



INTERNATIONAL  
BEARDED VULTURE  
MONITORING

Annual report 2021

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International Bearded Vulture Monitoring - IBM





# Imprint

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**Author**

Mirco Lauper

**Version**

27/06/2022

**Recommended form of citation**

Lauper, M. (2022): Annual Report 2021 - International Bearded Vulture Monitoring (IBM); ed. Vulture Conservation Foundation. pp 1-45.

**Contact**

[ibm@4vultures.org](mailto:ibm@4vultures.org)

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# 1 The IBM & its administration

The international Bearded Vulture monitoring (IBM) is an expanding international network to coordinate the monitoring activities for European Bearded Vulture populations, to unify and manage data collections in a shared database (IBM-database) and to discuss conservation strategies and priorities for this species on an international level.

In 2021 the IBM comprised 19 IBM-partners and 3 associated organisations. The lead partner was the Vulture Conservation Foundation (VCF) and the IBM-database was managed by Mirco Lauper and Katja Rauchenstein, while additional administrative and coordinating work was carried out by Franziska Lörcher and José Tavares. These costs, as well as the costs for rings, database hosting, database upgrade etc. were covered by a budget of 43'618 Euros. The budget was financed by the fee of each IBM-partner and additional funds from MAVVA and a Swiss foundation, which for the fifth consecutive year allowed to reduce the partner fee substantially, from 3'000 Euros to currently 1'600 Euros for partners which are releasing birds and 800 Euros for the other partners. Other supporting contributions were made by LBV, Parco Natura Viva and the Arca foundation.

In order to inform the IBM-partners about important news, the latest observations and the development of the Bearded Vulture reproduction in the wild, 10 short reports *IBM Update & Reminder* were sent out in 2021. Collective decisions and discussion were held during the steering committee meetings by phone in April and September 2021, as well as at the physical SC-meeting in November 2021.

## 2 Summary

24 Bearded Vultures have been released at 7 sites in France, Spain, Switzerland and, for the first time ever in Germany. In the Alpine range, 2 birds have been released in Berchtesgaden (GER), 2 in Vercors (FRA) and 2 in Melchsee-Frutt (CHE). Another 5 birds have been released in the Massif Central and 2 on Corsica in France. In Spain, 3 birds have been released in Maestrazgo and 8 in Parque Natural de Cazorla in Andalusia.

With 44 successful reproductions in the Alpine range, a new breeding record has been set in this year. Out of a total of 75 occupied territories, breeding attempts were reported from 61 nests, with productivity varying considerably from region to region: 79% in the central, 67% in the south-western, 61% in the north-western and 17% in the Eastern Alps (overall 65%). Additionally, first breeding activity has been reported from 5 territories (NordOstTessin (CHE), Bourg-Saint-Maurice-2 (FRA), Sardières (FRA), Sondrio (ITA) and Ötztal (AUT)) in this year.

On Corsica, where only 2 out of 4 known territories were occupied, no breeding success was reported in 2021.

In the Massif Central, nesting behaviour from two released male birds (Layrou and Adonis) has been observed for the fourth consecutive year in the first occupied territory in this area.

In 2021, a new ringing system with coloured aluminium rings has been implemented and should simplify the identification of birds. Black, blue and green rings on the right leg are only used in even years, where red, orange and purple are used in the odd years. Same as in the previous years, all released birds have been individually marked with bleached feather patterns and GPS-tags in order to follow their life history and spatial behaviour. Furthermore, 6 wild hatchlings were marked with rings and GPS-tags in Italy (Friday for Flying, Severino-Zebbru), France (Sunny) and Spain (Boni, Lopezosa, Capitel). In total, movements of 71 Bearded Vultures (16 wild-hatched and 56 released birds) were followed by GPS-tracking and stored in the WildlifeMonitor in 2021.

Over the year, the IBM-network documented more than 1'970 Bearded Vulture observations from 7 different countries in Europe (AUT, BEL, CHE, DEU, FRA, ITA, NDL) in the IBM-database. 29% of these observations deliver valuable information on the life history of 58 individuals (12 of them wild-hatched). Combining this information with the evidence from the reproduction monitoring, the GPS-data and the simultaneous census on the International Bearded Vulture Observation Days (IOD), a total of 169 individuals were identified on individual level (Alps = 142, Massif Central & Pyrenees = 13, Corsica = 6, Maestrazgo = 8) in 2021. In addition, more the 2'000 observations were transferred from the ornitho.ch database to the IBM-database so that the regional managers from Switzerland can check them and follow up on the information.

Only thanks to this close monitoring by the local teams was it possible to detect 13 dropout cases (5 in FRA, 5 in ESP, 2 in CHE, 1 in NDL and 1 in ITA). Indeed, cases such as the mortality of Angèle (first reported collision with wind mill), Palo-Pala (electrocution) or adult Sardières (poison), show that anthropogenic risks can cause fatal accidents. Although the majority of causes of death have a natural origin, rapid investigation is important to understand the cause and to take early action in order to ensure the long-term success of the reintroduction project.

## 3 Key facts

### 24 Bearded Vultures released at 7 sites:

- 2 in Germany in Berchtesgaden (first releases ever at this site)
- 9 in France: 2 in Corsica, 2 in Vercors and 5 in Grands Causses
- 2 in Switzerland in Melchsee-Frutt
- 11 in Spain: 3 birds in Maestrazgo and 8 in Parque Natural de Cazorla

### Reproduction

- Alpine range: 75 occupied territories, 61 clutches, 44 fledglings
  - Productivity varied between 79% (NW-Alps) and 33% (SW-Alps)
- Massif Central: first territory occupied by two male nesting birds since 2018 (Layrou & Adonis)
- Corsica: 2 occupied territories, 1 clutch but no breeding success in 2021

### Monitoring and the IBM-database

- 1'973 observations from 7 countries by 18 IBM-partners and 3 associated organisations
  - 29% of the observed birds could be identified on individual level
  - 58 individuals (34 males and 22 females) could be identified (12 of them are wild-hatched birds)
- 2'044 ornitho.ch observations were imported to the IBM-database in 2021
- 169 individuals with known origin in the Alps (N=142), the Massif Central & French Pyrenees (N=13), Corsica (N=6) and Maestrazgo (N=8) were identified on individual level
- IOD: 1'295 observers occupied 726 sites and reported 960 Bearded Vulture observations during the International Bearded Vulture Observation Days
- Population size estimates based on IOD 2021 data: 284 – 381 individuals were estimated in the Alpine range, 7-13 in the Massif Central, 6-7 for Aude in the Pre-Pyrenees (FRA), 21-33 for Spain (without Pyrenees) and 3-4 in Maestrazgo (ESP) respectively.

### Markings & telemetry

- All 24 released birds have been marked with a solar powered GPS-tag. In 2021 GPS data of 54 released and 17 wild-hatched birds was stored in the WildlifeMonitor.
- 6 wild-hatched juveniles were ringed/equipped with GPS-tags: Friday for Flying and Severino-Zeburu (ITA), Sunny (FRA), Boni, Lopezosa and Capitel (ESP).

### 13 Dropouts

- 12 mortalities: 8 released birds (5 juveniles, 3 immatures) and 4 wild-hatched birds (2 adults, 2 immatures).
- 1 recapture: Spinella (BG1096; FRA) was recaptured and could not be released again



## 4 IBM-standards

The IBM-standards should serve as guidelines for the definitions used for public communications and statistics within the international network of the IBM. Below you find a short overview over the most important definitions, that are based on previous work by Richard Zink in 2009 (Table 1).

### 4.1 Age class

*Table 1: Calendar years (cy) should be used as IBM-standard for age classification. This table should serve as a general standard for the age determination of unknown and known birds recorded in the IBM-database. Grey shaded = potentially breeding birds (see "checked pairs" below).*

Entry in the IBM (life stage)	Calendar year (cy)	Real age (years)		Life history event
		Jan-Feb	Mar-Dec	
juvenile (1. cy)	1	-	0	hatch
immature (2. cy)	2	0	1	non-territorial
immature (3. cy)	3	1	2	non-territorial
subadult (4. cy)	4	2	3	non-territorial
subadult (5. / 6. cy)	5	3	4	potential nesting
adult ( $\geq 6$ . cy)	6	4	5	potential breeding
adult ( $\geq 6$ . cy)	$\geq 7$	5	$\geq 6$	potential breeding

### 4.2 Dropout versus breeding failures

Dropouts include all incidents where individuals have been removed from the population (mortality, recapture). This also applies to birds that could be rereleased after the recapture. A recapture is in any case the last solution, which is why it must be assumed that these birds would not have survived without human intervention and would have died under natural conditions.

However, if a hatchling dies at less than 80 days of age, this loss is referred to as breeding failure and it is therefore not included in the dropout statistics.

Age	< 80 days	> 80 days	Type
hatch	→ mortality / recapture		→ breeding failure
hatch	→ mortality, recapture		→ dropout

### 4.3 Reproduction<sup>1</sup>

Table 2: IBM-standards for reproduction statistics based on previous work by R. Zink (2009).

Potential territory	Area occupied by at least 2 birds showing territorial behaviour → all territories entered in the IBM-database
Territorial pair <sup>2</sup>	Pair <sup>2</sup> occupying a territory with at least one nest → territories with nest or egg-lay date entered in the IBM-database
Checked pair <sup>2</sup>	Pair <sup>2</sup> monitored during the breeding season → territories with nest or egg-lay date entered in the IBM-database → age classification: subadult (5. / 6. cy) or adult (≥ 6. cy)
Breeding pair <sup>2</sup>	Cases of verified egg-laying → date of egg-laying entered in the IBM-database
Breeding success	$\frac{\textit{fledglings}}{\textit{breeding pairs}}$
Productivity	$\frac{\textit{fledglings}}{\textit{checked pairs}}$

<sup>1</sup> Based on: Monitoring guide (Protocol) Draft Version 0.2 (2009) by Richard Zink

<sup>2</sup> Definition of a pair: At least two birds occupying a territory with at least one nest or confirmed fledge

## 5 Releases

In 2021, a total of 24 Bearded Vultures were released at seven sites in the eastern and central Alps, the western Pre-Alps, in the Massif Central, Corsica as well as in two projects in Spain. 23 of them have been reared in seven different zoos and captive breeding centres of the EEP (European Endangered Species Programme), while one chick was saved from the wild in the Pyrenees, adopted in the EEP and released in Andalusia (ESP).

For the first time ever, two juveniles were released in Berchtesgaden (GER) a new release site that is part of the Alpine reintroduction program. Two birds were released in Vercors (FRA) in the Pre-Alps. Another five juveniles were released in the Massif Central (FRA). The release of seven juveniles in the French Pre-Alps (two birds in Vercors) and the Massif Central (five birds) as well as the release of three juveniles in Maestrazgo (ESP) is part of a long-term goal to restore the genetic exchange between the three separated Bearded Vulture populations of the Alps, the Pyrenees and Andalusia. The connection of these populations is still non-existent, since the extinction of the Alpine (around 1900) and Andalusian (1980) Bearded Vulture population and is vital to re-establish the European meta-population. In order to enforce the local reintroduced population in Andalusia, eight juveniles have been released in this region in 2021.

The release of two juveniles on Corsica (FRA) is one of the actions taken in order to address the dramatic decrease of the population and secure the survival of this unique genetic pool. The Bearded Vulture population of Corsica is one of the last surviving genetic pools of the former meta-population and has been declining during the last 25 years to currently only four territorial pairs.

All 24 released birds, except Parpaillou (BG1093) and Plumet (BG1095), took off for their first flight (Table 3). The average age at the first flight was 122.5 days with a minimum of 103 (BelArosa, BG1119) and a maximum of 172 days (Seo, BG1118).

## 5.1 Release sites 2021



Figure 1: 24 Bearded Vultures were released at seven sites in Germany, Spain, France and the Swiss Alps. For the first time ever, Bearded Vultures have been released in the German Alps in Berchtesgaden. This new release site is part of the Alpine reintroduction program and aims to enforce the populations in the eastern Alps. The releases of seven birds in the pre-Alps (Vercors) and the Massif Central are part of the long-term project GypConnect with the aim to re-establish genetic exchange between the Alpine and Pyrenean population. With a similar objective, three birds were released in Maestrazgo (ESP), an area that should serve as “stepping-stone” between the Pyrenean and Andalusian population. With the aim to enforce the growing Andalusian population 8 individuals were released in Cazorla (ESP), while genetically rare individuals, released in the Swiss Alps (Melchsee-Frutt), should enrich the genetic diversity of the Alpine population.

*Table 3: Details about 24 Bearded Vultures that have been released within the IBM monitoring area. 23 of them were reared in captivity while one chick was saved from the wild in the Pyrenees and released in Andalucía (Los Picones, Castril). The release site of the Maestrazgo project is called Tinença de Benifassà. Birds that died or had to be recaptured in 2021 are written with grey letters (more information see Table 16).*

Place release	BirdID	Name	Sex	Hatch	Fledge	Age at first flight	Place hatch	Date release
GER Berchtesgaden, Halsgrube	BG1113	<b>Wally</b>	f	14.03.21	12.07.21	120	CC Guadalentín (ESP)	10.06.21
	BG1112	<b>Bavaria</b>	f	11.03.21	08.07.21	119	CC Guadalentín (ESP)	10.06.21
CHE Melchsee-Frutt	BG1119	<b>BelArosa</b>	m	27.03.21	08.07.21	103	Breeding Centre Haute-Savoie (FRA)	27.06.21
	BG1117	<b>Donna Elvira</b>	f	24.03.21	23.07.21	121	CC Guadalentín (ESP)	27.07.21
Corsica, Niolo Valley	BG1099	<b>Urcula</b>	f	23.02.21	12.06.21	109	Torreferrussa (ESP)	20.05.21
	BG1096	<b>Spinella</b>	f	16.02.21	29.06.21	133	RFZ Haringsee (AUT)	20.05.21
	BG1093	<b>Parpaillou</b>	m	23.01.21	-	-	RFZ Haringsee (AUT)	25.04.21
FRA Grands Causses, Trévezel	BG1095	<b>Plumet</b>	m	01.02.21	-	-	RFZ Haringsee (AUT)	28.04.21
	BG1094	<b>Pyrenees</b>	f	29.01.21	25.05.21	116	CC Guadalentín (ESP)	28.04.21
	BG1116	<b>Peyre</b>	m	21.03.21	20.07.21	121	CC Guadalentín (ESP)	24.06.21
	BG1122	<b>Pradines</b>	f	10.04.21	19.08.2021 ( $\pm 1$ )	131 ( $\pm 1$ )	Puy du Fou (FRA)	12.07.21
PNR Vercors, Trechenu-Creyers	BG1101	<b>Telemark</b>	m	25.02.21	23.06.21	118	RFZ Haringsee (AUT)	23.05.21
	BG1098	<b>Novo</b>	m	20.02.21	25.06.21	125	Green Balkans (BGR)	23.05.21
Los Picones, Castril	BG1111	<b>Quercus</b>	m	06.03.21	01.07.21	117	Tierpark Friedrichsfeld (GER)	04.06.21
	BG1121	<b>Depana</b>	m	07.03.21	06.07.21	121	Prineo catalán, PS 18 (ESP)	08.06.21
	BG1110	<b>Adenex</b>	f	09.03.21	05.07.21	118	Liberec Zoo (CZE)	08.06.21
PN Cazorla	BG1123	<b>Panda</b>	m	09.05.21	14.09.21	128	Tallinn (EST)	31.07.21
	BG1118	<b>Seo</b>	m	26.03.21	14.09.21	172	Tallinn (EST)	31.07.21
ESP Tornillos de Gualay, Cazorla	BG1102	<b>Fapas</b>	m	26.02.21	15.06.21	109	CC Guadalentín (ESP)	27.05.21
	BG1100	<b>Brinzal</b>	f	24.02.21	28.06.21	124	CC Guadalentín (ESP)	27.05.21
	BG1107	<b>Grefa</b>	f	06.03.21	03.07.21	119	CC Guadalentín (ESP)	04.06.21
Tinença de Benifassà	BG1109	<b>Dalila</b>	f	08.03.21	04.07.21	118	Ostrava Zoo (CZE)	08.06.21
	BG1104	<b>Dena</b>	f	04.03.21	09.07.21	127	CC Guadalentín (ESP)	08.06.21
	BG1103	<b>Durall</b>	m	04.03.21	10.07.21	128	CC Guadalentín (ESP)	08.06.21

## 6 Reproduction in the wild

### 6.1 Breeding season 2020/2021

The number of occupied Bearded Vulture territories is continuously increasing and increased from 66 territories to 75 territories within the IBM-monitoring area in 2021. From 69 monitored territorial pairs and 3 trios a clutch has been reported in 62 nests. Among them are territories where breeding has never been observed in the previous years (13 in total) and for NordOstTessin (CHE), Bourg-Saint-Maurice-2 (FRA), Sardières (FRA), Sondrio (ITA) and Ötztal (AUT) it was the first breeding attempt ever. Of these, however, successful reproduction only occurred in the Ötztal territory.

