

Individual identification of free-living bearded vultures (*Gypaetus barbatus*) based on feather samples collected in 2008

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Material and Methods

Feather samples

In 2008, 102 feather samples were collected in the field and sent to ecogenics. Of these 60 were subject to DNA extraction using the protocol described in Gautschi et al. (2003). To test for successful DNA extraction, the samples were used in a P2/P3 sexing PCR (Griffiths et al. 1996). The PCR products were digested with the restriction enzyme *HaeIII* and the sex of the sample was determined by agarose gel electrophoreses as described in Griffiths et al. (1996). Fifty samples were further analysed with 14 microsatellite DNA markers (Gautschi et al. 2000).

No genetic fingerprint could be obtained from one of the feathers collected on 4.4.2008 in Zuoz and from one feather collected in Zebbru (Table 1). The feather collected at the Glockner in August 2003, is probably not of bearded vulture origin (Table 1).

Genotyping (= generating a genetic fingerprint)

Because of low DNA quantity and quality resulting from extractions of moulted feather samples, each sample was genotyped 3 to 6 (i.e. multiple tube approach). That way the two most frequent genotyping errors (i.e. false alleles, and allelic-drop out (Taberlet et al. 1999) can be minimised.

Computer simulations

Paternity simulations were performed using the computer program CERVUS 2.0 (Marshall et al. 1998) as described in the final report 2003.

Results

Individual genotypes found in the database

Twenty-two of the 25 genotypes detected in the feather samples could be found in the database.

Feathers from birds released since 1996

One feather of **BG288 (Republic 11)** was found at the Nest "aire du Culard" in the City of Magland on 13.8.2008.

A feather of **BG321 (Veronika)** was collected on 13.8.2008 in Passy.

In Mercantour Nationalpark feathers of **BG311 (Roubion)** were collected in August 2008 at Pelvat de Chabrière. In September 2008, feathers from **BG348 (Serenio)** and **BG370 (Roure)** were collected in September 2008 under the Nest of Haute Ubaye.

In Brünun, Unterengadin feathers from **BG464 (Natura)** were found on 25.10.2008.

BG393 (Stift) left feathers below a sleeping place in Val Sinestra, which were collected on 12.10.2008.

Below the eyrie of the Val Mora feathers from **BG357 (Rätia)** were collected on 11.8.2008.

One feather of **BG395 (Martell)** was found on 4.7.2008 below the eyrie of Val Tantermozza.

In the Pölltal feathers from **BG446 (Hubertus 2)** were collected in May 2008.

In the nest of Braulio/Bormio several feathers from **BG283 (Tell)** were collected.

Feathers from wild-born birds, and birds released before 1996

Several genotypes could not be directly matched to an individual studbook number. However, they have been identified in feather samples from previous years.

At the nest "aire du Culard" two feathers from **GT028** (offspring of Pair Bargy) were found on 13.8.2008. From the same bird one feather was collected at the coloring place in Moede-Villy on 14.8.2008.

In Pesey-Nancroix, Vallée de Roauel feathers from **GT027** (female offspring of BG019 and BG021) were collected on 25.4.2008.

One feather from the male **GT021** (offspring of pair Bargy) was found below the Mont Blanc de Peisey on 5.8.2008.

Feathers from **GT031** were collected on 12.10.2008 in one of the sleeping places of the Val Sinestra and on 8.7.2008 below the eyrie of Val Fex.

Feathers from a male offspring of the pair Zeburu (**GT026**) were found on 4.7.2008 below the eyrie of Val Tantermozza.

Three feathers from the female **GT004** (an offspring of the Bormio pair) were collected on 10.8.2008 below the eyrie of the pair Albula (Val Chamuera).

In the nest Zeburu, at least five feathers from **GT029** (a male offspring of the first pair in Bormio) and at least 4 feathers from the female **GT001** were collected.

In the nest in Braulio/Bormio 2 feathers from **GT003** (a female offspring of BG017/BG070) were found.

Individual genotypes not found in the database

GT033 is female offspring of the Pair Termignon (BG279 and GT018). Feathers of this bird were collected on 11.8.2008 in Val Mora.

A feather from an other female offspring (**GT034**) of the Pair Termignon was collected in Leukerbad, Valais.

