: 15th Jan	Aborted 09th Mar
Chomutov Zoo	BG 340018272 x BG 338134135	1st: 28th Dec	Infertile
Ostrava Zoo	BG 207017070 x BG 233122118	1st: 06Th Jan 2nd: ?12th Jan	Aborted (just before hatching) 08th Mar
	BG 325017070 x BG 322152153	1st: 13th dec	20th Mar ((just before hatching)
Prague Zoo	BG 511108175 x BG 519105178	1st: 12th Jan	Infertile

Table 4. Destination Offspring in 2021

STUDBOOK	PARENTAGE	SEX	BREEDING	DESTINATION
BG 1092 1)	BG 826 x BG 828		FPWC	DIED
BG 1093	BG 108 x BG 175	m	RFZ	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1094	BG 124 x BG 329	f	CC Guadalentín	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1095	BG 108 x BG 175	m	RFZ	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1096	BG 399 x BG 278	f	RFZ	RELEASE (Niolo Valley, Corsica, FRANCE)
BG 1097 2)	BG 174 x BG 118		Tierpark Goldau	DIED
BG 1098	BG 461 x BG 483	m	Green Balkans	RELEASE (Vercors, FRANCE)
BG 1099	BG 500 x BG 513	f	Torreferrussa	RELEASE (Niolo Valley, Corsica, FRANCE)
BG 1100	BG 362 x BG 389	f	CC Guadalentín	RELEASE (Guadalentín, Andalusia, SPAIN)
BG1101	BG 017 x BG 070	m	RFZ	RELEASE (Vercors, FRANCE)
BG 1102	BG 391 x BG 360	m	CC Guadalentín	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1103	BG 337 x BG 317	m	CC Guadalentín	RELEASE (P.N. Tinença, Valencia, SPAIN)
BG 1104	BG 391 x BG 360	f	CC Guadalentín	RELEASE (P.N. Tinença, Valencia, SPAIN)
BG 1105 3)	BG 297 x BG 115		CF Vallcalent	DIED
BG 1106	BG 788 x BG 281	f	Helsinki zoo	**BREEDING** (Tierpark Goldau)
BG 1107	BG 410 x BG 290	f	CC Guadalentín	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1108	BG 468 x BG 381	f	RFZ	**BREEDING** (RFZ)
BG 1109	BG 207 x BG 233	f	Ostrava zoo	RELEASE (P.N. Tinença, Valencia, SPAIN)
BG 1110	BG 654 x BG 656	f	Liberec zoo	RELEASE (Castril, Andalusia, SPAIN)
BG 1111	BG 398 x BG 320	m	Berlin Zoo	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1112	BG 337 x BG 317	f	CC Guadalentín	RELEASE (NP Berchtesgaden, GERMANY)
BG 1113	BG 313 x BG 330	f	CC Guadalentín	RELEASE (NP Berchtesgaden, GERMANY)
BG 1114 4)	BG 468 x BG 381		RFZ	DIED
BG 1115 5)	BG 700 x BG 627		Asters	DIED
BG 1116	BG 313 x BG 330	m	CC Guadalentín	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1117	BG 285 x BG 580	f	CC Guadalentín	RELEASE (Melchsee-Frutt, SWITZERLAND)
BG 1118	BG 431 x BG 436	m	Tallinn zoo	RELEASE (Guadalentín, Andalusia, SPAIN)
BG 1119	BG 700 x BG 627	m	Asters	RELEASE (Melchsee-Frutt, SWITZERLAND)
BG 1120	BG 763 x BG 635	f	Beauval zoo	**BREEDING** (CC Guadalentín)
BG 1121*	wild	m	Pyrenees	RELEASE (Castril, Andalusia, SPAIN)
BG 1122	BG 753 x BG 653	f	Puy du Fou	RELEASE (Aveyron, Grands Causses, FRANCE)
BG 1123	BG 431 x BG 436	m	Tallinn zoo	RELEASE (Guadalentín, Andalusia, SPAIN)

1) removed from the nest because hatching problems. Died 48 hours after assisted hatch. Yolk sack still not reabsorbed.
2) died a few hours after hatching in the nest.
3) died in the air cell because of meconium aspiration.
4) disappeared during the night by foster pair (1 day old). Two days before pecked egg adopted by foster pair.
5) died 4 hours after hatching. Male didn't take care of the chick. Continued only incubating the 2nd egg, leaving the hatchling out of the nest bowl during the night.
** Wild recovered nestling from the Pyrenees. One of the adults disappeared being necessary to remove and rear it inside the EEP.*