In the Alpine range 61 of 72 breeding units produced a clutch with a total of 53 birds hatching in these nests (87% hatch rate). Finally, 44 young Bearded Vultures fledged by the end of the summer: 21 in Switzerland, 12 in Italy, 9 in France, and 2 in Austrian (Figure 3). It was the first report of a breeding attempt in the southern Alps of Switzerland in the central Alps, an area without breeding activity between the core nuclei of Bearded Vulture reproduction in the central and north-western Alps.

On Corsica, only 2 of 4 known territories were occupied this year. Although there was a breeding attempt in the territory Popolasca, no breeding success was reported from the small Bearded Vulture population on Corsica.

In the Massif Central, the two released male birds (Adonis 2014 & Layrou 2013) are still showing territorial behaviour (nesting and copulation) since 2018. Even though, this couple will not be able to reproduce in this constellation it is a first sign for settling territorial birds in the region.

Similar as in previous years, the reproduction success (and productivity) varies considerably among regions with only one fledgling in the eastern (17%), 4 in the south-western (67%), 17 in the north-western (61%) and 22 in the central Alps (79%). The overall breeding success of 72%, was higher than in the last year but still lower compared to 2019, the year with 76% breeding success. While breeding success describes the ratio between fledglings and clutches, productivity, defined as the ratio of fledglings over checked breeding pairs or trios, also takes into account territories occupied by mature birds that are not breeding. Therefore, productivity might be very low in a struggling population, despite high breeding success, and is thus a more accurate measure for reproductive success. We observe a declining productivity from 72% in 2019 to 65% in 2021, a trend that is mainly influenced by the low productivity in the eastern Alps.

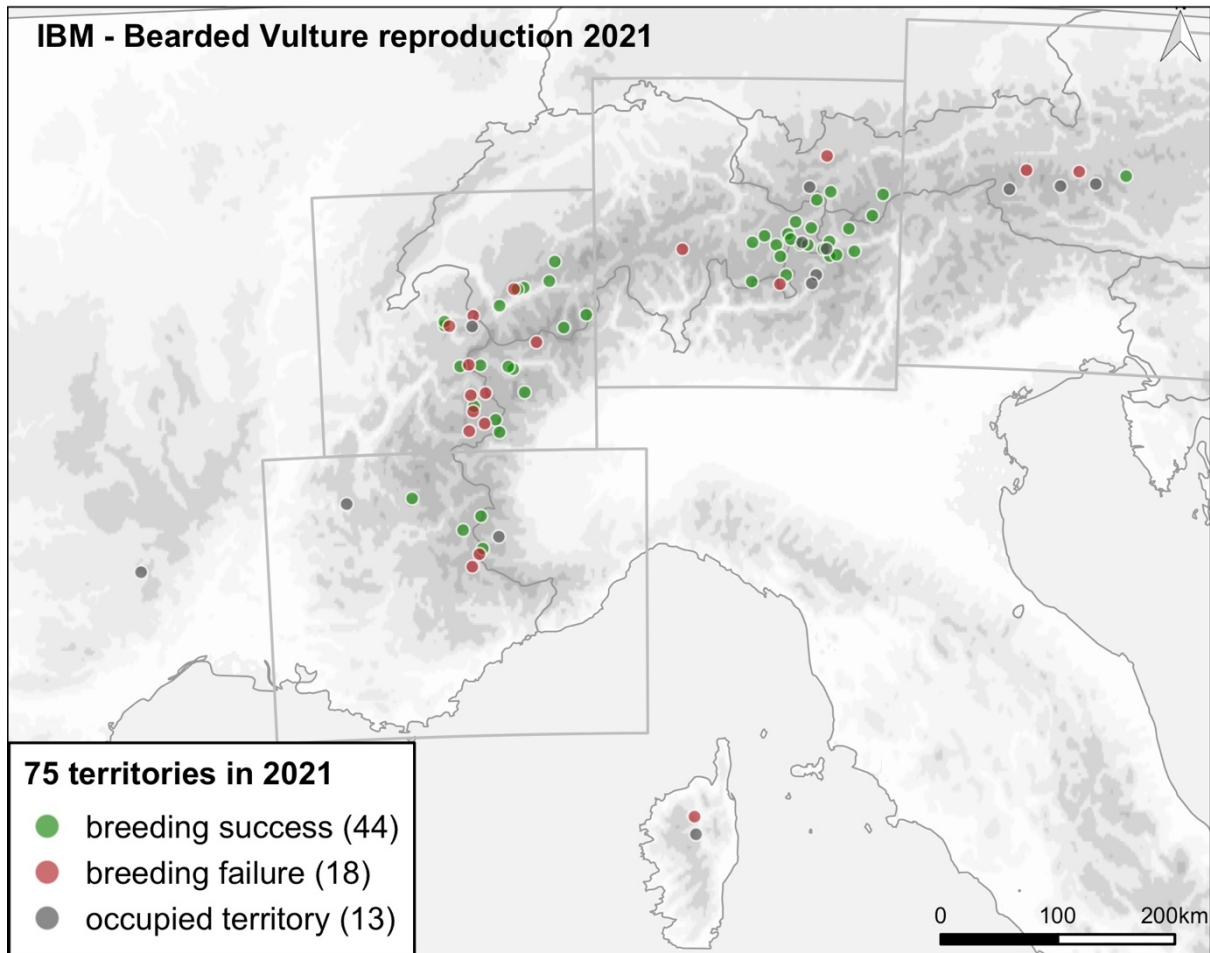


Figure 2: Reproduction status in 75 occupied territories in the Alpine range, Corsica and the Massif Central. With 44 successful reproductions a new record number of wild fledglings has been set. In the Massif Central, the two released male birds, Layrou and Adonis, are still occupying a territory (Jonte amont) for the third year. The rectangles represent the 4 monitoring zones: south-western Alps, north-western Alps, central Alps and eastern Alps, from left to right.

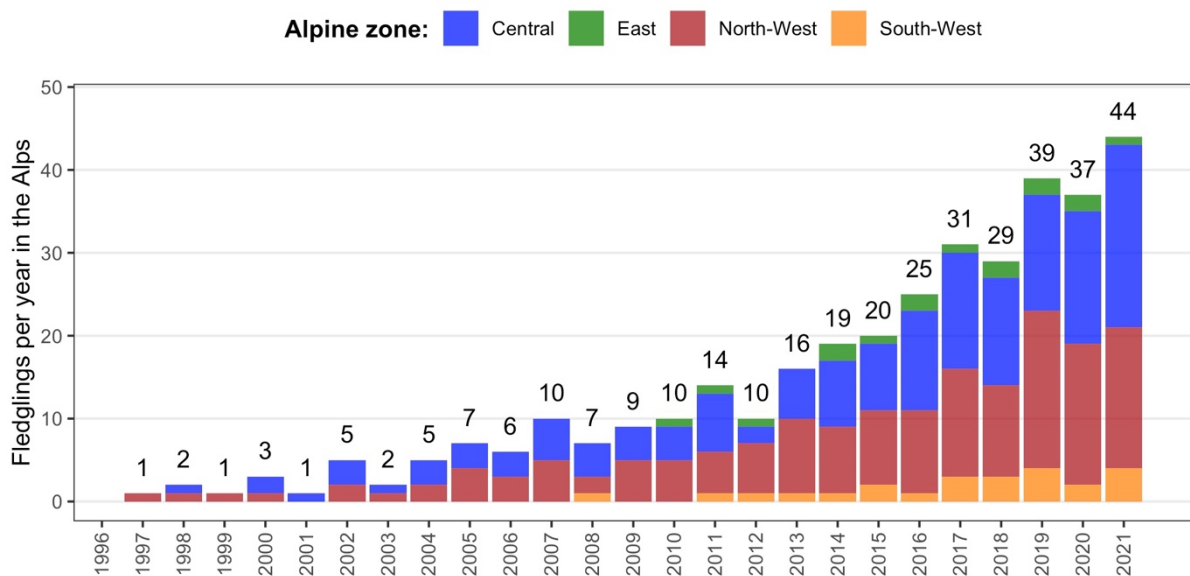


Figure 3. Fledglings per year and Alpine region, since the first reproduction in 1997.

Table 4: Breeding statistics for the season 2020/2021. See Table 2 for further details about the IBM-standards for breeding statistics.

	Zone	Potential territories	Territorial pairs	Checked pairs	Breeding pairs	Hatches	Fledglings	Failures	Breeding success	Productivity
Alpine range	<b>2021</b>	<b>72</b>	<b>69</b>	<b>68</b>	<b>61</b>	<b>53</b>	<b>44</b>	<b>17</b>	<b>72%</b>	<b>65%</b>
	East	6	6	6	3	2	1	2	33%	17%
	Central	30	28	28	25	23	22	3	88%	79%
	North-West	28	28	28	27	22	17	10	63%	61%
	South-West	8	7	6	6	6	4	2	67%	67%
	<b>2020</b>	<b>61</b>	<b>56</b>	<b>54</b>	<b>53</b>	<b>44</b>	<b>37</b>	<b>16</b>	<b>70%</b>	<b>69%</b>
	East	3	3	3	3	2	2	1	67%	67%
	Central	24	22	22	21	17	16	5	76%	73%
	North-West	28	25	23	23	20	17	6	74%	74%
	South-West	6	6	6	6	5	2	4	33%	33%
	<b>2019</b>	<b>58</b>	<b>54</b>	<b>54</b>	<b>51</b>	<b>43</b>	<b>39</b>	<b>11</b>	<b>76%</b>	<b>72%</b>
	East	3	3	3	3	2	2	1	67%	67%
	Central	23	20	20	19	15	14	5	74%	70%
North-West	26	25	25	23	21	19	3	83%	76%	
South-West	6	6	6	6	5	4	2	67%	67%	
<b>Corsica</b>										
	<b>2021</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0%</b>	<b>0%</b>
	<b>2020</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>50%</b>	<b>25%</b>
	<b>2019</b>	<b>5</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0%</b>	<b>0%</b>
<b>Massif Central</b>										
	<b>2021</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>-</b>
	<b>2020</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>-</b>
	<b>2019</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>-</b>

**Alpine bearded vulture reproduction**

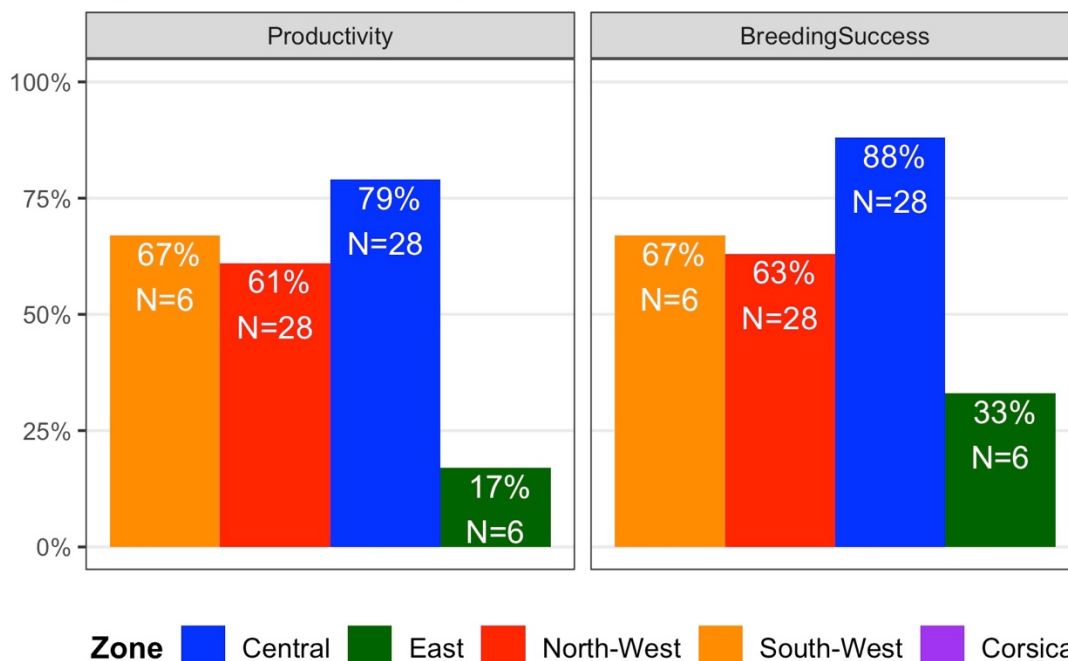


Figure 4: Productivity and breeding success vary within the different alpine zones with the highest productivity and breeding success in the north-western Alpine. Note that sample size (breeding territories) N varies considerably among regions. See Table 2 for further details about the IBM-standards for breeding statistics.



Table 5: Reproduction in the eastern and central Alpine range. Territories with no clutch in previous years are marked with an asterisk (\*).