A bearded vulture found dead on 28.4.2008 in Perflbach (Naturns/Schnalstal) was given the Genotype ID **GT035**. It was a male offspring of the pair Zeburu (GT001/BG264).

In Mercantour NP a feather from a female bearded vulture was collected on 8.9.2008. This bird is related to BG091 and BG006. However, the genotype (**GT036**) does not match with the genotype of BG 363 (Christelle) nor can it be an offspring of the breeding pairs BG005/BG006 and BG009/BG006. At the moment, I therefore can not place this bird correctly.

Summaries

Tables 4 and 5 present summaries of the identification of birds hatched in the wild and the composition of breeding pairs.

References

- Gautschi B, Tenzer I., Müller J.P & Schmid B. (2000). Isolation and characterization of microsatellite loci in the bearded vulture (*Gypaetus barbatus*) and cross-amplification in three Old World vulture species. *Molecular Ecology*, 9, 2193-2195.
- Gautschi B. Müller J. P., Schmid B., & Shykoff J. A. (2003). Effective number of breeders and maintenance of genetic diversity in the captive bearded vulture population. *Heredity* 91 (1). 9-16.
- Griffiths, R., Daan, S., & Dijkstra, C. (1996). Sex identification in birds using two CHD genes. *Proc. R. Soc. Lond. B.*, 263, 1251-1256.
- Marshall TC, Slate J, Kruuk L and Pemberton JM. 1998. Statistical confidence for likelihood-based paternity inferences in natural populations. *Molecular Ecology*, 7, pp. 639-655.
- Taberlet P, Waits LP, Luikart G. 1999. Noninvasive genetic sampling: look before you leap. *Trends in Ecology and Evolution*, 14, pp 323-327.

Table 1. Feather samples received and analysed in 2008. Listed are the sampling areas and locations, the date of sampling, the person in charge, the sample name given in the laboratory, the sex, the ID of related individuals (P =most likely parents and R = related birds, but not necessarily the parents), and individual ID (BG= studbook number, GT = genotype number). Samples revealing the same genotype are given the same genotype identity.

