Reason for Hope

Reintroduction of the Northern Bald Ibis in Europe

ANNUAL REPORT 2020

Nest on the Mount Georgenberg, Kuchl, Region Salzburg 2020 (J Fritz)

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1. COVID19-PANDEMIC

Photo 1 *Northern Bald Ibises in Überlingen (Photo Rudolf Beck)*

Also for us, the year 2020 was marked by the pandemic. In March 2020, we took the decision to cancel the planned hand-raising and human-led migration due to the lockdown and the associated restrictions. The second major restriction concerned the colony in Überlingen. The first breeding there was cancelled because during the lockdown we were unable to complete the necessary infrastructure.

The colonies in Burghausen and Kuchl were barely affected by the restrictions, as they are already largely independent. In autumn, we were able to continue the establishment of the fourth breeding colony, the one in Rosegg, by releasing young birds equipped with transmitters.

Tab. 1 *Demographic development 2020 of the four breeding colonies; BGH: Burghausen; ÜBLG: Überlingen. Lambda >1 Increase in population size, Lambda <1 decrease.*

	Kuchl	BGH	ÜBLG	Rosegg	SUM
Initital stock	38	38	51	15	**142**
Increase	14	13	0	0	**27**
Release	0	0	0	42	**42**
Losses	10	12	13	18	**53**
Final stock	42	39	38	39	**158**
Lambda	*1,11*	*1,03*	*0,75*	*2,60*	*1,11*

[1] ***Böhm et al. (2020) The Northern Bald Ibis Geronticus eremita: History, current status, and future perspectives***. Oryx, 1-13. DOI: https://doi.org/10.1017/S0030605320000198

Overall, the balance for the pandemic year is thoroughly positive, despite all the limitations. The two independent breeding colonies Burghausen and Kuchl have grown autonomously and the population as a whole has increased.

2. DEMOGRAPHY

The population grew from 142 to 158 wild migrating individuals in 2020, consisting of four breeding colonies with a common winter site in Tuscany (Tab.1).

27 fledglings in 9 nests fledged in the two breeding areas Burghausen and Kuchl, of which 24 individuals belong to the first wild generation (F1) and 3 individuals to the second (F2). The reproduction rate in 2020 was better than ever before with 3.00 fledged young birds per nest (Tab.2).

Tab. 2 *Reproduction 2020 in the breeding areas of Kuchl and Burghausen (BGH); the reproduction rate is the mean number of fledged young birds per nest.*

	Kuchl	BGH	SUM
Nests	5	4	9
Fledglings	14	13	27
Reproduction rate	*2,80*	*3,25*	*3,00*

Tab.3 shows the reproduction data of different Northern Bald Ibis populations in comparison (according to Boehm et al. 2020[1]). According to this, the mean reproduction rate of our population for the period 2008-2019 was 2.15 and was thus only surpassed by the sedentary colony of the Rosegg Zoo.

Photo 2 *Breeding at Georgenberg in Kuchl (Photo J Fritz)*

The proportion of nestlings fledging is correspondingly high at 83%; for the Moroccan wild population this proportion is 47%. We attribute these good reproduction values in particular to the high quality of the feeding habitats in the breeding areas.

Due to the failed human-led migration, the reintroduction was limited to 42 young birds from the Rosegg Zoo, which were integrated into the colony.

Tab. 3 *Reproduction rates of different Northern Bald Ibis populations; Data according to Böhm et al. (2020; footnote [1]).*

Population, state (periode)	Type of population	Reproduction rate
Waldrappteam **, EU (2008-2019)**	**release migratory**	**2.15 (± 0.70)**
Rosegg, AUT (2005-2016)[2]	semi-wild, managed	2.24 (± 0.32)
Proyecto Eremita , ESP (2008-2018)	release sedentary	0.97 (± 0.49)
Birecik, Türkei (2006-2018)	semi-wild, managed	1.53 (± 0.20)
Palmyra, Syrien (2002-2012)	wild migratory	1.38 (± 1.13)
KLF[1], AUT (2001-2016)	semi-wild, managed	1.25 (± 0.54)
Morocco total (2006-2018)	wild sedentary	1.23 (± 0.31)

1 Konrad-Lorenz research station, core facility University of Vienna.
2 Date from 2012 and 2013 were excluded due to brood control.