	Territory	Nest	Parent 1	Parent 2	Parent 3	Clutch	Hatch	Fledge	Failure	Chick	First clutch	First fledge	Total clutches	Total fledglings	
<b>Alps total</b>	<b>72</b>	<b>66</b>	<b>72</b>	<b>72</b>	<b>3</b>	<b>61</b>	<b>53</b>	<b>44</b>	<b>17</b>	<b>53</b>	<b>1996</b>	<b>1997</b>	<b>513</b>	<b>353</b>	
<b>Eastern Alps</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2001</b>	<b>2010</b>	<b>38</b>	<b>16</b>	
<b>AUT</b>	Gastein/Rauris	X	Andreas Hofer	Alexa	-	11/01	09/03 (±1)	-	25/03 (±10)	Gastein2021 (W389)	2003	2010	19	7	
	Gschlöß	X	adult	adult	-	11/01	-	-	24/04	-	2014	-	3	0	
	Heiligenblut	X	Fortuna	adult	-	-	-	-	-	-	2001	-	1	0	
	Katschberg	X	Hubertus 2	Romaris	-	12/01 (±3)	10/03 (±2)	11/07	-	Katschberg2021 (W392)	2010	2012	12	9	
	Mallnitz *	X	Felix2	subadult (5./6.cy)	-	-	-	-	-	-	-	-	-	-	-
Prägraten	X	adult	adult	-	-	-	-	-	-	2018	-	3	0		
<b>Central Alps</b>	<b>30</b>	<b>28</b>	<b>30</b>	<b>30</b>	<b>0</b>	<b>25</b>	<b>23</b>	<b>22</b>	<b>3</b>	<b>23</b>	<b>1998</b>	<b>1998</b>	<b>207</b>	<b>156</b>	
<b>AUT</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2019</b>	<b>2019</b>	<b>4</b>	<b>3</b>	
	Galtür *	X	subad / adult (?)	subad / adult (?)	-	-	-	-	-	-	-	-	-	-	
	Lechtal	X	Madagaskar	Natura	-	20/01 (±10)	-	-	15/03 (±10)	-	2019	2019	3	2	
Ötztal *	X	subad / adult (?)	subad / adult (?)	-	01/03 (±7)	25/04 (±7)	21/08	-	Ötztal2021 (W421)	-	-	-	-		
<b>CHE</b>	<b>17</b>	<b>17</b>	<b>17</b>	<b>17</b>	<b>0</b>	<b>15</b>	<b>15</b>	<b>14</b>	<b>1</b>	<b>15</b>	<b>2007</b>	<b>2007</b>	<b>111</b>	<b>83</b>	
	Albula	X	wild-hatched (≥6.cy)	Diana-Stelvio	-	09/01	06/03	24/06	-	Albula2021 (W403)	2008	2008	14	11	
	Bergün	X	GT0116	GT0117	-	17/01 (±1)	12/03 (±2)	28/06	-	Bergün2021 (W407)	2016	2016	6	5	
	Buffalora	X	Ingenius	Retia	-	27/12 (±2)	25/02 (±5)	25/06 (±1)	-	Buffalora2021 (W381)	2017	2017	5	3	
	Foraz	X	adult	GT031	-	16/02 (±5)	11/04 (±4)	11/07	-	Foraz2021 (W410)	2012	2014	10	8	
	Maloja	X	Rurese	Folio	-	30/12	22/02	11/06	-	Maloja2021 (W376)	2016	2016	5	2	
	Martina	X	adult	adult	-	27/01 (±2)	20/03 (±2)	21/08	-	Martina2021 (W398)	2020	2021	2	1	
	Müstair *	X	adult	adult	-	-	-	-	-	-	-	-	-	-	-
	NordOstTessin *	X	adult	adult	-	15/01 (±15)	11/03 (±5)	-	13/05 (±5)	Tessin2021 (W404)	-	-	-	-	
	Ofenpass	X	Livigno	Ortler	-	30/01 (±7)	25/03 (±7)	13/07 (±5)	-	Ofenpass2021 (W415)	2007	2007	12	10	
	Ova Spin	X	adult	adult	-	25/12 (±2)	15/02 (±2)	12/06 (±2)	-	Ova Spin2021 (W380)	2015	2018	6	4	
	Pontresina	X	wild-hatched (≥6.cy)	GT0163	-	08/01 (±1)	06/03	19/07 (±2)	-	Pontresina2021 (W388)	2019	2019	3	3	
	Poschiavo	X	GT057	GT038	-	09/01 (±2)	04/03 (±1)	01/07 (±3)	-	Poschiavo2021 (W387)	2013	2013	9	9	
	Sinestra	X	Samuel	Moische-Livigno	-	16/01 (±6)	11/03 (±7)	09/07 (±2)	-	Sinestra2021 (W405)	2012	2013	10	8	
	Spöl	X	adult	GT090	-	-	-	-	-	-	2014	2014	6	4	
	Tantermozza	X	Zebzu	GT048	-	05/01 (±7)	28/02 (±6)	16/06 (±5)	-	Tantermozza2021 (W384)	2007	2007	15	11	
	Tinizong	X	Cravallo	Inge	-	12/01 (±5)	09/03 (±3)	20/07 (±2)	-	Tinizong2021 (W390)	2020	2021	2	1	
Trupchun	X	Urbano	GT062	-	15/01 (±10)	15/03 (±9)	03/07 (±5)	-	Trupchun2021 (W395)	2017	2019	5	3		
<b>ITA</b>	<b>10</b>	<b>8</b>	<b>10</b>	<b>10</b>	<b>0</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>1</b>	<b>7</b>	<b>1998</b>	<b>1998</b>	<b>92</b>	<b>70</b>	
	Foscagno	-	GT0132	GT0129	-	-	-	-	-	-	2011	2011	1	1	
	Livigno	X	Cic	Moische	-	21/01 (±2)	16/03 (±2)	02/07 (±2)	-	Friday For Flying - Livigno (W396)	1999	2000	23	19	
	Ortler	X	adult	Jo	-	17/01	12/03	08/06	-	Trafoi2021 (W406)	2016	2017	6	4	
	Planeil	X	Blick	subadult (5./6.cy)	-	20/02 (±3)	15/04 (±3)	11/08	-	Sieglinde (W420)	2013	2021	6	1	
	Schnals	X	Pep-Albula	adult	-	04/01 (±2)	27/02 (±2)	24/06 (±1)	-	Schnals2021 (W400)	2013	2018	5	4	
	Sondalo *	-	adult	adult	-	-	-	-	-	-	-	-	-	-	
	Sondrio *	X	subadult (5./6.cy)	adult	-	07/01 (±2)	-	-	14/03 (±15)	-	-	-	-	-	
	Val Martello	X	wild-hatched (≥6.cy)	Temperatio	-	04/01 (±1)	27/02 (±1)	25/06	-	Martello2021 (W401)	2015	2015	7	7	
	Valle del Braulio	X	Tell	Stift	-	14/12 (±3)	06/02 (±3)	14/06 (±1)	-	Germano - Braulio (W379)	1998	1998	24	17	
Zebzu	X	Heinz-Serraglio	Felice	-	22/12 (±1)	15/02 (±1)	16/06	-	Severino-Zebzu (W372)	2002	2002	19	17		

Table 6: Reproduction in the north- and south-western Alpine range. Territories with no clutch in previous years are marked with an asterisk (\*).

	Territory	Nest	Parent 1	Parent 2	Parent 3	Clutch	Hatch	Fledge	Failure	Chick	First clutch	First fledge	Total clutches	Total fledglings
NW Alps	28	25	28	28	2	27	22	17	10	22	1996	1997	229	157
	8	7	8	8	0	8	7	7	1	7	2007	2007	46	34
CHE	Coude du Rhône	X	subadult (5./6.cy)	adult	-	12/02 (±7)	08/04 (±10)	12/08 (±1)	-	Michel (W414)	2019	2019	3	2
	Derborence_down	X	subadult (5./6.cy)	subadult (5./6.cy)	-	02/01	24/02 (±1)	14/06	-	Derborence_down2021 (W377)	2012	2012	9	8
	Derborence_Vérouet	-	Pablo	Guillaumes	-	20/01 (±20)	-	-	11/03 (±11)	-	2007	2007	10	6
	Kandertal	X	adult	GT0126	-	01/01	23/02 (±1)	19/06	-	Kandersteg2021 (W422)	2020	2020	2	2
	Leukerbad	X	adult	adult	-	23/12 (±3)	16/02 (±5)	12/06	-	Leukerbad2021 (W374)	2012	2015	6	4
	Saas	X	adult	adult	-	02/01 (±4)	21/02 (±3)	15/06 (±4)	-	Saas2021 (W375)	2019	2019	3	3
	Sionne	X	adult	adult	-	01/01 (±15)	28/02 (±15)	21/06 (±6)	-	Sionne2021 (W383)	2019	2019	2	2
	Zermatt	X	Smaragd	adult	-	16/12 (±13)	08/02 (±11)	08/06 (±1)	-	Zermatt2021 (W402)	2016	2016	6	5
	14	13	14	14	1	13	10	5	8	10	1996	1997	144	94
FRA	Andagne	X	adult	adult	-	24/01	16/03	19/07	-	Andagne2021 (W419)	2011	2014	8	4
	Aravis	X	wild-hatched (≥6.cy)	wild-hatched (≥6.cy)	-	03/01 (±16)	27/02 (±2)	-	20/03 (±2)	Aravis2021 (W382)	2006	2009	16	9
	Bargy	X	wild-hatched (≥6.cy)	wild-hatched (≥6.cy)	wild-hatched (≥6.cy)	27/01 (±7)	18/03 (±3)	26/07	-	Sunny (W397)	1996	1997	25	20
	Bargy BIS	X	wild-hatched (≥6.cy)	adult	-	13/01 (±2)	14/03 (±7)	06/07 (±3)	-	Belle étoile (W394)	2016	2017	6	4
	Bourg-Saint-Maurice	X	adult	adult	-	09/01	13/03	03/07 (±2)	-	Bourg-Saint-Maurice2021 (W423)	2016	2017	6	5
	Bourg-Saint-Maurice-2	X	adult	adult	-	18/12	-	-	08/02	-	-	-	-	-
	Passy *	X	adult	adult	-	-	-	-	-	-	-	-	-	-
	Peisey-Nancroix	X	adult	adult	-	04/01	-	-	20/02	-	2005	2005	17	13
	Pra de pis	X	adult	adult	-	02/01	26/02	-	14/04	Pra de pis2021 (W416)	2019	-	3	0
	Pralognan	X	adult	adult	-	08/03	-	-	12/06 (±6)	-	2018	2018	4	3
	Sardières *	X	adult	Thuri	-	21/01	10/03	-	19/04	Sardières2021 (W418)	-	-	-	-
	Sixt Fiz	X	wild-hatched (≥6.cy)	adult	-	07/01 (±1)	03/03 (±1)	-	25/03 (±3)	SixtFiz2021 (W386)	2007	2009	15	9
	Termignon	-	adult	adult	-	29/12	23/02	16/06	-	Termignon2021 (W424)	2002	2002	20	15
	Val d'Isère	X	adult	adult	-	02/01 (±4)	26/02 (±2)	-	14/04 (±5)	Val d'Isère2021 (W417)	1999	2002	22	12
	6	5	6	6	1	6	5	5	1	5	2010	2012	39	29
ITA	Bionaz	X	adult	adult	-	17/02 (±5)	-	-	26/02 (±3)	-	2020	-	3	0
	Chamoussière	X	Michegabri	adult	-	18/01	13/03	08/07 (±2)	-	Chamoussière2021 (W408)	2011	2012	11	8
	Usseglio	X	Italia 150	subadult (5./6.cy)	-	15/02 (±1)	06/04 (±1)	06/08	-	Chateaux (W413)	2019	2019	3	3
	Val di Rhemes	X	adult	adult	adult	23/01	18/03 (±1)	17/07	-	Rhemes2021 (W409)	2010	2012	11	9
	Valdigne	-	adult	adult	-	28/01 (±10)	27/03 (±10)	05/07 (±2)	-	Valdigne2021 (W411)	2010	2019	4	3
	Valnontey	X	adult	adult	-	03/01 (±2)	27/02 (±1)	16/06	-	Valnontey2021 (W399)	2015	2015	7	6
SW Alps	8	7	8	8	1	6	6	4	2	6	2008	2008	39	24
	7	6	7	7	1	6	6	4	2	6	2008	2008	39	24
FRA	Archiane *	-	adult	Gerlinde	-	-	-	-	-	-	-	-	-	-
	Bonette	X	GT150	Bellemotte	-	12/01 (±1)	10/03 (±1)	14/07	-	Vignemale (W391)	2017	2017	5	5
	Chambeyron-Ubayette	X	Stephan	Rimani	-	05/01 (±3)	24/02 (±1)	02/07	-	Adrechoun (W378)	2016	2020	6	2
	Malaval	X	Basalte	adult	adult	25/12 (±1)	15/02 (±1)	11/06	-	Edelweiss (W373)	2018	2018	4	3
	Source de la Tinée	X	Rocca	Girasole	-	02/02 (±1)	27/03 (±1)	-	11/05 (±6)	Tinée2021 (W412)	2013	2015	8	5
	Source de l'Ubaye	X	Sereno	GT036	-	06/01 (±5)	02/03 (±5)	24/06 (±1)	-	Cassiopée (W385)	2008	2008	12	9
	Val d'Entraunes	X	Tenao	adult	-	16/01	11/03	-	09/04 (±3)	Entraunes2021 (W393)	2019	-	3	0
ITA	Maira *	X	Roman (5./6.cy)	wild-hatched (4.cy)	-	-	-	-	-	-	-	-	-	-

Table 7: Reproduction in Corsica and the Massif Central. The IBM does not include reproduction data for Corsica before 2018. As in the previous year, no reproduction has been reported from the Massif Central, where two male birds have established a territory since 2018. Territories with no clutch in previous years are marked with an asterisk (\*).

	Territory	Nest	Parent 1	Parent 2	Parent 3	Clutch	Hatch	Fledge	Failure	Chick	First clutch	First fledge	Total clutches	Total fledglings
<b>Corsica **</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2018</b>	<b>2018</b>	<b>9</b>	<b>2</b>
<b>FRA</b>	Popolasca	X	Popolasca 1	Popolasca 2	-	25/02 (±10)	30/04 (±10)	-	10/05 (±10)	Popolasca2021 (W425)	2019	-	3	0
	Restonica	-	Restonica 1	Restonica 2	-	-	-	-	-	-	2019	-	1	0
<i>** Reproduction data included in the IBM since 2018.</i>														
<b>Massif Central</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>0</b>	<b>0</b>
<b>FRA</b>	Jonte amont *	X	Layrou (≥6.cy) ♂	Adonis (≥6.cy) ♂	-	-	-	-	-	-	-	-	-	-

*Info: Two male birds built a nest.*

# 7 Observations

## 7.1 IBM-network & -monitoring area

Bearded Vulture observations are collected within the area of the International Bearded Vulture Monitoring (IBM) network. Regional coordinators from national parks, regional nature parks or NGO's (Table 8) are responsible for a certain area (20 areas in 2021, see Figure 5), where the professionals collect and validate reported Bearded Vulture observations that are later stored in the IBM-database.

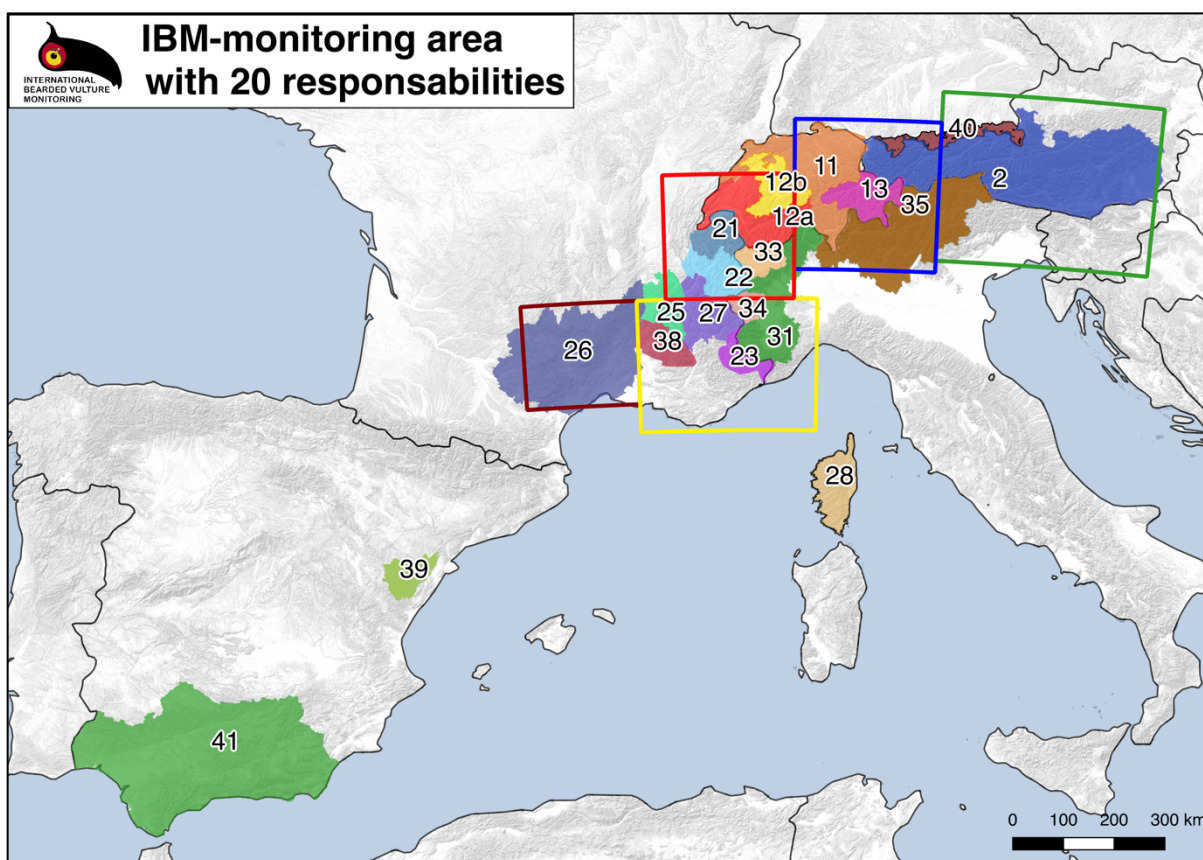


Figure 5: 20 Areas of responsibility that form the International Bearded Vulture Monitoring Network.

Table 8: IBM-partners and associated organisations (\*) that collect data within their area of responsibility.