Sampling area	Sampling location	Date of sampling	Collector	Sample Name	Sex	Related Individuals	Individual ID
France							
City of Magland	Nest "Aire du Culard"	13.8.2008	Rémi Fabre	CUL01	M	GT007/GT016 ^P	GT028
	Nest "Aire du Culard",	13.8.2008	Rémi Fabre	CUL02	M	GT007/GT016 ^P	GT028
	Nest "Aire du Culard"	13.8.2008	Rémi Fabre	CUL03	F	BG011/BG054 ^P	BG288, Republic11
City of Passy	under "Jumelles"	13.8.2008	Julien Heuret	JUM01	F	BG034/BG130 ^P	BG321, Veronika
	Moede-Villy, Passy	Coloring place	14.8.2008	Etienne Marlé	MOE04	?	GT007/GT016 ^P
Coloring place		14.8.2008	Etienne Marlé	MOE05	-	Not analyzed	-
Vanoise NP	Coloration zone	19.8.2008	Céline Rutten	VAN18	-	Not analyzed	-
	Peisey-Nancroix	Vallée de Roauel	25.4.2008	Henri Suret	NAN14	F	BG019/BG021 ^P
Pied des falaises du Pt		5.8.2008	B. Blumelcoq	NAN15	M	GT007/GT016 ^P	GT021
Mercantour NP	Mont Blanc de Peisey	20.8.2008	F. Breton	FR0001	M	BG011/BG054 ^P	BG311, Roubion
	Pelvat de Chabrière	8.9.2008	F. Breton	FR0002	-	Not analyzed	-
	below nest of Haute Ubaye	8.9.2008	F. Breton	FR0003	M	BG011/BG054 ^P	BG348, Sereno
	below nest of Haute Ubaye	8.9.2008	F. Breton	FR0004	F	BG086/BG104 ^P	BG370, Roure
	below nest of Haute Ubaye	8.9.2008	F. Breton	FR0005	(M)	BG011/BG054 ^P	BG348, Sereno
	below nest of Haute Ubaye	8.9.2008	F. Breton	FR0006	M	BG011/BG054 ^P	BG348, Sereno
	below nest of Haute Ubaye	8.9.2008	F. Breton	FR0007	F	BG091,BG006 ^R	GT036
	below nest of Haute Ubaye	8.9.2008	F. Breton	FR0008	(M)	BG011/BG054 ^P	BG348, Sereno
Switzerland							
Unterengadin Zuoz, Resgia-Araiglia	Brünun 820 200/197 900	25.10.2008	Georg Brosi	CH0001	F	BG034/BG103 ^P	BG464, Natura
		4.4.2008	David Jenny	CH0002	F	No results	-
		4.4.2008	David Jenny	CH0003	-	Not analyzed	-
Val Sinestra	Below sleeping place	12.10.2008	David Jenny	CH0004	F	BG086/BG104 ^P	BG393, Stiff
		12.10.2008	David Jenny	CH0005	F	GT005/GT006 ^P	GT031
		12.10.2008	David Jenny	CH0006	F	BG086/BG104 ^P	BG393, Stiff
		12.10.2008	David Jenny	CH0007	(F)	Not analyzed	-
		12.10.2008	David Jenny	CH0008	F	BG086/BG104 ^P	BG393, Stiff
Val Fex,Marmoré/Sils	Below eyrie	8.7.2008	David Jenny	CH0009	F	GT005/GT006 ^P	GT031
		8.7.2008	David Jenny	CH0010	F	GT005/GT006 ^P	GT031
Val Mora Pair Serraglio	Below eyrie	11.8.2008	David Jenny	CH0011	F	BG279/GT018 ^P	GT033
		11.8.2008	David Jenny	CH0012	F	BG086/BG104 ^P	BG357, Rätia
Val Tantermozza	Below eyrie	4.7.2008	David Jenny	CH0013	-	Not analyzed	-
		4.7.2008	David Jenny	CH0014	(M)	GT001/BG264 ^P	GT026
Val Chamuera /Paraid Melna	Below eyrie	4.7.2008	David Jenny	CH0015	F	BG122/GG118 ^P	BG395, Martell
		10.8.2008	David Jenny	CH0016	F	GT002/GT003 ^P	GT004
		10.8.2008	David Jenny	CH0017	F	GT002/GT003 ^P	GT004
Leukerbad, Valais	Coordinates 614/138	10.8.2008	David Jenny	CH0018	F	GT002/GT003 ^P	GT004
		?	Dolf Roten	LEU01	F	BG279/GT018 ^P	GT034
Austria							
NP Hohe Tauern	Gschlöss, Fehbertauern, above white cliff	May 2008	M. Knollseisen	AU0001	F	BG034,BG065 ^R	GT013
Glockner	?	August 03	Theo Klein	AU0002	F	No bearded vulture?	
Pölltal	Langrand	May 2008	P.Ramsbacher	POEL02	M	BG174/BG118 ^P	BG446, Hubertus 2