[2] Drenske et al. (in prep.) Halfway to self-sustainability: *Reintroduced migratory European Northern Bald Ibises still need management interventions for population viability.*

Last year, 51 birds from our population died. This is 36% of the population at year's beginning and represents a lower loss rate compared to the LIFE+ period 2014-2019 (mean 50%). For 47% of the birds, the cause of death remained unknown. The causes of death in the known cases are shown in Fig.1. Electrocution was the most common cause of death with 45%, which is exactly the same as the mean during the LIFE+ project. In contrast, losses due to illegal bird hunting in Italy were 28%, well above the mean of 17% during the LIFE+ project period.

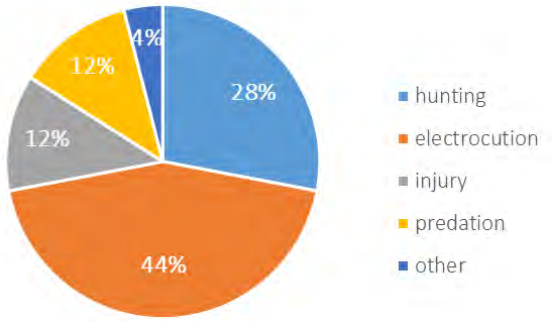

Fig. 1 *Mortality 2020. In 24 cases (47%) the cause of death is unknown.*

Lambda describes the development of the population or colony, where a value >1 means an increase and a value <1 a decrease of the population. The lambda values are shown in Tab.1. Both colonies Burghausen and Kuchl increased due to their own offspring. In Überlingen, the population decreased as a direct consequence of the pandemic, as hand-raising failed and the colony also had no breeding opportunities due to the pandemic. In Rosegg, we could register a strong colony growth due to the reintroduction. Overall, Lambda is slightly positive for the total population.

Monitoring and management of the wild birds was carried out by Daniela Trobe, Corinna Esterer and Anne-Gabriela Schmalstieg, Oliver Habel, Ursula Lindorfer and numerous volunteers.

3. Breeding colony Burghausen & Kuchl

In Burghausen, 13 young birds grew up in 4 nests. Monitoring was carried out by means of GPS transmitters. Public relations work was largely suspended this season due to the pandemic.

In Kuchl, 14 young birds grew up in 5 nests. In the previous year, two nests with chicks and parent birds were transferred from the artificial breeding wall to a niche in the rock face of the Georgenberg in order to induce their colonisation. If possible, further nest transfers were planned for 2020. To everyone's surprise, this was not necessary, as all the birds without exception bred in the rock face. The artificial rock niches were deserted.

Photo 3 *Oliver Habel and Corinna Esterer marking the young birds (Photo J Fritz)*

In the two colonies, all ibises were permanently in free flight and were not fed.

4. Breeding colony Überlingen

Photo 4 *Northern Bald Ibises in the breeding site of Überlingen (Photo Rainer Killelmann)*

After Sonic, the first Northern Bald Ibis of the Überlingen colony, to return to its breeding area in 2019, we expected the return of sexually mature birds and the first brood in 2020. This would have happened. However, the lockdown in March prevented the completion of the breeding facility in Überlingen, which is required for the start-up of the breeding colony. A total of 16 subadult and adult birds from Überlingen returned to their breeding area and then stayed mainly in the foothills of the Swiss Alps.

The female from Überlingen, Sonic, was migrating north for the second time in 2020, when she died of electrocution on an unsecured medium-voltage pylon in Graubünden's Beverin Nature Park on 19 April. The bird had already gained notoriety in Switzerland and the incident caused quite a stir. As a result, the dangerous pylons in the nature park should be secured.

A major presentation of the project was planned for 2020 as part of the Überlingen State Garden Show, but this could not take place due to the pandemic. However, the birds caused quite a stir in the region.

5. Breeding colony Rosegg

In 2018, the first two young birds from Rosegg were integrated into the wild colony. One of them, the male Phebe, already returned as a subadult bird from the wintering area to its breeding area in Carinthia in May 2020. In October he separated from the colony again and flew south. It then spent the winter 2020/21 in northern Italy. We assume that Phebe will also return to Carinthia in 2021 and become the founder of another migrating colony.

As started in the previous year, also in 2020 a total of 42 young birds from the sedentary colony of the zoo Rosegg in Carinthia were equipped with GPS transmitters in autumn and stayed outside of the aviary. They were socialised with experienced adult birds of the wild population in order to follow them into the wintering site.

6. Migration & GPS Tracking

In spring, 30 birds migrated to Burghausen and Kuchl, 16 birds to Überlingen, which is a surprisingly large number, and for the first time also one bird to Rosegg (Tab. 4).

In autumn, migration was again considerably delayed. In the end, a total of 37 birds migrated independently back to the wintering site. Another 37 birds had to be captured due to an approaching winter onset and transferred to Tuscany. 26 birds wintered in different regions of northern Italy.