Collecting centre ID	Responsible organisation	Country
2	Hohe Tauern National Park	AUT
11	Stiftung Pro Bartgeier Central	CHE
12a	Stiftung Pro Bartgeier north-west	CHE
12b	Stiftung Pro Bartgeier south-west	CHE
13	Stiftung Pro Bartgeier east	CHE
21	ASTERS	FRA
22	Parc National de la Vanoise	FRA
23	Parc National du Mercantour	FRA
25	Parc Naturel Régional des Vercors	FRA
26	LPO Grands Causses	FRA
26	National Park of Cevennes *	FRA
28	PNR de Corse	FRA
38	Association Vautours en Baronnies	FRA
39	Envergures Alpines	FRA
39	Parc National des Écrins*	FRA
31	Parco Naturale Alpi Marittime	ITA
33	Parco Nazionale Gran Paradiso	ITA
33	Regione autonoma valle d'Aosta*	ITA
34	Parco Naturale Alpi Cozie	ITA
35	Parco Nazionale dello Stelvio	ITA
39	Maestrazgo - Els Ports	ESP
41	Junta de Andalucia	ESP
40	Landesbund für Vogelschutz - LBV	GER
40	Zentrum Naturerlebnis Alpin - ZNAIp	GER

## 7.2 Visual observations

In 2021, 1'973 Bearded Vulture observations from 7 different countries in Europe have been registered in the IBM-database. For 547 (29%) observations it was possible to identify the observed individual, for 163 (8%) cases there are hypotheses about the bird's identity, while it was not possible to identify the individuals in 1'263 (64%) observations (Figure 6).

58 individuals (12 of them wild-hatched) were identified by at least one visual observation, while some birds have been observed several times in 2021. Two birds have even been observed over 60 times in 2021. The most frequently observed birds are Roman (BG854, Alpi Marittime 2015) with 63 and Eglazine (BG1069, Grands Causses 2020) with 61 observations (Table 9).

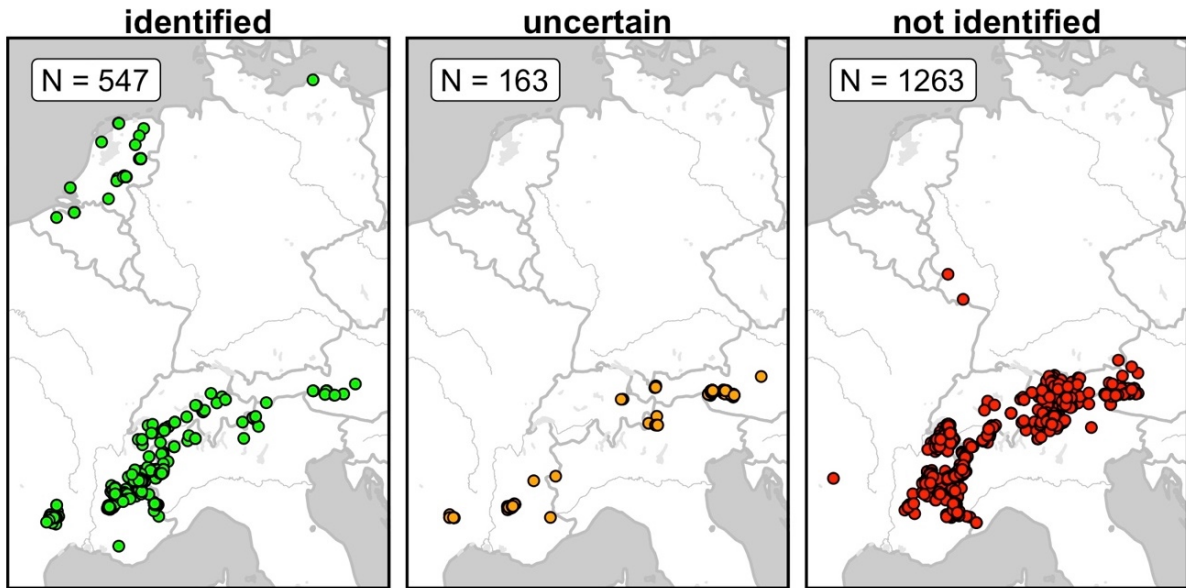


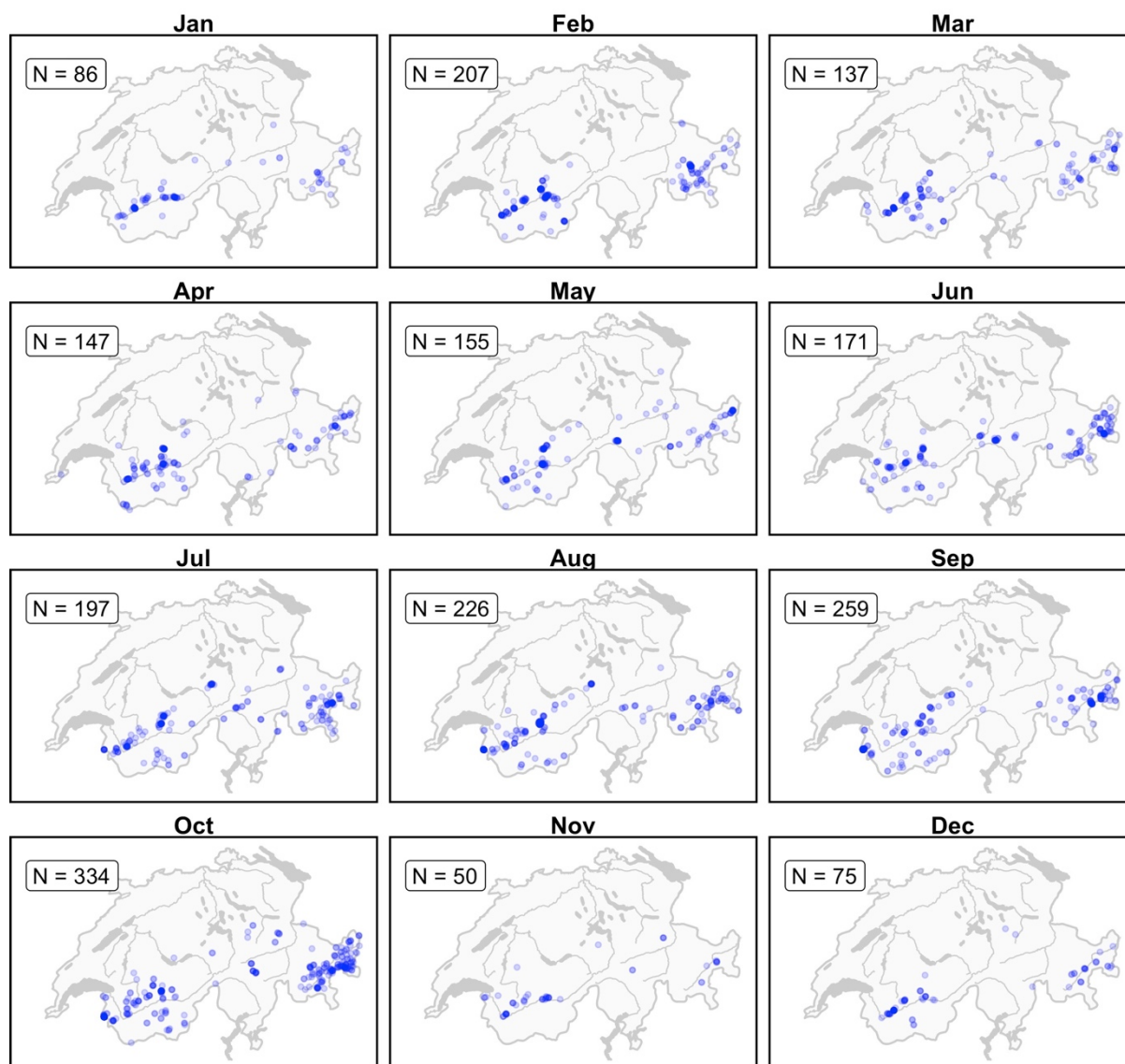
Figure 6: Overview the 1'973 Bearded Vulture observations that have been reported in 2021. In 29% of all observations the observed bird could be identified on the individual level (547 identifications).

Table 9: Overview of all 1'973 observations from 7 different countries reported in the IBM-database for the year 2021. The older a bird is and the more often it has been observed, the darker it is highlighted in green. The longer a bird has not been observed before 2021, the darker it is highlighted in red.

Bird	Sex (m/f/u)	Age (cy)	Observed ...			AUT	BEL	CHE	DEU	FRA	ITA	NDL	Observed in 2021
			before period	in period	total								
Adonis (BG794)	m	8	01.10.20	1	289	-	-	-	-	1	-	1	
Alexa (BG100)	f	34	20.09.20	3	98	3	-	-	-	-	-	3	
Andreas Hofer (BG260)	m	26	02.08.20	2	70	2	-	-	-	-	-	2	
Angèle (BG1058)	m	2	30.12.20	18	55	-	-	-	-	16	2	18	
Aven (BG1067)	f	2	-	5	5	-	-	-	-	5	-	5	
Basalte (BG716)	m	10	30.12.20	1	109	-	-	-	-	1	-	1	
Bavaria (BG1112)	f	1	-	1	1	1	-	-	-	-	-	1	
BelArosa (BG1119)	m	1	-	5	5	-	-	2	-	1	2	5	
Belle etoile (W394)	f	1	-	1	1	-	-	-	-	1	-	1	
Caeli (BG998)	m	4	12.03.20	1	14	1	-	-	-	-	-	1	
Calandreto (BG948)	m	5	22.05.20	6	40	-	-	-	-	6	-	6	
Carmen (BG1027)	f	3	16.09.20	1	77	-	-	-	-	1	-	1	
Cévennes (BG1032)	m	3	22.12.20	3	43	-	-	-	-	3	-	3	
Chateaux (W413)	u	1	-	11	11	-	-	-	-	-	11	11	
Clapas (BG975)	m	4	30.12.20	39	158	-	-	-	-	39	-	39	
Donna Elvira (BG1117)	f	1	-	3	3	-	-	2	-	-	1	3	
Eglazine (BG1069)	f	2	29.12.20	61	63	-	5	-	1	7	48	61	
Elvio (BG1026)	m	3	28.12.20	14	60	-	-	-	-	12	2	14	
Emparis (W284)	f	3	11.01.20	1	3	-	-	-	-	1	-	1	
Fario (BG1079)	f	2	27.11.20	2	3	-	-	-	-	2	-	2	
Felix2 (BG793)	m	8	19.12.20	2	121	2	-	-	-	-	-	2	
Finja (BG1003)	f	4	14.12.20	6	24	-	-	6	-	-	-	6	
Fortuna (BG843)	m	7	03.10.20	1	46	1	-	-	-	-	-	1	
Fortunat (BG1068)	m	2	30.10.20	10	15	-	-	9	-	1	-	10	
Fredueli (BG1001)	m	4	09.10.20	6	25	-	-	2	-	-	4	6	
Gildo (BG299)	f	24	23.04.15	1	93	-	-	1	-	-	-	1	
Glocknerlady (BG718)	f	10	29.11.20	2	44	2	-	-	-	-	-	2	
Gypsy (W209)	m	5	14.05.20	2	13	-	-	1	-	1	-	2	
Heinz-Serraglio (W45)	m	15	31.12.20	1	9	-	-	-	-	-	1	1	
Hubertus 2 (BG446)	m	18	18.03.20	1	102	1	-	-	-	-	-	1	
Italia 150 (BG660)	m	11	22.12.20	30	71	-	-	-	-	-	30	30	
Kirsi (BG764)	m	9	23.12.20	3	88	-	-	-	-	3	-	3	
Kobalann (BG1063)	f	2	29.12.20	24	60	-	-	-	-	24	-	24	
Layrou (BG761)	m	9	11.12.20	4	301	-	-	-	-	4	-	4	
Léoux (BG950)	f	5	14.02.19	1	20	-	-	1	-	-	-	1	
Mison (W230)	f	5	13.09.19	11	209	-	-	-	-	11	-	11	
Mistral (BG1022)	m	3	28.12.20	23	81	-	-	1	-	22	-	23	
Neige (W198)	m	6	05.02.20	1	13	-	-	-	-	1	-	1	
Noel-Leya (BG797)	m	8	03.10.20	1	13	-	-	1	-	-	-	1	
Novo (BG1098)	m	1	-	41	41	-	-	-	-	41	-	41	
Ophrys (BG1078)	f	2	27.11.20	8	11	-	-	-	-	8	-	8	
Palo-Pala (BG1062)	m	2	28.12.20	4	33	-	-	-	-	1	3	4	
Pamela (BG1031)	f	3	28.12.20	14	69	-	-	-	-	14	-	14	
Penti2020 (W349)	f	2	31.12.20	4	6	-	-	1	-	-	3	4	
Peyre (BG1116)	m	1	-	3	3	-	-	-	-	3	-	3	
Pierro (W301)	m	3	27.08.20	2	4	-	-	-	-	1	1	2	
Pradines (BG1122)	f	1	-	5	5	-	-	-	-	5	-	5	
Prazon-sixt-fer-a-cheval (W346)	u	2	-	1	1	-	-	1	-	-	-	1	
Pyrenees (BG1094)	f	1	-	1	1	-	-	-	-	1	-	1	
Roman (BG854)	m	7	03.11.20	63	150	-	-	-	-	-	63	63	
Romaris (BG528)	f	15	18.03.20	1	41	1	-	-	-	-	-	1	
Sempach 2 (BG841)	f	7	01.11.19	2	41	-	-	2	-	-	-	2	
Severino-Zebru (W372)	m	1	-	1	1	-	-	-	-	-	1	1	
Simay (BG983)	m	4	08.03.20	4	62	-	-	-	-	2	2	4	
Sunny (W397)	m	1	-	1	1	-	-	-	-	1	-	1	
Telemark (BG1101)	m	1	-	38	38	-	-	-	-	38	-	38	
Tell (BG283)	m	25	18.12.20	1	78	-	-	-	-	-	1	1	
Volcaire (BG905)	m	6	30.12.20	44	174	-	-	-	-	44	-	44	
unknown						290	-	24	8	458	646	-	1'426
<b>59</b>			<b>34/22/2</b>			<b>304</b>	<b>5</b>	<b>54</b>	<b>9</b>	<b>780</b>	<b>771</b>	<b>50</b>	<b>1'973</b>

### 7.2.1 Ornitho.ch data

Another 2'044 Bearded Vulture observations have been reported on the Swiss ornithologist reporting platform *ornitho.ch*. Even though these observations were not validated by the IBM-partner network, these observations deliver information about Bearded Vulture hotspots and future focal areas (Figure 7).



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Figure 7. All observations classified as Bearded Vulture observations on *Ornitho.ch* in 2021. The points are shown with 20% coverage, so five overlapping observations appear in dark blue.



### 7.3 Individual identification

Thanks to the sophisticated marking system of the IBM, it was possible to identify 169 Bearded Vultures in 2021 (Table 10, Table 11, Table 12 and Table 13). Data from observations, the reproduction monitoring, telemetry as well as the IOD were used to gain valuable information about Bearded Vultures on the individual level.

This information allows to draw conclusions about the life history of individuals, which forms the basis for survival analyses in order to better understand and manage the reintroduction process of this endangered species. Furthermore, such life history data is essential for population modelling and predictions about the development of the Bearded Vulture population.