Table 1. Continued

Sampling area	Sampling location	Date of sampling	Collector	Sample Name	Sex	Related Individuals	Individual ID
Italy							
Zebra	Nest		? Enrico Bassi	IT0001	(*)		
	Nest		? Enrico Bassi	IT0002	(*)		
	Nest		? Enrico Bassi	IT0003	(*)		
	Nest		? Enrico Bassi	IT0004	(*)		
	Nest		? Enrico Bassi	IT0005	M	GT001/GT002 ^P	GT029
	Nest		? Enrico Bassi	IT0006	M	GT001/GT002 ^P	GT029
	Nest		? Enrico Bassi	IT0007	M	GT001/GT002 ^P	GT029
	Nest		? Enrico Bassi	IT0008	F	BG034, BG054 ^R	GT001
	Nest		? Enrico Bassi	IT0009	(*)		
	Nest		? Enrico Bassi	IT0010	(*)		
	Nest		? Enrico Bassi	IT0011	(*)		
	Nest		? Enrico Bassi	IT0012	(*)		
	Nest		? Enrico Bassi	IT0013	(*)		
	Nest		? Enrico Bassi	IT0014	(*)		
	Nest		? Enrico Bassi	IT0015	(*)		
	Nest		? Enrico Bassi	IT0016	(*)		
	Nest		? Enrico Bassi	IT0017	(*)		
	Nest		? Enrico Bassi	IT0018	(*)		
	Nest		? Enrico Bassi	IT0019	(*)		
	Nest		? Enrico Bassi	IT0020	(*)		
	Nest		? Enrico Bassi	IT0021	(*)		
	Nest		? Enrico Bassi	IT0022	(*)		
	Nest		? Enrico Bassi	IT0023	F	BG034, BG054 ^R	GT001
	Nest		? Enrico Bassi	IT0024	(*)		
	Nest		? Enrico Bassi	IT0025	(*)		
	Nest		? Enrico Bassi	IT0026	M	No results	
	Nest		? Enrico Bassi	IT0027	(*)		
	Nest		? Enrico Bassi	IT0028	(*)		
	Nest		? Enrico Bassi	IT0029	(*)		
	Nest		? Enrico Bassi	IT0030	(*)		
	Nest		? Enrico Bassi	IT0031	(*)		
	Nest		? Enrico Bassi	IT0032	(*)		
	Nest		? Enrico Bassi	IT0033	(*)		
	Nest		? Enrico Bassi	IT0034	(*)		
	Nest		? Enrico Bassi	IT0035	(*)		
	Nest		? Enrico Bassi	IT0036	-	GT001/GT002 ^P	GT029
	Nest		? Enrico Bassi	IT0037	(*)		
	Nest		? Enrico Bassi	IT0038	(*)		
	Nest		? Enrico Bassi	IT0039	F	BG034, BG054 ^R	GT001
	Nest		? Enrico Bassi	IT0040	(*)		
	Nest		? Enrico Bassi	IT0041	M	GT001/GT002 ^P	GT029
	Nest		? Enrico Bassi	IT0042	(*)		
	Nest		? Enrico Bassi	IT0043	F	BG034, BG054 ^R	GT001
Nest		? Enrico Bassi	IT0044	(*)			
Nest		? Enrico Bassi	IT0045	(*)			
Nest		? Enrico Bassi	IT0046	(*)			
Zebra Valley Braulio	Chitomas	August 08	Renato Antonioni	IT0062	-	Not analyzed	-
	Nest		? Enrico Bassi	IT0047	(*)		
	Nest		? Enrico Bassi	IT0048	F	BG017/BG070 ^P	GT003
	Nest		? Enrico Bassi	IT0049	-	Not analyzed	-
	Nest		? Enrico Bassi	IT0050	(*)		
	Nest		? Enrico Bassi	IT0051	(*)		
	Nest		? Enrico Bassi	IT0052	-	BG086/BG104 ^P	BG283, Tell
	Nest		? Enrico Bassi	IT0053	-	Not analyzed	-
	Nest		? Enrico Bassi	IT0054	-	BG086/BG104 ^P	BG283, Tell
	Nest		? Enrico Bassi	IT0055	(M)	BG086/BG104 ^P	BG283, Tell
	Nest		? Enrico Bassi	IT0056	F	BG017/BG070 ^P	GT003
	Nest		? Enrico Bassi	IT0057	(*)		
	Nest		? Enrico Bassi	IT0058	(*)		
	Nest		? Enrico Bassi	IT0059	(*)		
	Nest		? Enrico Bassi	IT0060	-	BG086/BG104 ^P	BG283, Tell
Nest		? Enrico Bassi	IT0061	-	Not analyzed	-	
Naturns/Schnalstal	Perflbach	28.4.2008	Klaus Bliem	BGS	M	GT001/BG264 ^P	GT035†

(*) To reduce costs, these samples were not yet subject to DNA extraction and genotyping.

Table 2. Overview of all bearded vulture genotypes sampled from 1998 till 2008. Each genotype was given an individual identification number. Listed are, the laboratory identities of the samples that could be assigned to the genotype, the sampling date, location and area and the number of samples analysed. For each genotype the studbook numbers of the closest relatives are given (P= parents, R=relatives, not necessarily the parents).