Tab. 4 *Migration 2020*

	BGH & Kuchl	ÜBLG	Rosegg
Spring migration	30	16	1
Group size autumn	49	16	43
Autumn migration in Tuscany	14	14	9
Transfer in Tuscany	25	2	10
Wintering in Northern Italy	4	0	22

Autumn migration continues to be challenging for the project. We assume that the high temperatures and the resulting good food availability until late autumn cause these delays.

Photo 5 *Autumnal aggregation of ibises in Tyrol (Photo Daniela Trobe)*

We will implement various measures in the colonies north of the Alps from 2021 onwards to promote an earlier start of autumn migration. In addition, a colony will be established south of the Alps in Bussolengo starting in 2022, which will provide breeding opportunities for the transferred birds if, as mature birds, they do not master the return flight across the Alps to their breeding sites.

We consider the wintering of part of the population in northern Italy as a natural process promoted by climate change.

Photo 6 *Sign for the protection of the assembled ibises, erected on the initiative of the municipality of Kirchdorf in Tyrol. (Photo Gemeinde Kirchdorf).*

The majority of the young birds have been equipped with GPS transmitters. Thus, monitoring of the entire population during migration flights continues to be possible. All data is transferred to the App Animal Tracker. Numerous people use this possibility to follow the birds on their flights.

The GPS transmitters are now exclusively attached to the lower back using a leg-loop harness. Since then, there have been no more cases of eye opacity in our population. The data on the so-called unilateral corneal opacity, which we discovered in our birds in 2016/17 and which we were able to attribute to the transmitter, have been published in the meantime (Fritz et. al 2020[3]).

Photo 7 *Young bird with GPS transmitter (Photo Daniela Trobe)*

[3] Fritz et al. 2020. *Biologging is suspect to cause corneal opacity in two populations of wild living Northern Bald Ibises*. Avian Research 11:38, 1-9; DOI: 10.1186/s40657-020-00223-8

We are further engaged in the field of biologging, among other things we are investigating the aerodynamic costs of the GPS transmitters on the birds' backs in the wind tunnel (see chapter 10).

7. Illegal hunting

After the losses due to illegal hunting could be reduced to 17% (or 31% of the losses in Italy) during the period of the LIFE+ project, last year the rate increased again to 28%. 2020 illegal shooting also increased for other species.

It can be assumed that the increase in this environmental crime is related to the pandemic. Bird hunting in Italy is one of those regional "leisure activities" that have increased considerably due to the travel restrictions, which has also resulted in an increase in illegal shooting. In addition, the capacity and possibility for police patrols has been reduced by the pandemic.

It is hoped that the increase in shooting is a temporary phenomenon. All shootings have been reported and we are supporting and pushing the investigations as far as possible.

8. Public & Media Relation

Visitor support at the project sites and presentations at events were largely cancelled due to the pandemic restrictions.

Planned media productions in the context of human-led migration had to be postponed until 2021. Nevertheless, 9 TV productions were realised, mostly in the breeding sites of Burghausen and Kuchl as well as in the wind tunnel in Seekirchen.

Among others:

Terra X - Aus Liebe zum Leben: Artenschutz; ZDF 2020: https://www.zdf.de/dokumentation/terra-x/dirk-steffens-aus-liebe-zum-leben-artenschutz-100.html

Burg zu Burghausen: Ein Zuhause für die Waldrappen; Servus TV 2020: https://www.servustv.com/videos/aa-21bmrybqw1w12/

P.M. Wissen: Wie überlebt der Waldrapp-Vogel?; Servus TV 2020: https://www.pm-wissen.com/videos/aa-24mur9f6s1w12/

For the final report of the LIFE+ project, we evaluated the public relations and media presence. In the period 2014 to 2019, 994 articles were published about the project, 59 TV and cinema features were produced and 33 scientific articles were published (Tab.5). 1.3 MIO people attended various project presentations. (Tab.5).

Tab. 5 *Public and media relation LIFE+ 2014-2019.*

	articles	TV productions	press releases	public talks	scientific papers
2014	167	4	9	10	7
2015	224	9	14	7	6
2016	142	7	15	8	7
2017	161	9	10	9	5
2018	150	13	8	9	2
2019	150	17	6	5	6
total	**994**	**59**	**62**	**48**	**33**

9. HABITAT EVALUATION

Photo 8 *Observation of ibises in the breeding area Kuchl; from the left Evelyne Seppi, Katharina Huchler, Helena Wehner; in the foreground Team BBC Natural History (Photo J Fritz).*

In 2020, extensive data collection took place in the breeding areas of Burghausen and Kuchl. In Burghausen, in particular we recorded habitat use. For this purpose, ecological, physical and agricultural parameters were collected on the agricultural areas used by the birds and on reference plots. In Kuchl, the birds' foraging behaviour was surveyed and a previously collected data set was supplemented.