*Table 10. List of all birds that have been identified in 2021 with "origin" in the eastern Alpine range. Wild-hatched birds are marked with a prefixed "W" or "GT" in the BirdID. "Identification" describes the data basis that was used for their record: r = reproduction, i = IOD, t = telemetry, o = observation. Sorted by their region of origin (territory or release site). \* = territory of hatch from juvenile birds from 2021.*

Name	BirdID	Sex	Hatch	Death	Age (cy)	Origin (release site / territory / country)	Zone	Territory (2021)	Identification
<b>Eastern &amp; Central Alpine range</b>									<b>79</b>
Cravallo	W156	m	2015		7	Katschberg		Tinizong (CHE)	r
Katschberg2021	W392	u	2021		1	Katschberg		Katschberg (AUT)*	r
Ötztal2021	W421	u	2021		1	Ötztal		Ötztal (AUT)*	r
Felix2	793	m	2014		8	NP Hohe Tauern, Debantal		Mallnitz (AUT)	r,o,i,t
Fortuna	843	m	2015		7	NP Hohe Tauern, Dorfertal		Heiligenblut (AUT)	r,o,t
Lea	840	m	2015		7	NP Hohe Tauern, Dorfertal			t
Glocknerlady	718	f	2012		10	NP Hohe Tauern, Fleißtal			o,i
Inge	720	f	2012		10	NP Hohe Tauern, Fleißtal		Tinizong (CHE)	r
Smaragd	675	m	2011		11	NP Hohe Tauern, Habachtal	<b>AUT</b>	Zermatt (CHE)	r
Hubertus 2	446	m	2004		18	NP Hohe Tauern, Kals		Katschberg (AUT)	r,o
Romaris	528	f	2007		15	NP Hohe Tauern, Kals		Katschberg (AUT)	r,o
Caeli	998	m	2018		4	NP Hohe Tauern, Mallnitz			o,t
Alexa	100	f	1988		34	NP Hohe Tauern, Rauris	<b>East</b>	Gastein/Rauris (AUT)	r,o,i
Andreas Hofer	260	m	1996		26	NP Hohe Tauern, Rauris		Gastein/Rauris (AUT)	r,o,i
Pinzgarus	558	m	2008		14	NP Hohe Tauern, Rauris			i
Rurese	559	m	2008		14	NP Hohe Tauern, Rauris		Maloja (CHE)	r
Charlie	910	f	2016		6	NP Hohe Tauern, Untersulzbachtal			i
Bavaria	1112	f	2021		1	Berchtesgaden, Halsgrube	<b>GER</b>		o,i,t
Wally	1113	f	2021		1	Berchtesgaden, Halsgrube			i,t
Retia	357	f	2000		22	NP Stilfserjoch, Martell		Buffalora (CHE)	r,i
Stift	393	f	2002		20	NP Stilfserjoch, Martell		Valle del Braulio (ITA)	r,i
Ortler	439	f	2004		18	NP Stilfserjoch, Martell	<b>ITA</b>	Ofenpass (CHE)	r,i
Temperatio	495	f	2006		16	NP Stilfserjoch, Martell		Val Martello (ITA)	r,i
Zufall	493	f	2006		16	NP Stilfserjoch, Martell		Bargy BIS (FRA)	r,i

Table 11. List of all birds that have been identified in 2021 with "origin" in the central Alpine range. Wild-hatched birds are marked with a prefixed "W" or "GT" in the BirdID. "Identification" describes the data basis that was used for their record: r = reproduction, i = IOD, t = telemetry, o = observation. Sorted by their region of origin (territory or release site). \* = territory of hatch from juvenile birds from 2021.

Name	BirdID	Sex	Hatch	Death	Age (cy)	Origin (release site / territory / country)	Zone	Territory (2021)	Identification
<b>Central Alpine range</b>									
Pep-Albula	W119	m	2013		9	Albula		Schnals (ITA)	r
Albula2021	W403	u	2021		1	Albula		Albula (CHE)*	r
Bergün2021	W407	u	2021		1	Bergün		Bergün (CHE)*	r
Buffalora2021	W381	u	2021		1	Buffalora		Buffalora (CHE)*	r
Foraz2021	W410	u	2021		1	Foraz		Foraz (CHE)*	r
Maloja2021	W376	u	2021		1	Maloja		Maloja (CHE)*	r
Heinz-Serraglio	W45	m	2007		15	Ofenpass		Zebbru (ITA)	r,o,i
Ofenpass2021	W415	u	2021		1	Ofenpass		Ofenpass (CHE)*	r
Ova Spin2021	W380	u	2021		1	Ova Spin		Ova Spin (CHE)*	r
Pontresina2021	W388	u	2021		1	Pontresina		Pontresina (CHE)*	r
Poschiavo2021	W387	u	2021		1	Poschiavo		Poschiavo (CHE)*	r
Sinestra2021	W405	u	2021		1	Sinestra		Sinestra (CHE)*	r
Tantermozza2021	W384	u	2021		1	Tantermozza		Tantermozza (CHE)*	r
Tinizong2021	W390	u	2021		1	Tinizong		Tinizong (CHE)*	r
Trupchun2021	W395	u	2021		1	Trupchun		Trupchun (CHE)*	r
Ingenius	621	m	2010		12	Calfeisen, Vaettis		Buffalora (CHE)	r,i
Madagaskar	665	m	2011		11	Calfeisen, Vaettis		Lechtal (AUT)	r
Noel-Leya	797	m	2014		8	Calfeisen, Vaettis			o,i,t
Schils	802	m	2014		8	Calfeisen, Vaettis			i,t
Ewolina	838	f	2015		7	Melchsee-Frutt	CHE		t
Sempach 2	841	f	2015		7	Melchsee-Frutt			o
Cierzo	899	m	2016		6	Melchsee-Frutt			t
Finja	1003	f	2018		4	Melchsee-Frutt			o,t
Fredueli	1001	m	2018		4	Melchsee-Frutt			o,i,t
Fortunat	1068	m	2020		2	Melchsee-Frutt			o,i,t
Luzerna	1071	f	2020		2	Melchsee-Frutt			t
BelArosa	1119	m	2021		1	Melchsee-Frutt	Central		o,t
Donna Elvira	1117	f	2021		1	Melchsee-Frutt			o,t
Moische	146	f	1991		31	NP Engadin, Zernez		Livigno (ITA)	r,i
Jo	169	f	1992		30	NP Engadin, Zernez		Ortler (ITA)	r,i
Cic	186	m	1993		29	NP Engadin, Zernez		Livigno (ITA)	r,i
Tell	283	m	1997		25	NP Engadin, Zernez		Valle del Braulio (ITA)	r,o,i
Gildo	299	f	1998		24	NP Engadin, Zernez			o
Veronika	321	f	1999		23	NP Engadin, Zernez			t
Felice	375	f	2001		21	NP Engadin, Zernez		Zebbru (ITA)	r,i
Thuri	424	f	2003		19	NP Engadin, Zernez		Sardières (FRA)	r
Folio	463	f	2005		17	NP Engadin, Zernez		Maloja (CHE)	r
Natura	464	f	2005		17	NP Engadin, Zernez		Lechtal (AUT)	r
Blick	524	m	2007		15	NP Engadin, Zernez		Planeil (ITA)	r
Samuel	526	m	2007		15	NP Engadin, Zernez		Sinestra (CHE)	r,i
Livigno	W08	m	2000		22	Livigno		Ofenpass (CHE)	r,i
Moische-Livigno	W11	f	2002		20	Livigno		Sinestra (CHE)	r,i
Urbano	W122	m	2013		9	Livigno		Trupchun (CHE)	r
Penti2020	W349	f	2020		2	Livigno			o,i,t
Friday For Flying - Livigno	W396	m	2021		1	Livigno		Livigno (ITA)*	r,i,t
Martina2021	W398	u	2021		1	Martina		Martina (CHE)*	r
Trafoi2021	W406	u	2021		1	Ortler		Ortler (ITA)*	r
Sieglinde	W420	u	2021		1	Planeil	ITA	Planeil (ITA)*	r,i
Schnals2021	W400	u	2021		1	Schnals		Schnals (ITA)*	r
Martello2021	W401	u	2021		1	Val Martello		Val Martello (ITA)*	r
Diana-Stelvio	W07	f	2000		22	Valle del Braulio		Albula (CHE)	r,i
Germano - Braulio	W379	u	2021		1	Valle del Braulio		Valle del Braulio (ITA)*	r,i
Zebbru	W12	m	2002		20	Zebbru		Tantermozza (CHE)	r
Rimani	W93	f	2011		11	Zebbru		Chambeyron-Ubayette (FRA)	r,i
Severino-Zebbru	W372	m	2021		1	Zebbru		Zebbru (ITA)*	r,o,i,t

Table 12. List of all birds that have been identified in 2021 with "origin" in the northern and southern Alpine range. Wild-hatched birds are marked with a prefixed "W" or "GT" in the BirdID. "Identification" describes the data basis that was used for their record: r = reproduction, i = IOD, t = telemetry, o = observation. Sorted by their region of origin (territory or release site). \* = territory of hatch from juvenile birds from 2021.

Name	BirdID	Sex	Hatch	Death	Age (cy)	Origin (release site / territory / country)	Zone	Territory (2021)	Identification
<b>North- and south-western Alpine range</b>									
Mison	W230	f	2017		5	Bagnes			o,t
Michel	W414	u	2021		1	Coude du Rhône		Coude du Rhône (CHE)*	r
Derborence_down2021	W377	u	2021		1	Derborence_down		Derborence_down (CHE)*	r
Kandersteg2021	W422	u	2021		1	Kandertal	CHE	Kandertal (CHE)*	r,i
Leukerbad2021	W374	u	2021		1	Leukerbad		Leukerbad (CHE)*	r
Saas2021	W375	u	2021		1	Saas		Saas (CHE)*	r
Sionne2021	W383	u	2021		1	Sionne		Sionne (CHE)*	r
Zermatt2021	W402	u	2021		1	Zermatt		Zermatt (CHE)*	r
Andagne2021	W419	u	2021		1	Andagne		Andagne (FRA)*	r
Neige	W198	m	2016		6	Aravis			o,t
Gypsy	W209	m	2017		5	Aravis			o,t
Phenix Alp Action	W01	m	1997		25	Bargy		Bargy (FRA)	r
Gemapi	W196	f	2016		6	Bargy			t
Lapie	W251	m	2018		4	Bargy			t
Pierro	W301	m	2019		3	Bargy			o,t
Vidoc	W356	u	2020		2	Bargy			t
Sunny	W397	m	2021		1	Bargy	FRA	Bargy (FRA)*	r,o,i,t
Belle etoile	W394	f	2021		1	Bargy BIS		Bargy BIS (FRA)*	r,o
Bourg-Saint-Maurice2021	W423	u	2021		1	Bourg-Saint-Maurice		Bourg-Saint-Maurice (FRA)*	r
Altitude	W313	f	2019		3	Peisey-Nancroix			t
Bellecote	W361	u	2020		2	Peisey-Nancroix			t
Sixt Buet	W285	f	2019		3	Sixt Fiz			t
Prazon-sixt-fer-a-cheval	W346	u	2020		2	Sixt Fiz			o,t
Termignon2021	W424	u	2021		1	Termignon		Termignon (FRA)*	r
Pablo	359	m	2000		22	Haute-Savoie, Bargy		Derborence_Vérouet (CHE)	r
Chamoussière2021	W408	u	2021		1	Chamoussière		Chamoussière (ITA)*	r
Chateaux	W413	u	2021		1	Usseglio		Usseglio (ITA)*	r,o,i
Rhemes2021	W409	u	2021		1	Val di Rhemes	ITA	Val di Rhemes (ITA)*	r
Valdigne2021	W411	u	2021		1	Valdigne		Valdigne (ITA)*	r
Valnontey2021	W399	u	2021		1	Valnontey		Valnontey (ITA)*	r
Vignemale	W391	u	2021		1	Bonette		Bonette (FRA)*	r,i
Adrechoun	W378	u	2021		1	Chambeyron-Ubayette		Chambeyron-Ubayette (FRA)*	r,i
Emparis	W284	f	2019		3	Malaval			o,t
Edelweiss	W373	u	2021		1	Malaval		Malaval (FRA)*	r
Cassiopée	W385	u	2021		1	Source de l'Ubaye		Source de l'Ubaye (FRA)*	r
Girun	904	f	2016		6	Baronnies, Léoux Valley			t
Volcaire	905	m	2016		6	Baronnies, Léoux Valley			o
Léoux	950	f	2017		5	Baronnies, Léoux Valley			o,t
Clapas	975	m	2018		4	Baronnies, Léoux Valley			o
Simay	983	m	2018		4	Baronnies, Léoux Valley			o,t
Carmen	1027	f	2019		3	Baronnies, Léoux Valley			o,t
Pamela	1031	f	2019		3	Baronnies, Léoux Valley			o,i,t
Angèle	1058	m	2020	26.05.21	1	Baronnies, Léoux Valley			o,t
Guillaumes	411	f	2003		19	PN du Mercantour, Vignols	FRA	Derborence_Vérouet (CHE)	r
Fontvieille	520	f	2007		15	PN du Mercantour, Vignols		Valnontey (ITA)	r
Rocca	516	m	2007		15	PN du Mercantour, Vignols		Source de la Tinée (FRA)	r,i
Tenao	755	m	2013		9	PN du Mercantour, Vignols		Val d'Entraunes (FRA)	r,i,t
Stephan	616	m	2010		12	PNR Vercors, Trechenu-Creyers		Chambeyron-Ubayette (FRA)	r,i
Bellemotte	708	f	2012		10	PNR Vercors, Trechenu-Creyers		Bonette (FRA)	r,i
Gerlinde	759	f	2013		9	PNR Vercors, Trechenu-Creyers		Archiane (FRA)	r
Kirsi	764	m	2013		9	PNR Vercors, Trechenu-Creyers			o,i
Elvio	1026	m	2019		3	PNR Vercors, Trechenu-Creyers			o,t
Mistral	1022	m	2019		3	PNR Vercors, Trechenu-Creyers			o,i,t
Kobalann	1063	f	2020		2	PNR Vercors, Trechenu-Creyers			o,i,t
Palo-Pala	1062	m	2020	16.02.21	1	PNR Vercors, Trechenu-Creyers			o,t
Novo	1098	m	2021		1	PNR Vercors, Trechenu-Creyers			o,i,t
Telemark	1101	m	2021		1	PNR Vercors, Trechenu-Creyers			o,t
Sereno	348	m	2000		22	PN Alpi Marittime, Argentera		Source de l'Ubaye (FRA)	r,i
Michegabri	488	m	2006		16	PN Alpi Marittime, Argentera		Chamoussière (ITA)	r,i
Girasole	549	f	2008		14	PN Alpi Marittime, Argentera	ITA	Source de la Tinée (FRA)	r,i
Nonno Bob	548	m	2008		14	PN Alpi Marittime, Argentera			i
Italia 150	660	m	2011		11	PN Alpi Marittime, Argentera		Usseglio (ITA)	r,o,i
Roman	854	m	2015		7	PN Alpi Marittime, Argentera		Maira (ITA)	r,o,i,t

Table 13. List of all birds that have been identified in 2021 with “origin” in the Massif Central (FRA) and the French Pyrenees, in Maestrazgo (ESP) and on Corsica (FRA). Wild-hatched birds are marked with a prefixed “W” or “GT” in the BirdID. “Identification” describes the data basis that was used for their record: r = reproduction, i = IOD, t = telemetry, o = observation. Sorted by their region of origin (territory or release site). \* = territory of hatch from juvenile birds from 2021.