Genotype	Relatedness	Sex	Laboratory ID	Sampling date	Sampling location	Sampling area	No of samples
GT001	BG034,BG054 ^R	F	F13.8.3, Bo1, Bo2	13.08.1998	Nest	Bormio	3
			Zeb4, Zeb6	07.08.2002	Below Nest	Zebru	2
			Zeb25, 26, 27, 29	17.06.2003	Eyrie	Zebru	7
			Zeb7, 9, 12	07.08.2003	Nest	Zebru	3
			Zeb35, 36	28.09.2004	Nest	Zebru	2
			Zeb44, Zeb49, Zeb50	16.10.2007	Below active nest	Zebru	3
			IT0008,23,39,43	2008	Nest	Zebru	4
GT002	BG107/BG151 ^R	M	Bo6, Bo7	13.08.1998	Nest Bormio	Bormio	2
			Bo18	03.05.1999	Sleeping Place	Bormio	1
			Bo12	06.08.2001	Sleeping Place	Bormio	1
GT003	BG017/BG070 ^P	F	Sin26, Sin 28	13.10.2004	Sleeping Place	Sinestra	2
			Bo10, Bo11	06.08.2001	Sleeping Place	Bormio	2
			Bo13	28.08.2001	Nest Bormio	Bormio	1
			Bo15, Bo16	06.08.2002	Nest Site	Bormio	2
			Bo28, Bo30, Bo32	12.10.2005	Sleeping Place	Bormio	3
GT004	GT002/GT003 ^P	F	BO35, BO36	26.7.2007	Below eyrie	Bormio	2
			IT0048, 56	2008	Nest	Braulio/Bormio	2
			Bo24	13.08.2000	Below Nest site	Bormio	1
GT005	BG051/BG049 ^P	M	CHA03, CHA04	16.10.2007	Below eyrie Melna	Val Chamuera	2
			CH0016,17,18	10.8.2008	Below eyrie Melna	Val Chamuera	3
GT006	BG017/BG070 ^P	F	Liv1-Liv5	01.05.1999	Nest	Livigno	5
			Liv16	2006	Trepalle/Eira's Pass	Livigno	1
GT007	BG034/BG035	F	Punt Ota	25.01.1998	Punt Ota	-	1
			Liv9	05.08.2002	Nest Livigno	Livigno	1
			Liv11	05.08.2003	Horst	Livigno	1
			LIV18, LIV19	31.10.2007	Below active nest	Livigno	2
GT008	GT007/GT016 ^P	M	Bargy	April 2000	-	Bargy	1
			Bag5-Bag7	22.04.2003	Nest	Bargy	3
			Bag1, Bag2	03.07.2001	Colouring zone	Bargy	2
GT009	BG009/BG041 ^P	M	Nan 1	No date	Peisey-Nancroix	Vanoise NP	1
			Nan 05	30.9.2006	Rocher de Sétives	Peisey-Nancroix	1
			Nan06	31.9.2007	Foot of the nest	Peisey-Nancroix	1
			Val1	27.06.2001	-	Val d'Isère	1
GT010	BG19/BG021 ^P	F	Val8	No date	-	Val d'Isère	1
			Val11	2005	Below nest site	Val d'Isère	1
			Val2	27.06.2001	-	Val d'Isère	1
GT011	BG011/BG054 ^P	F	Val6	No date	-	Val d'Isère	1
			Val8.1	2005	Below nest site	Val d'Isère	1
GT012	BG019/BG021 ^P	F	Val3	27.06.2001	-	Val d'Isère	1
GT013	BG034/BG065 ^R	F	HB1 (HB8)	-	-	Heiligenblut	1-2
			HB2	2001	Horst	Heiligenblut	1
			HB3, 4, 7, 9	Aug. 2002		Heiligenblut	4
			Gro01	July 2005	Near releasing site	Grossglockner	1
			Fus03	28.7.2005	-	Fuscherlacke	1
			Glo07	9.8.2006	Hochtor/Glocknerstr.	Hohe Tauern	1
			AU0001	May 2008	Gschlöss	Hohe Tauern	1
			Lechtal	Wi 98/99	-	Lechtal	1
			Gast1-Gast5	2003	Nest	Gastein	5
			Köt1, Köt2	?	Sleeping place	Kötschachtal	2
GT014	BG009/BG041 ^P	M	Bag8	27.09.2004	Near nest site	Bargy	1
GT015	BG019/BG021 ^P	F	Pont1	Aug. 2003	Nest	Ponte Bernardo	1
			Pont8	Aug. 2004	Nest	Ponte Bernardo	1
GT016	BG070/BG022 ^R	?	Van2, 4, 8	No date	-	Termignon	3
GT017	BG131/BG132 ^P	F	Embryo free	01.05.1999	Nest Livigno	Livigno	1
GT018	GT001/GT002 ^P	M	Köt1	?	Nest	Kötschachtal	Egg skin
			Köt3	?	Nest	Kötschachtal	Egg skin
GT019 †	GT005/GT006 ^P	F	Pasc07	07.07.2004	Known colouring zone	Passy	1
			Pasn01,Pasn08	07.07.2004	New colouring zone	Passy	2
			NAN15	5.8.2008	Pied des falaises	Peisey	1
GT020 †	GT007/GT016	M	SNP01, SNP05, SNP06	20.06.2005	Val Stabelchod	CH	3
			For01, For03	12.10.2005	Sleeping place	Foraz	2
GT021	GT005/GT006	F	Ser01, Ser02	20.7.2006	Under sleeping place	Serraglio	2
			SER06, SER07	15.8.2007	Below eyrie	Serraglio	2
GT022	GT005/GT006	F	For02	12.10.2005	Sleeping place	Foraz	1