The data are currently being evaluated. In addition, a species distribution model for the northern Alpine foothills is to be created in combination with remote sensing data in order to identify suitable habitats for the Northern Bald Ibis.

The collection of the data and the analysis is carried out by Helena Wehner, Katharina Huchler, Evelyne Seppi and Tegan Jarvis (Univ. of Wolverhampton), in cooperation with the ornithological station of Sempach and Andreas Klingler from the Forschungsanstalt Raumberg-Gumpenstein.

10. Research Wind Tunnel

Photo 9 *Flight training in the wind tunnel, Seekirchen am Wallersee, Land Salzburg; Frederik Amann and Katharina Neugebauer (Photo J Fritz)*

The research project started in 2018, financed by the Austrian Science Fund (FWF P30620-BBL), will continue. For this data were collected in Seekirchen am Wallersee, Land Salzburg. In 2019, the FH Joanneum Graz installed a wind tunnel in a former shed as part of a cooperation. Four Northern Bald Ibises from the Zurich Zoo were raised by Frederik Amann and Katharina Neugebauer and trained for flight in the wind tunnel.

In 2020, the relationship between heart rate and energy consumption was studied in the wind tunnel as part of Ortal Rewald's PhD.

This was followed by another data collection on an applied question. This was about the aerodynamic costs caused by GPS devices attached to the birds' backs. The heart rate of the birds during flight in the wind tunnel was compared when they wore a cuboid or an aerodynamically optimised housing on their backs.

At the end of the season, the four birds were integrated into the temporary free-flying sedentary colony at Rosegg Zoo.

Data collection was done by Katharina Neugebauer, Frederik Amann and Ortal Rewald, with support from Herwig Grogger, Bernhard Völkl, Michael Makovec, Paul Ackerl and others.

11. Scientific Publication

Fritz J, Eberhard B, Esterer C, Goenner B, Trobe D, Unsöld M, Voelkl B, Wehner H & Scope A (2020) Biologging is suspect to cause corneal opacity in two populations of wild living Northern Bald Ibises. Avian Research; https://avianres.biomedcentral.com/articles/10.1186/s40657-020-00223-8.

Böhm C, Bowden CG, Seddon PJ, Hatipoglu T, Oubrou W, el Bekkay M, Quevedo MA, Fritz J, Yeniyurt C, Lopez JW, Orueta JF, Frigerio D, Unsöld M, (2020) The Northern Bald Ibis Geronticus eremita: History, current status, and future perspectives. Oryx, 1-13. DOI: https://doi.org/10.1017/S0030605320000198.

Böhm C, Fritz J, Asmus J (2020): Koordination und Kooperation von Zoo- und Freilandarbeit bis zur Wiederansiedlung: vier Fallbeispiele. In: Wildvogelhaltung (W Lantermann & J Asmus Eds.). Springer Verlag GmbH.

Fritz J & Janák J (subm.) How human intervention and climate change shaped the fate of the Northern Bald Ibis from ancient Egypt to the presence: an interdisciplinary approach to extinction and recovery of an iconic bird species. bioRxiv pre-print doi: https://doi.org/10.1101/2020.11.25.397570.

Drenske et al. (subm.) Ready for rewilding? Reintroduced Northern Bald Ibis (Geronticus eremita) still need management interventions for critical survival.

Grogger H, Gossar M, Makovec M, Fritz J, Voelkl B, Neugebauer K, Amann F. (subm.) A low-cost wind tunnel for bird flight experiments.

Huchler K, Wehner H, Fritz J, et al. (in prep.) Assessing the foraging habitat of breeding Northern Bald Ibises (Geronticus eremita) in the wild with resource selection functions.

Wehner H, Huchler K, Fritz J, et al. (in prep.) Suitable Foraging Areas for the endangered Northern Bald Ibis (Geronticus eremita) in Switzerland.

Wehner H, Fritz J, & Voelkl B. (in prep.) Soaring and intermittent flap-gliding during migratory flights of Northern Bald Ibis.

Wirtz et al. (subm.) SNP discovery and genetic mapping for the critically endangered Northern Bald Ibis (Geronticus eremita).

PARTNER & SUPPORTERS 2020*

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* For reasons of data protection, only an extract of persons and institutions is mentioned.

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Photo 10 *Sunbathing ibises (Photo Rudolf Beck)*