Name	BirdID	Sex	Hatch	Death	Age (cy)	Origin (release site / territory / country)	Zone	Territory (2021)	Identification
<b>Massif Central</b>									<b>13</b>
Layrou	761	m	2013		9	Grands Causses, Trévezel		Jonte amont (FRA)	r,o,i,t
Calandreto	948	m	2017		5	Grands Causses, Trévezel			o
Eglazine	1069	f	2020		2	Grands Causses, Trévezel			o,t
Fario	1079	f	2020		2	Grands Causses, Trévezel			o,t
Ophrys	1078	f	2020		2	Grands Causses, Trévezel			o,i,t
Peyre	1116	m	2021		1	Grands Causses, Trévezel			o,t
Pradines	1122	f	2021		1	Grands Causses, Trévezel	FRA		o,i,t
Pyrenees	1094	f	2021		1	Grands Causses, Trévezel			o,i,t
Basalte	716	m	2012		10	Grands Causses,Frépestel		Malaval (FRA)	r,o
Adonis	794	m	2014		8	Grands Causses,Frépestel		Jonte amont (FRA)	r,o,i
Cévennes	1032	m	2019		3	Grands Causses,Frépestel			o,t
Aven	1067	f	2020		2	Grands Causses,Frépestel			o,i,t
Roc Genèse		m	2016		6	Pyrenees		Pyrenees	t
<b>Maestrazgo</b>									<b>8</b>
Alos	992	m	2018		4	Tinença de Benifassà			t
Amic	995	m	2018		4	Tinença de Benifassà			t
Bassi	1033	m	2019		3	Tinença de Benifassà			t
Boira	1040	f	2019		3	Tinença de Benifassà			t
Celest	1073	f	2020		2	Tinença de Benifassà	ESP		t
Dalila	1109	f	2021		1	Tinença de Benifassà			i,t
Dena	1104	f	2021		1	Tinença de Benifassà			i,t
Durall	1103	m	2021	13.08.21	1	Tinença de Benifassà			t
<b>Corsica</b>									<b>6</b>
Muntagnolu	890	m	2016		6	Corsica, Niolo Valley			t
Luna	959	f	2017		5	Corsica, Niolo Valley			t
Cintu	1042	m	2019		3	Corsica, Niolo Valley	FRA	Corsica	t
Orba	1041	f	2019		3	Corsica, Niolo Valley			t
Spinella	1096	f	2021		1	Corsica, Niolo Valley			t
Urcula	1099	f	2021	15.06.21	1	Corsica, Niolo Valley			t

## 7.4 Population estimate based on IOD 2021

On this year's Focal Day on the 2<sup>nd</sup> of October, almost 1'300 observers were able to benefit from mostly favourable weather conditions and thus contribute to the 16<sup>th</sup> annual Bearded Vulture census. Although a small proportion of observers located south of the main Alpine ridge faced unsuitable weather conditions (16%), visibility was mainly good (77%) or moderate (7%) and allowed for 927 Bearded Vulture observations at 311 of the 748 (42%) occupied sites. 18 IBM-partners and several associated organisations coordinated synchronous observations at 726 sites on the focal day and 22 more during the IOD period. Furthermore, these experts are familiar with the local situation and are key to give an estimate about the population size in their region and also to identify individual birds. This made it possible to compile, evaluate and summarise the observations and estimates over the monitoring area in order to get an overview of the age class distribution and to compare the estimates on the alpine scale with the predicted population size from demographic modelling (Schaub et al. 2009).

The Alpine population was estimated to vary between 284 and 381 individuals. This is slightly lower than the model<sup>1</sup> estimate of 380 individuals. However, similar as in the previous years, the estimated age class distribution is well in line with the predicted values of the demographic model<sup>1</sup> with a slight underestimate of the number of subadult birds, which are difficult to identify correctly in the field (estimated age class distribution: 57% adults, 6% subadults, 18% immature, 14% juveniles). The population estimate and the age class distribution are based on observation data collected during the focal day combined with the estimated number of individuals that have not been observed but are supposed to be present in the specific region (territorial birds, in some exceptional cases their fledglings, GPS-tagged birds (N = 62 in 2021) etc.).

The small population of the Massif Central is estimated to vary between 7-13 individuals, and around 7 individuals have been estimated to be present in the Aude region in the French Pyrenees. In Spain, outside of the Pyrenees, Bearded Vulture populations haven't been estimated to vary between 3 and 4 individuals in Maestrazgo and 21-33 in Andalusia and Rioja. Similar as in the last years, no Bearded Vultures have been observed in Bulgaria where the species has been considered extinct since 1972.

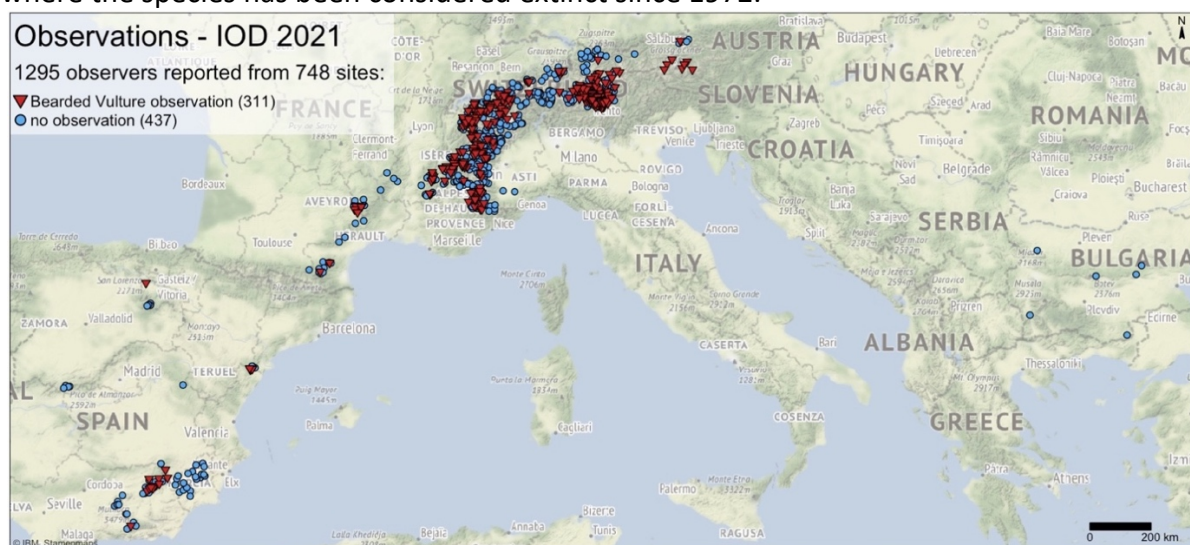


Figure 8. Distribution of all 748 observation sites during the IOD 2021 in Europe. Red triangles depict those sites where Bearded Vultures have been observed at least once during the IOD period 2<sup>nd</sup>-9<sup>th</sup> of October 2021 (N=311) while no observations have been reported from sites marked with a blue dot (N=437).

\*\* The complete IOD 2021 report can be found online on [www.gyp-monitoring.com](http://www.gyp-monitoring.com) \*\*

## 8 Markings

Individual based monitoring makes the International Bearded Vulture Monitoring unique among monitoring projects of this scale. By the end of 2021, more than 80'800 Bearded Vulture observations were stored in the IBM-database, ~30% of them from identified individuals. The marking of released and wild-hatched birds is of major importance to follow the life history and reveal the behavioural patterns of the individuals in order to understand the demography and track the development of the reintroduction process. Therefore, young Bearded Vultures are marked with rings (chapter 8.1), some feathers are bleached (chapter 8.2) as well as GPS-tags (chapter 8.3) before they are released into the wild (Figure 10).

### 8.1 Rings

Due to the limited number of two-digit alphanumeric codes and the rare possibilities to actually decipher a ring code in the field, the IBM-steering-committee has decided to use coloured aluminium rings with a two-digit code for ringing starting in 2021. The colours are intended to facilitate identification without the need to decipher the code. In addition, the combination of numbers and colours provides more options for individual rings, which will allow this system to continue for the next years.

This adaptation has further improved the existing marking system, because apart from the colours, the rings remain the same as in the previous years. Newly, the colour of the right ring can also be used to identify whether the animal was ringed in an odd year (red, orange, purple) or an even year (blue, green, black).

Two rings with inverted identical codes but different orientation were used in 2021. This inversion improves legibility, as it is more likely to be able to read both characters of the code. The right aluminium ring is marked with a country-specific code of the national ringing centre (Table 14), while the left IBM-ring is marked with the two-digit code and IBM-contact details.



Figure 9: IBM-ringing system since 2021: 2 Aluminium rings in the six colours red, orange, purple, blue, green and black with large two-digit code and a smaller engraving for the national code (right) and aluminium standard IBM-engraving (left) facing up.

*Table 14: Engravings for the country-specific national code (####) and the IBM-standard ring.*

<b>Country</b>	<b>Right aluminium ring</b>	<b>Left aluminium ring</b>
AUT	AB#### KLIVV.AT AB#### KLIVV.AT	Contact ibm@4vultures.org
CHE	Vogelwarte Helvetia Sempach GYP####	Contact ibm@4vultures.org
DEU	Radolfzell Germania www.ring.ac AAB###	Contact ibm@4vultures.org
ESP	Contact ibm@4vultures.org	Contact ibm@4vultures.org
FRA	Museum Paris TZ#### 4vultures.org	Contact ibm@4vultures.org
ITA	INFS OZZANO (BO) ITALY MC#### ring.ac	Contact ibm@4vultures.org

## 8.2 Markings 2021

### 8.2.1 Released birds<sup>3</sup>

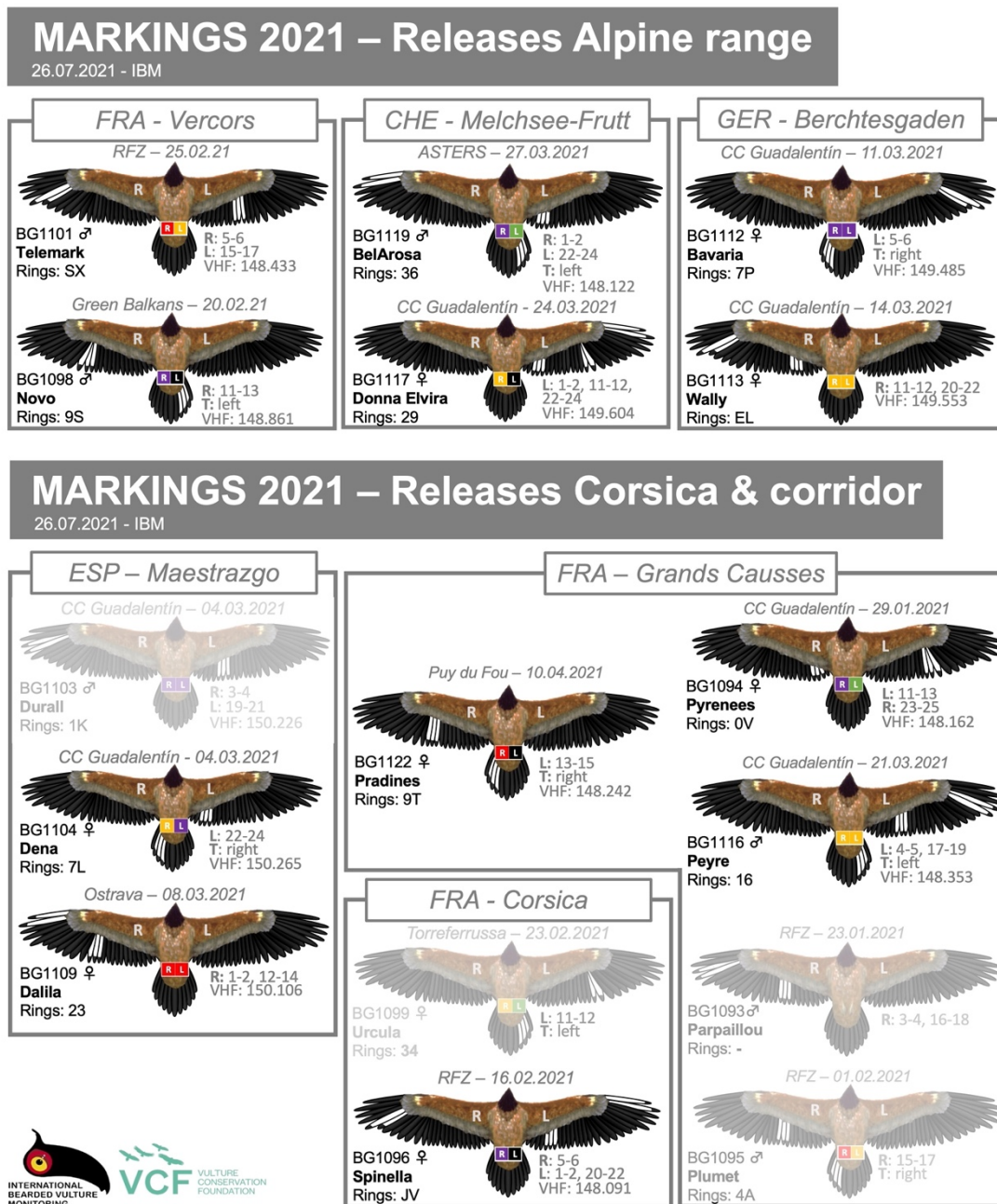


Figure 10: Marking patterns of 16 Bearded Vultures released in 2021.

<sup>3</sup> Download this file on: [www.gyp-monitoring.com](http://www.gyp-monitoring.com) --> Downloads --> Marking pattern





**BRINZAL**

Ala derecha: 13, 14 (Secundarias 3, 4)  
 Anilla izquierda: 2L Azul  
 Anilla derecha: 2L Naranja  
 Sexo: Hembra



**FAPAS**

Ala derecha: 2, 3 (Primarias 8, 9)  
 Ala izquierda: 2, 3 (Primarias 8, 9)  
 Anilla izquierda: 9E Roja  
 Anilla derecha: 9E Morada



**GREFA**

Ala izquierda: 13, 14 (Secunda. 3, 4), 20, 21, 22 (Secunda. 10, 11, 12)  
 Anilla izquierda: 17 Naranja  
 Anilla derecha: 17 Morada  
 Sexo: Hembra



**ADENEX**

Ala derecha: 13, 14 (Secunda. 3, 4), 20, 21, 22 (Secunda. 10, 11, 12)  
 Anilla izquierda: 0T Verde  
 Anilla derecha: 0T Naranja  
 Sexo: Hembra



**QUERCUS**

Ala izquierda: 2, 3 (Prima. 8, 9), 20, 21, 22 (Secund. 10, 11, 12)  
 Anilla izquierda: 6E Azul  
 Anilla derecha: 6E Roja  
 Sexo: Macho



**SEO**

Ala derecha: 13, 14 (Secundarias 3, 4)  
 Ala izquierda: 2, 3 (Primarias 8, 9)  
 Anilla izquierda: 3K Naranja  
 Anilla derecha: 3K Roja  
 Sexo: Macho



**DEPANA**

Ala derecha: 13, 14 (Secundarias 3, 4)  
 Ala izquierda: 13, 14 (Secundarias 3, 4)  
 Anilla izquierda: 6P Verde  
 Anilla derecha: 6P Morada  
 Sexo: Macho



**PANDA**

Ala derecha: 2, 3 (Primarias 8, 9) 13, 14 (Secundarias 3, 4)  
 Ala izquierda: 13, 14 (Secundarias 3, 4)  
 Anilla izquierda: JK Roja  
 Anilla derecha: JK Roja  
 Sexo: Macho

Figure 11. Markings of 8 birds released in Andalusia in 2021. Corresponding BG-numbers: Brinzal (BG1100), Fapas (BG1102), Grefa (BG1107), Adenex (BG1110), Quercus (BG1111), Seo (1118), Depana (BG1121) and Panda (BG1123).

### 8.2.2 Wild-hatched birds

The IBM-network plans to intensify its efforts to mark wild hatched animals in the future, as marking of wild hatchlings delivers insight into their behaviour and survival and which are keystone factors to follow and understand the developments of the Bearded Vulture reintroduction project. In 2021 six wild-hatched birds have been marked in Spain (3), Italy (2) and France (1) (Figure 12 and Figure 13).

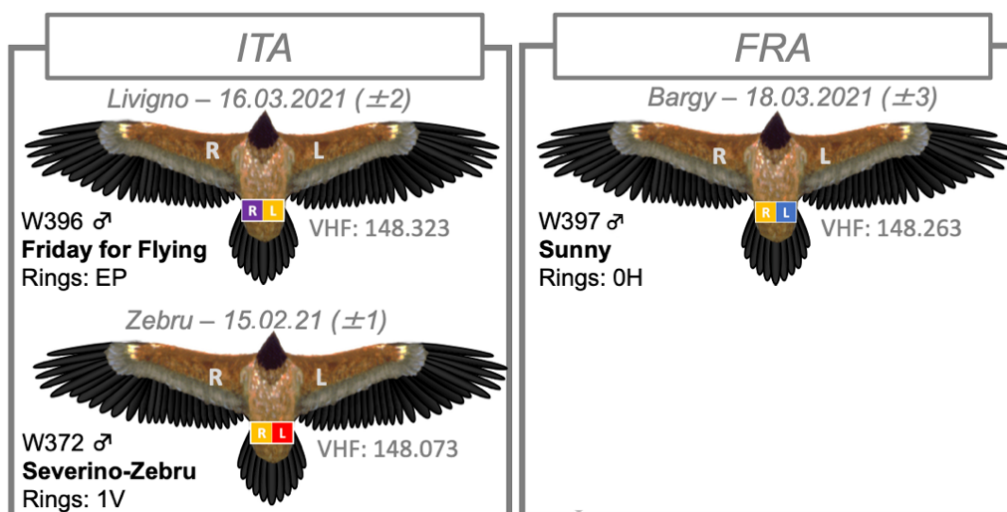


Figure 12. Three wild-hatched birds have been marked with GPS/GSM tags and coloured rings in 2021 in the Alpine range.