Table 2. Continued

GT025	BG019/BG021 ^P	M	Gast19, Gast20	2.8.2006	Nest	Heitzing	2
GT026	GT001/BG264 ^P	M	Sch01	28.5.2006	Murtiröt	S-chanf	1
			Cim01	17.7.2006	Cima dei Buoi	CH Nationpark	1
			Tan01, Tan02	29.10.2006	Below eyrie	Val Tantermozza	2
			TAN08, TAN10, TAN11	9.10.2007	Below eyrie	Val Tantermozza	3
			CH0014	4.7.2008	Below eyrie	Val Tantermozza	1
GT027	BG019/BG021 ^P	F	Nan02	19.9.2004	Under unoccupied nest	Mont Blanc de Peisey	1
			Nan03, Nan04	28.4.2006	Rocher de Séteives	Peisey-Nancroix	2
			NAN14	25.4.2008	Vallée de Roauel	Peisey-Nancroix	1
GT028	GT007/GT016 ^P	M	Lan01		Lancheron à Mayères	Aravis Nord 74	1
			Ara01	1.9.2007	Passage du Saix	Aravis	1
			CUL01, 02	13.8.2008	"Aired u Culard"	Magland	2
			MOE04	14.8.2008	Coloring place	Passy	1
GT029	GT001/GT002 ^P	M	Zeb43	July 2006	Zebru Valley	Zebru	1
			Zeb45, Zeb46, Zeb47	16.10.2007	Below active nest	Zebru	3
			IT0005-7, 36,41	2008	Nest	Zebru	5
GT030	BG051/BG049 ^P	M	Maira03	12.9.2006	Maira Valley	Alpi-Maritime	1
GT031	GT005/GT006 ^P	F	Sin32	31.8.2007	Below sleeping place	Val Sinestra	1
			CH0005	12.10.2008	Below sleeping place	Val Sinestra	1
			CH0009, CH0010	8.7.2008	Below eyrie	Val Fex	2
GT032	GT010/GT009 ^P	F	SAV01	12.8.2007	Val Savarenche	Aosta	1
GT033	BG279/GT018 ^P	F	CH0011	11.8.2008	Below eyrie	Val Mora	1
GT034	BG279/GT018 ^P	F	LEU01	?	Coordinates 614/138	Leukerbad	1
GT035†	GT001/BG264 ^P	M	BGS	28.04.2008	Perflbach Naturns	Schnalstal	4
GT036	BG091,BG006 ^R	F	FR0007	8.9.2008	Nest Haute Ubaye	Mercantour	1

Table 3. Overview of bearded vulture individuals identified through the analysis of feather samples collected from 1998 till 2008. For each individual the studbook number, the name, the laboratory identities, the sampling date, location and area and the number of samples analysed are given.

Studbook No.	Name	Sex	Laboratory ID	Sampling date	Sampling location	Sampling area	No of samples
BG264	Mauritio	M	Zeb1, 2, 3, 5	07.08.2002	Below Nest site	Zebra	4
			Zeb28, 31, 32, 34	17.06.2003		Zebra	4
			Zeb8, 10, 11,	07.08.2003	Horst	Zebra	3
BG279	Gelas	F	Van1	25.05.2003	-	Termignon	1
			Van3, 5, 6, 9	No date	-	Termignon	4
			Van10-12	24.7.2005	under nest No 3	Termignon	3
			Van14, Van15	21.7.2006	Below nest	Termignon	2
BG283	Tell	M	Sin15	13.10.2002	Sleeping place	Sinestra	1
			Bo29, Bo31	09.08.2005	Sleeping place	Bormio	2
			Bo34	20.6.2006	50m from active nest site	Braulio/Bormio	1
			IT0052,54,55,60	2008	Nest	Braulio/Bormio	4
BG285	Sina	F	Sin9 -Sin14,16	13.10.2002	Sleeping place	Sinestra	7
			Sin21, 24	19.10.2003	Sleeping place	Sinestra	2
BG288	Republic11	F	Ast1	06.03.2003	New colouring place	Aster	1
			Pasc01,03, 04	04.07.2005	Known colouring zone	Passy	3
			Pasn02, Pasn09	04.07.2005	New colouring zone	Passy	2
			CUL03	13.8.2008	Aire du Culard	Magland	1
BG296	Jackpot 3	M	Pöll1	2003	-	Pölltal	1
BG299	Gildo	F	Deb1	Summer 04	Haut de Cry	Dérborance	1
			Deb2	?	?	Dérborance	1
			Deb06	17.8.2007	Eyrie	Dérborance	1
BG304	Aisone	M	Deb3	?	?	Dérborance	1
			Deb07, Deb09	17.8.2007	Eyrie	Dérborance	2
BG305	Vernante	M	Stura	Summer 01	-	Stura Valley	1
			Bai01	05.06.2005	La bai Graine?	Mercantour	1
BG311	Roubion	M	Maira05	12.9.2006	Maira valley	Alpi-Maritime	1
			FR0001	20.8.2008	Pelvat de Charière	Mercantour	1
BG321	Veronika	F	Clo01	9.6.2006	sixt Fer à Cheval	Clos de Sales	1
			Moe02	26.6.2006	?	Moède-RN Passy	1
			JUM01	13.8.2008	Under "Jumelles"	Passy	1
BG323†	Sempach	F	Bev02, Bev05	29.5./3.6.2006	786.4/158.5	Val Bever	2
BG348	Sereno	M	Pont2	Aug. 2003	Nest	Ponte Bernardo	1
			Pont3, 7	Aug. 2004	Nest	Ponte Bernardo	2
			PAUL1	24.5.2007	Belwo nest site	Saint Paul sur Ubaye	1
			FR0003,5,6,8	8.9.2008	Nest Haute Ubaye	Mercantour	4
BG357	Rätia	F	Sin17, 18, 20	19.10.2003	Sleeping place	Sinestra	3
			Sin27, 29, 30	13.10.2004	Sleeping site	Sinestra	3
			Ser03, Ser05	20.7.2006	Under sleeping place	Serraglio	2
			CH0012	11.8.2008	Below eyrie	Val Mora/Serraglio	1
BG359	Pablo	M	Deb04	23.6.2007	?	Dérborance	1
			Deb05, Deb08	17.8.2007	Eyrie	Dérborance	2
BG361	Montblanc	M	Moe01, Moe03	26.6.2006	?	Moède-RN Passy	2
BG364	Louis	M	CHA01, CHA02	16.10.2007	Below eyrie Melna	Val Chamuera	2
BG370	Roure	F	Maira02,04,06,07	12.9.2006	Maira valley	Alpi-Maritime	4
			FR0004	8.9.2008	Below nest Haute Ubaye	Mercantour	1
BG393	Stift	F	Sin31	31.8.2007	Below sleeping place	Val Sinestra	1
			CH0004,06,08	12.10.2008	Below sleeping place	Val Sinestra	3
BG395	Martell	F	Madu1	09.04.2003	-	Madulain	1
			LaS1	March 04	804.300/175.500	Zernez	1
			TAN03, TAN05, TAN06	9.10.2007	Below eyrie	Val Tantermozza	3
			CH0015	4.7.2008	Below eyrie	Val Tantermozza	1
BG413	Jausier	F	Van13	3.5.2006	Vallon final des Ardlets d'en Haut	Termignon	1
BG438†	Culan	M	Gun1, Gun2	April 2005	Matschertal	Souttirol	2
BG446	Hubertus 2	M	POEL02	May2008	Langrand	Pölltal	1
BG462	Escalero	F	Fus04	28.07.2005	Fuscherlacke	Hohen Tauern	1
BG464	Natura	F	SNP02, SNP03	20.06.2005	Val Stabelchod	CH Nationalpark	2
			CH0001	25.10.2008	Brünun 820 200/197 900	Unterengadin	1
BG465	Doraja	F	Glo02, 04, 06	20.7.2005	Glockner	Hohe Tauern	3