**BONI**

Ala izquierda: 2, 3 (Primarias 8, 9)  
 Anilla izquierda: 9H Roja  
 Anilla derecha: Metálica Oficial Ministerio  
 Sexo: Macho  
 Origen: Hijo de Encina y Bigup



**LOPEZOSA**

Ala derecha: 2, 3 (Primarias 8, 9)  
 Anilla izquierda: AH Azul  
 Anilla derecha: Metálica Oficial Ministerio  
 Sexo: Macho  
 Origen: Hijo de Blimunda v Tono



**CAPITEL**

Ala izquierda: 13, 14 Secundarias 3, 4)  
 Anilla izquierda: 04 Negra  
 Anilla derecha: Metálica Oficial Ministerio  
 Sexo: Hembra  
 Origen: Hijo de Marchena y Hortelano

Figure 13. Another three wild hatchling were marked by the Junta de Andalusia. Corresponding BG-numbers: Boni (W427), Lopezosa (W428) and Capitel (W429).

### **8.3 GPS-tagged birds in 2021**

In order to gain insight into their life history, the first wild fledglings were ringed in Haute Savoie, France in 2013. Modern monitoring methods, such as GPS-tags, have been continuously developed and well-proven with the reintroduced Bearded Vultures. Such data provide valuable information on mortality (dropout) cases and the spatial behaviour of the released birds. With successful natural reproduction, the proportion of wild-hatched Bearded Vultures in the population is steadily increasing.

In order to gain knowledge about the spatial behaviour of wild-hatched birds, it was therefore decided to mark two wild fledglings (Neige and Gemapi) with GPS-tags for the first time in 2016. Since then, another 18 wild-hatched juveniles (2 in 2017, 5 in 2018, 4 in 2019, 7 in 2020) were marked with a GPS-tag and in 2021 it was even possible to mark 6 wild-hatched individuals (Friday for Flying – Livigno, Severino Zebbru, Sunny, Boni, Lopezosa, Capitel); see Figure 12).

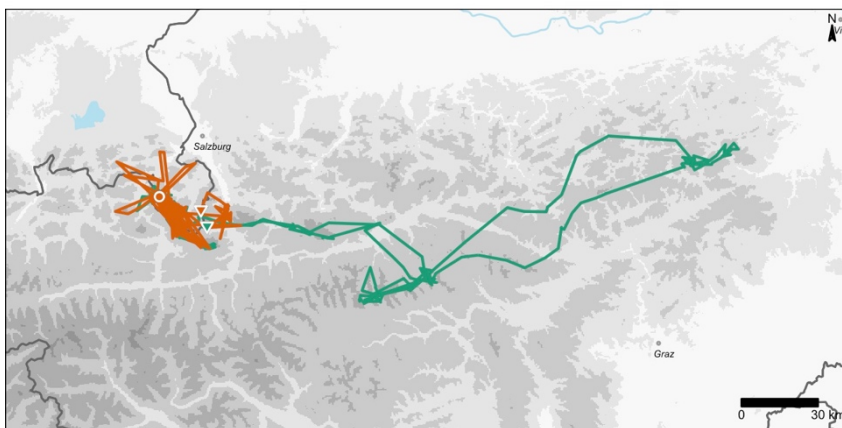
In total, movements of 71 Bearded Vultures (16 wild-hatched and 56 released birds) were followed by GPS-tracking and stored in the WildlifeMonitor in 2021 (Table 15). Besides sixteen adult birds, most of the tagged birds are non-adult individuals. With 35 males, 32 females and 4 unknowns the sex-ratio is fairly balanced.

### **8.4 Lost GPS-tags**

#### **8.4.1 Lea (BG0840)**

Lea, which was released in 2015 in the Nationalpark Hohe Tauern has lost the tag. On the 01.08.2021, the GPS data showed no movement. The broken tag was found later and we now know that Lea is one of the breeding birds in Prägraten (2022).

### 8.5 GPS-trajectories 2021 by region

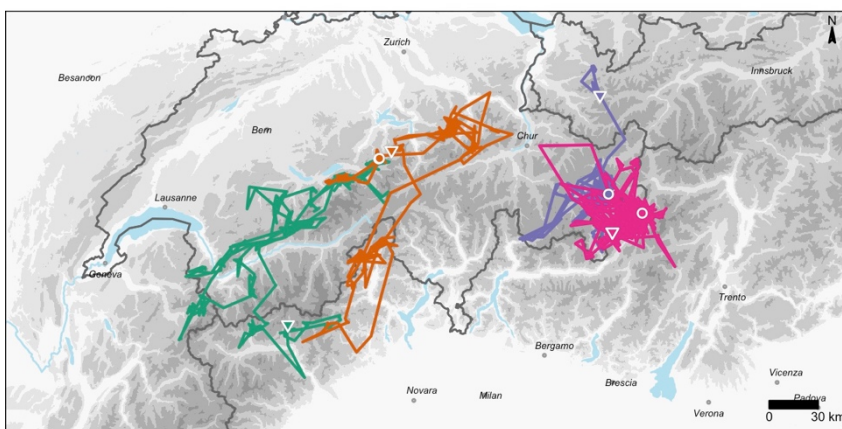


#### Eastern Alps

GPS-data 2021

- Bavaria (released - 2021)
- Wally (released - 2021)

- ▼ end
- start

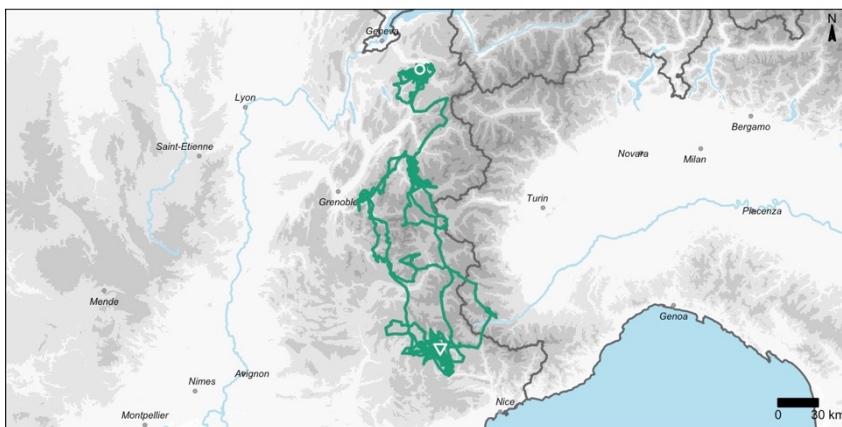


#### Central Alps

GPS-data 2021

- BelArosa (released - 2021)
- Donna Elvira (released - 2021)
- Friday For Flying - Livigno (wild - 2021)
- Severino-Zebbru (wild - 2021)

- ▼ end
- start

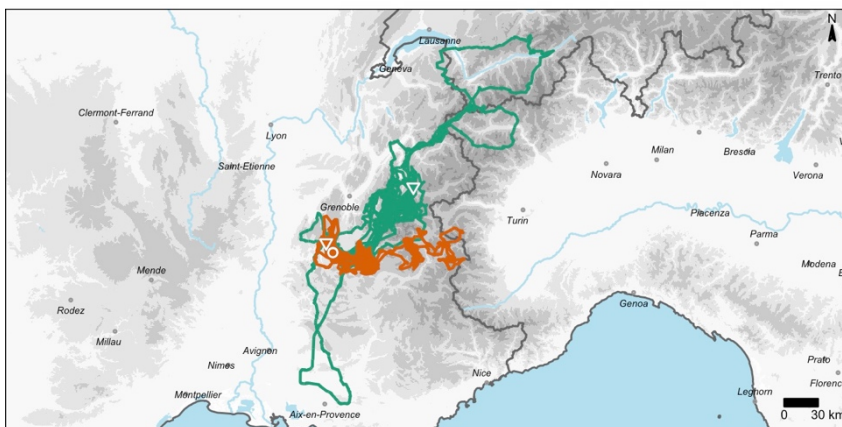


#### North-western Alps

GPS-data 2021

- Sunny (wild - 2021)

- ▼ end
- start



#### South-western Alps

GPS-data 2021

- Novo (released - 2021)
- Telemark (released - 2021)

- ▼ end
- start

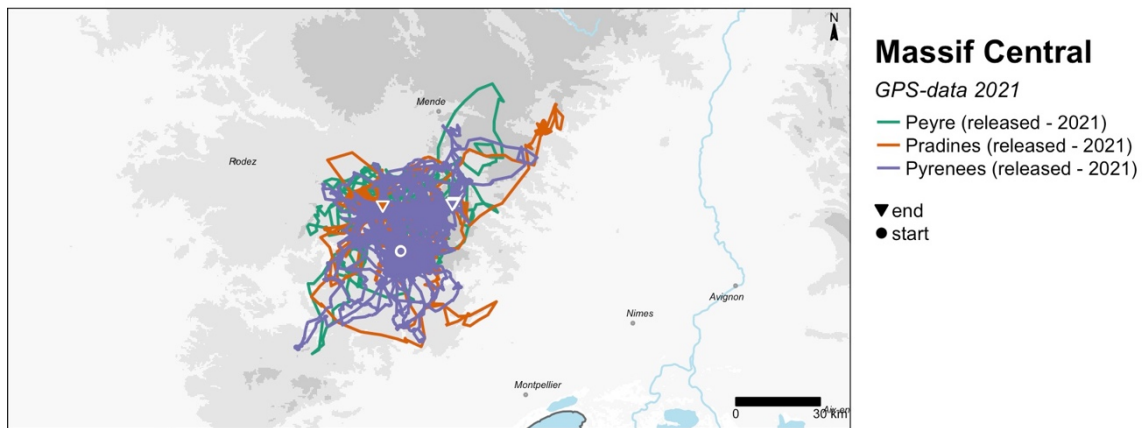


Figure 14. GPS-trajectories of 12 birds that have been marked with GPS in 2021. The data of the Corsican birds is not included as one had to be recaptured only two weeks after the first flight (*Spinella*) or died just few days after (*Urcula*).

### 8.6 Extraordinary excursion

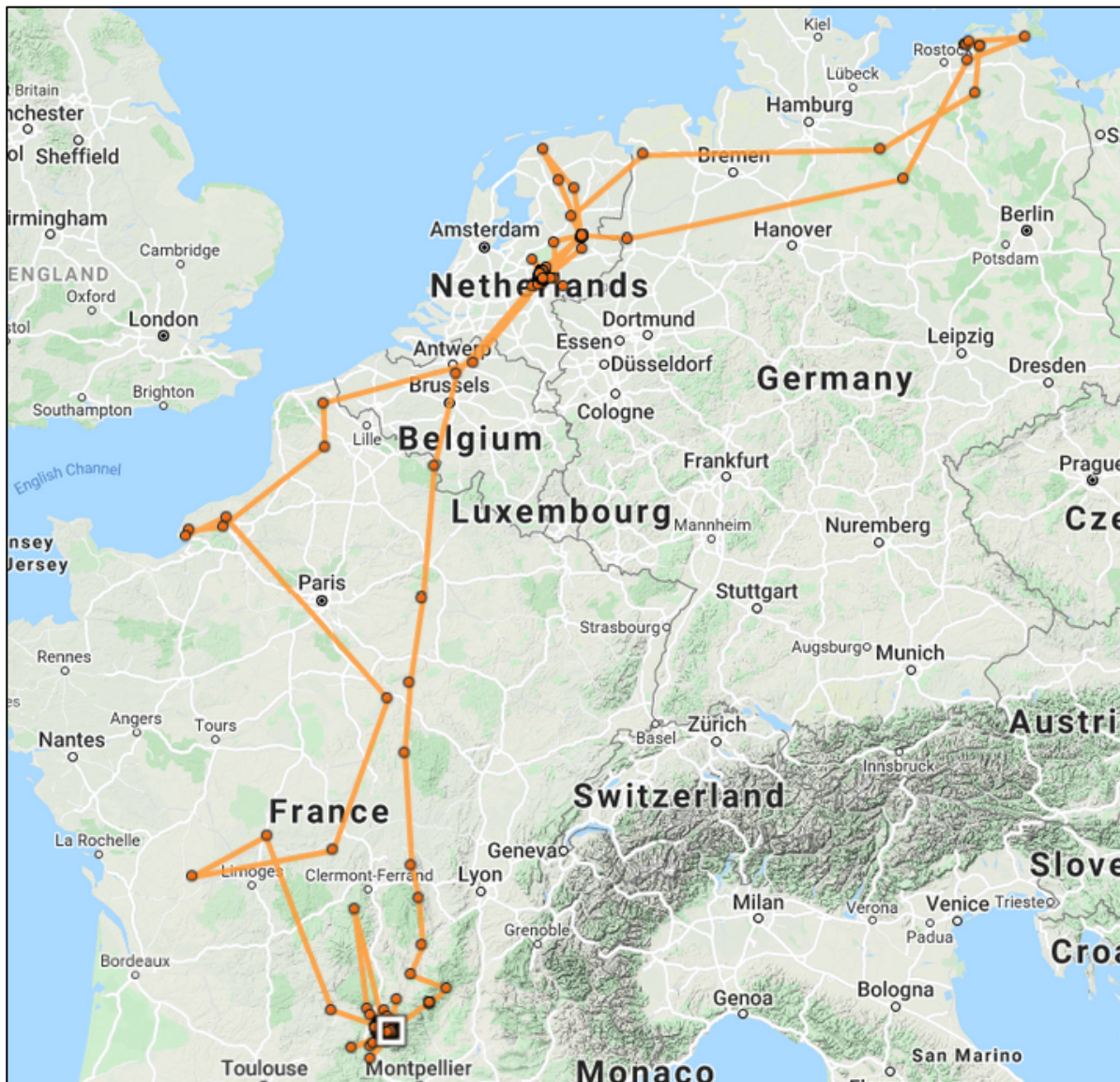


Figure 15. Eglazine's (BG1096) excursion to North (BEL, NDL, GER) 09.04. – 10.10.2021. This is the first evidence of a bird with a GPS tag to spend several months in Northern Europe, mainly in the Netherlands.

Table 15: 71 birds from different age classes could be followed by GPS during 2021 thanks to the support by partner organisations. minDT and maxDT represent the day of the first and last location in 2021 respectively. The number of obtained localisations varies considerably among individuals (2 – 907/397 positions) and mainly depends on tag type used, age of the tag and battery charge level.

Animal	BirdID	Sex	Hatch	Place release	minDT	maxDT	Days with locations	Tracking end	Locations total
Bavaria	1112	f		Berchtesgaden, Halsgrube (GER)	08.07.21	25.11.21	141	Temp. tag failure	806
BelArosa	1119	m		Melchsee-Frutt (CHE)	20.07.21	31.12.21	165		1'321
Dalila	1109	f		Tinença de Benifassà (ESP)	04.07.21	31.12.21	181		1'352
Dena	1104	f		Tinença de Benifassà (ESP)	09.07.21	31.12.21	176		1'313
Donna Elvira	1117	f		Melchsee-Frutt (CHE)	23.07.21	31.12.21	162		1'367
Durall	1103	m		Tinença de Benifassà (ESP)	10.07.21	13.08.21	35	Mortality	295
Friday For Flying - Livigno	W396	m		wild-hatched	05.07.21	31.12.21	180		1'038
Novo	1098	m		PNR Vercors, Trechenu-Creyers (FRA)	19.06.21	31.12.21	196		1'221
Peyre	1116	m	2021	Grands Causses, Trévezel (FRA)	10.08.21	31.12.21	144		1'302
Pradines	1122	f		Grands Causses, Trévezel (FRA)	19.08.21	31.12.21	135		1'126
Pyrenees	1094	f		Grands Causses, Trévezel (FRA)	25.05.21	31.12.21	221		1'831
Severino-Zeburu	W372	m		wild-hatched	16.06.21	31.12.21	199		1'281
Spinella	1096	f		Corsica, Niolo Valley (FRA)	29.06.21	15.07.21	17	Recapture	113
Sunny	W397	m		wild-hatched	27.07.21	31.12.21	158		1'099
Telemark	1101	m		PNR Vercors, Trechenu-Creyers (FRA)	23.06.21	31.12.21	192		1'346
Urcula	1099	f		Corsica, Niolo Valley (FRA)	12.06.21	16.06.21	5	Mortality	11
Wally	1113	f		Berchtesgaden, Halsgrube (GER)	12.07.21	31.12.21	169		871
Angèle	1058	m		Baronnies, Léoux Valley (FRA)	01.01.21	26.05.21	146	Mortality	995
Aven	1067	f		Grands Causses,Frépestel (FRA)	01.01.21	31.12.21	350		3'616
Bellecote	W361	u		wild-hatched	01.01.21	31.12.21	347		2'392
Celest	1073	f		Tinença de Benifassà (ESP)	01.01.21	31.12.21	347		3'181
Eglazine	1069	f		Grands Causses, Trévezel (FRA)	01.01.21	31.12.21	364		2'513
Fario	1079	f		Grands Causses, Trévezel (FRA)	01.01.21	31.12.21	351		3'847
Fortunat	1068	m		Melchsee-Frutt (CHE)	01.01.21	13.11.21	306	Temp. tag failure	2'121
Kobalann	1063	f	2020	PNR Vercors, Trechenu-Creyers (FRA)	01.01.21	31.12.21	351		2'514
Luzerna	1071	f		Melchsee-Frutt (CHE)	01.01.21	31.12.21	363		2'519
Ophrys	1078	f		Grands Causses, Trévezel (FRA)	01.01.21	31.12.21	348		3'816
Palo-Pala	1062	m		PNR Vercors, Trechenu-Creyers (FRA)	01.01.21	11.02.21	42	Mortality	227
Penti2020	W349	f		wild-hatched	01.01.21	31.12.21	353		2'343
Prazon-sixt-fer-a-cheval	W346	u		wild-hatched	01.01.21	31.12.21	349		2'929
Vidoc	W356	u		wild-hatched	01.01.21	31.12.21	365		3'012
Altitude	W313	f		wild-hatched	01.01.21	31.12.21	364		2'248
Bassi	1033	m		Tinença de Benifassà (ESP)	01.01.21	31.12.21	355		3'815
Boira	1040	f		Tinença de Benifassà (ESP)	01.01.21	31.12.21	357		3'089
Carmen	1027	f		Baronnies, Léoux Valley (FRA)	01.01.21	20.03.21	79	Tag loss	427
Cévennes	1032	m		Grands Causses,Frépestel (FRA)	01.01.21	31.12.21	349		3'907
Cintu	1042	m		Corsica, Niolo Valley (FRA)	01.01.21	31.12.21	347		3'823
Elvio	1026	m	2019	PNR Vercors, Trechenu-Creyers (FRA)	01.01.21	31.12.21	349		2'319
Emparis	W284	m		wild-hatched	01.01.21	31.12.21	360		2'444
Mistral	1022	f		PNR Vercors, Trechenu-Creyers (FRA)	01.01.21	31.12.21	349		2'418
Orba	1041	f		Corsica, Niolo Valley (FRA)	01.01.21	31.12.21	347		3'789
Pamela	1031	f		Baronnies, Léoux Valley (FRA)	01.01.21	31.12.21	352		2'510
Pierro	W301	m		wild-hatched	01.01.21	31.12.21	357		2'373
Sixt Buet	W285	f		wild-hatched	01.01.21	31.12.21	356		2'415
Alos	992	m		Tinença de Benifassà (ESP)	01.01.21	31.12.21	361		2'957
Amic	995	m		Tinença de Benifassà (ESP)	01.01.21	31.12.21	358		3'192
Caeli	998	m		NP Hohe Tauern, Mallnitz (AUT)	01.01.21	31.12.21	363		2'312
Finja	1003	f	2018	Melchsee-Frutt (CHE)	01.01.21	31.12.21	355		2'432
Fredueli	1001	m		Melchsee-Frutt (CHE)	01.01.21	31.12.21	353		2'544
Lapie	W251	m		wild-hatched	01.01.21	31.12.21	356		2'229
Simay	983	m		Baronnies, Léoux Valley (FRA)	01.01.21	31.12.21	363		2'307
Gypsy	W209	m		wild-hatched	01.01.21	31.12.21	352		2'330
Léoux	950	f	2017	Baronnies, Léoux Valley (FRA)	01.01.21	31.12.21	356		1'925
Luna	959	f		Corsica, Niolo Valley (FRA)	01.01.21	31.12.21	358		1'748
Mison	W230	f		wild-hatched	31.01.21	31.12.21	323		1'227
Cierzo	899	m		Melchsee-Frutt (CHE)	01.01.21	31.12.21	221		1'809
Gemapi	W196	f		wild-hatched	01.01.21	31.12.21	360		1'828
Girun	904	f	2016	Baronnies, Léoux Valley (FRA)	10.01.21	31.12.21	267		910
Muntagnolu	890	m		Corsica, Niolo Valley (FRA)	01.01.21	31.12.21	357		1'546
Neige	W198	m		wild-hatched	26.01.21	27.12.21	270		947
Roc Genèse		m		wild-hatched	01.01.21	31.12.21	341		1'871
Ewolina	838	f		Melchsee-Frutt (CHE)	01.01.21	26.12.21	175		287
Fortuna	843	m	2015	NP Hohe Tauern, Dorfertal (AUT)	01.01.21	31.12.21	358		1'998
Lea	840	m		NP Hohe Tauern, Dorfertal (AUT)	01.01.21	31.07.21	205	Tag loss	1'245
Roman	854	m		PN Alpi Marittime, Argentera (ITA)	01.01.21	31.12.21	277		809
Felix2	793	m		NP Hohe Tauern, Debanttal (AUT)	01.01.21	28.12.21	134		348
Noel-Leya	797	m	2014	Calfeisen, Vaettis (CHE)	01.01.21	02.01.21	1	Temp. tag failure	2
Schils	802	m		Calfeisen, Vaettis (CHE)	01.01.21	31.12.21	314		2'135
Layrou	761	m	2013	Grands Causses, Trévezel (FRA)	01.01.21	31.12.21	339		2'587
Tenao	755	m		PN du Mercantour, Vignols (FRA)	01.01.21	31.12.21	339		918
Veronika	321	f	1999	NP Engadin, Zernez (CHE)	01.01.21	31.12.21	349		1'655

## 9 Dropouts

Dropouts include all incidents where individuals have been removed from the population (mortality, recapture). This also applies to birds that have been recaptured and could be released again. A recapture is in any case the last solution, which is why it must be assumed that these birds would not have survived without human intervention and would have died under natural conditions. However, if a hatchling dies at less than 80 days of age, this loss is referred to as breeding failure and it is therefore not included in the dropout statistics (see IBM-standard, chapter 4.2).

Mortalities of 12 Bearded Vultures have been reported in 2021: in France (5), Switzerland (2), Spain (4) and in the Netherlands (Angèle) (Figure 16). At least four birds died as a result of anthropogenic influences: the adult bird from Sardières was found poisoned together with the hatchling (FRA), the immature bird Angèle collided with a wind mill in the Netherlands (NDL), the juvenile Palo-Pala died in captivity after electrocution (ITA) and Parpaillou and Plumet both showed liver damages from an accidentally intoxication with disinfectants in the transport box (evaporation through the air).

Although much effort is invested in the search for, and investigation of dead animals, the reason of dropout remains unclear in the case of Urcula (FRA). With 9 released and 4 wild-hatched dropout cases in their first two years of life it becomes clear that young Bearded Vultures in particular are exposed to various threats in the wild.

However, thanks to the close monitoring and quick intervention of the IBM partners and the regional coordinators, it was possible to recapture the juvenile Spinella shortly after her release on Corsica. Spinella had an accident and had a broken leg. The bird will remain in captivity and will be included in the EEP-breeding network.

*Table 16: List of all 13 reported dropouts from 2021. \* Even though Parpaillou died due to injuries from a predation event, the bird showed the same intoxication damages from disinfectant as Plumet and would probably have died a few days later due to a liver pathology.*

Name	BirdID	Bird type	Age [cy]	Dropout	Date	Country	Reason	Classification
Palo-Pala	1062	released	1	mortality	16.02.21	ITA	electrocution	anthropogenic
Christoph-Ofenpass	W150	wild hatched	8	mortality	04.04.21 (±90)	CHE	avalanche	natural
Aithon-Ofenpass	W305	wild hatched	3	mortality	06.04.21 (±90)	CHE	avalanche	natural
Adult Sardières	-	wild hatched	adult	mortality	19.04.21	FRA	poison	anthropogenic
Trashumancia	1025	released	3	mortality	26.04.21	ESP	electrical storm	natural
Vainilla	1029	released	3	mortality	26.04.21	ESP	electrical storm	natural
Jovan	W303	wild hatched	3	mortality	26.04.21	ESP	electrical storm	natural
Parpaillou	1093	released	1	mortality	28.04.21	FRA	predation*	natural
Plumet	1095	released	1	mortality	11.05.21	FRA	intoxication with disinfectant	anthropogenic
Angèle	1058	released	2	mortality	26.05.21	NDL	collision with wind mill	anthropogenic
Urcula	1099	released	1	mortality	15.06.21	FRA	unknown	unknown
Durall	1103	released	1	mortality	13.08.21	ESP	golden eagle attack	natural
Spinella	1096	released	1	recapture	15.07.21	FRA	leg fracture	natural



## 9.1 Mortalities

### 9.1.1 Palo-Pala (BG1062)

On the 10.02.2021 the local partners from Vercors (FRA) alerted due to unusually little activity of Palo-Pala according to the GPS data. During the control in the field, the animal was startled and could only be caught after a short flight in the Aosta Valley (ITA). The bird continued to behave unusually in captivity, but could not be saved despite treatment and died on 16.02.2021 due to the late effects of electrocution. The traces of electrification are clearly visible where the aluminium rings touched the skin (picture). However, the bird died from internal damage that was not caused by the electrification.



### 9.1.2 Christoph-Ofenpass (W150)

The dead adult bird was found on the 04.04.2021 by back-country skiers near Zernez (CHE). The bird showed no signs of injury and still had fresh meat in the pharynx. The most likely hypothesis is that an avalanche was the cause of death. The bird that hatched in the Ofenpass territory in 2014 was genetically identified.

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### 9.1.3 Aithon-Ofenpass (W305)

The dead immature bird was found dead below 50cm of snow cover on the 06.04.2021. The bird showed no signs of injury and all signs indicate that the bird got caught in an avalanche and died probably already some weeks earlier. The bird that hatched in the Ofenpass territory in 2019 was genetically identified. The bodies of Christoph-Ofenpass (9.1.2) and a golden eagle were found only few meters away in the same avalanche.

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#### 9.1.4 Adult Sardières (wild-hatched, GT0193)

The male adult (GT0193) bird and the hatchling (GT0192) of the breeding territory “Sardières” were found dead in the nest on the 19.04.2021 in the community Bramans (FRA). Both animals showed signs of poison as cause of mortality. This territory is monitored since 1995 and had a first successful reproduction in 2002. The female of the breeding pair was found to be Thuri (BG424).

#### 9.1.5 Trashumancia (BG1025), Vainilla (BG1029), Jovan (W303)

Three immature birds, Vainilla, Trashumancia (both released 2019), and Jovan (wild-hatched 2019) were killed by electrical shocks from a thunderstorm on the 26.04.2021 near Hueter (ESP). Flying birds can act like lightning rods and typical symptoms for birds that are touched by rays/ramifications are: perforation of the tympanum, cramping of the limbs (a picture very similar to poisoning victims), magnetic effects that can cause paralysis of the musculature, leading to death by asphyxiation and haematomas from the fall. Finding this cause of death was a huge challenge and shows once more the excellent knowledge and determination of our Spanish colleagues.

#### 9.1.6 Parpaillou (BG1093)

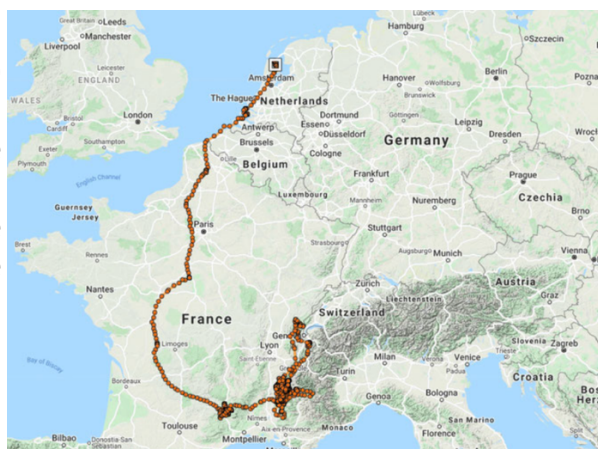
The juvenile bird Parpaillou was found dead on the 28.04.2021 in the hacking cave from Grands Causses, Trévezel (FRA) with bite marks on the throat. The necropsy then revealed liver damages (advanced hepatic steatosis) which most probably originate from the disinfectant to which they were exposed for 3 days in the transport box. The boxes were disinfected immediately before transport with an agent that will no longer be used in the future due to this knowledge. This case shows how important a comprehensive necropsy is in order to gain knowledge from deaths for the future.

#### 9.1.7 Plumet (BG1095)

Plumet died on the 11.05.2021 due to the same liver pathology (advanced hepatic steatosis) as Parpaillou (see above).

#### 9.1.8 Angèle (BG1058)

On the 26.5.2021 Angèle has been found dead under a wind turbine in Wieringerwerf (NLD) after he collided with the blade of the wind mill. The immature Bearded Vulture Angèle (BG1058), that had been released in 2020 in Baronnie (FRA), spent the winter near the release site and migrated north to the Netherlands in spring 2021. To our knowledge, this is the first documented case of a Bearded Vulture killed by a wind turbine in Europe. With the increasing populations, and also with the encroachment of wind farms in several places where Bearded Vultures now occur, this was bound to happen.



### **9.1.9 Urcula (BG1099)**

On the 15.06.2021 the juvenile Urcula was found dead near the release site in the Niolo Valley (Corsica FRA). The bird that has been released in 2021 died only three days after her first flight. The cause of death remains unknown following the analyses.

### **9.1.10 Durall (BG1103)**

On the 13.08.2021 the juvenile Durall died suddenly at the hacking site in Mastrazgo (Tinença de Benifassà, ESP). In the morning the bird was flying with the other two juveniles. He entered the hacking cave and ate from the feeding site. After 30 minutes he suddenly made movements of wanting to expel a pellet and one of these attempts he suddenly fell backwards and died. The tests for numerous toxins were all negative. The necropsy revealed a small perforation of the skull and as GPS-data showed, that the bird was moving close to the nearest golden eagle nest. Therefore, it is very likely that the bird died due to injuries from a golden eagle attack. Durall was released together with two other birds in Mastrazgo in 2021.

## **9.2 Recaptures**

### **9.2.1 Spinella (BG1096)**

On the 15.07.2021 the juvenile Spinella had to be recaptured after unusual behaviour has been detected. Investigations showed that the bird had broken a leg. Due to the long healing process, the bird could not be released and will now be integrated into the EEP breeding programme. Spinella was released in the Niolo Valley (Corsica) in 2021.



Figure 16. 12 mortalities and 1 recapture of Bearded Vultures in 2021. Grey labels mark wild-hatched individuals (N=4). \* Even though Parpaillou died due to injuries from a predation event, the bird showed the same intoxication damages from disinfectant as Plumet and would probably have died a few days later due to a liver pathology.

## 10 Acknowledgements

Thanks to all the field workers, assistants, gamekeepers, hunters, ornithologists and non-professional observers who report Bearded Vulture sightings and valuable information during the reproduction monitoring. Furthermore, thanks to the regional coordinators of the IBM-network and associated organisations who enter the data in the IBM, coordinate the monitoring network within their area of responsibility and contribute to this report with their inputs. Also, thanks to the valuable inputs by Franziska Lörcher (VCF), Claudio Schorta (SPB) during the review of this report.

Only thanks to the financial support of the IBM-partners and the funding organisations MAVA, LBV, Parco Natura Viva, Arca Foundation and LIFE GypConnect, LIFE GypRescue, the IBM-data collection could be summarised and published in this report.