Table 4. Overview of genotypes from birds hatched in the wild. Given are the ID (i.e. genotype number), the nest site of their parents, the sex and information about the sampling date and location.

Genotype	Offspring of Pair	Sex	Sampling date	Sampling location	Sampling area	No of samples
GT008	Bargy	M	03.07.2001	Colouring zone	Bargy	2
			No date	Peisey-Nancroix	Vanoise NP	1
			30.9.2006	Rocher de Sétives	Peisey-Nancroix	1
			31.9.2007	Foot of the nest	Peisey-Nancroix	1
GT004	Bormio 2000	F	13.08.2000	Below Nest site	Bormio	1
			16.10.2007	Below eyrie Melna	Val Chamuera	2
GT018	Bormio (before 2000)	M	No date	-	Termignon	3
GT019 †	Livigno	F	01.05.1999	Nest Livigno	Livigno	1
GT020 †	Kötschachtal	M	?	Nest	Kötschachtal	Egg skin
GT021	Bargy	M	07.07.2004	Known colouring zone	Passy	1
			07.07.2004	New colouring zone	Passy	2
GT022	Livigno	F	20.06.2005	Val Stabelchod	CH Nationalpark	3
GT023	Livigno	M	12.10.2005	Sleeping place	Foraz	2
			20.7.2006	Under sleeping place	Serraglio	2
			15.8.2007	Below eyrie	Serraglio	2
GT024	Livigno	F	12.10.2005	Sleeping place	Foraz	1
GT026	Zebbru	M	28.5.2006	Murtiröt	S-chanf	1
			17.7.2006	Cima dei Buoi	CH Nationalpark	1
			29.10.2006	Below eyrie	Val Tantermozza	2
			9.10.2007	Below eyrie	Val Tantermozza	3
GT028	Bargy	M	?	Lancheron à Mayères	Aravis Nord 74	1
			1.9.2007	HS 10 AR 3 passage du Saix	Aravis	1
GT029	Bormio (before 2000)	M	July 2006	Zebbru Valley	Zebbru	1
			16.10.2007	Below active nest	Zebbru	3
GT031	Livigno	F	31.8.2007	Below sleeping place	Val Sinestra	1
GT032	Val d'Isère	F	12.8.2007	Val Savarenche	Aosta	1
GT033	Termignon	F	11.8.2008	Below eyrie	Val Mora	1
GT034	Termignon	F	?	Coordinates 614/138	Leukerbad	1
GT035†	Zebbru	M	28.04.2008	Perflbach Naturns	Schnalstal	4

Table 5. Overview of all bearded vulture pairs identified between 1998 and 2008. Given are the nest locations, the individual identity (ID) and/or relatedness, and the years in which samples were collected.

Pair	Sex	ID and relatedness	Year(s) of sample collection
Bargy	Male	GT016, offspring of BG022/BG023	2004
	Female	GT007, offspring of BG034/BG035	2000, 2003
Bormio (before 2000)	Male	GT002, offspring of BG150/BG151	1998, 1999, 2001
	Female	GT001, related to BG034/BG054	1998
Bormio (from 2002)	Male	Tell (BG283)	2005, 2006, 2008
	Female	GT003, offspring of BG017/BG070	2001, 2002, 2005, 2007, 2008
Dérborance	Female	Gildo (BG299)	2004, 2005(?), 2007
	Male	Pablo (BG359)	2007
	Male	Aisone (BG304)	2005(?), 2007
Gastein/Kötschachtal	Male	-	-
	Female	GT015, offspring of BG019/BG021	2003
Heiligenblut	Male	-	-
	Female	GT012, offspring of BG019/BG021	No date
	Female	GT013, related to BG034/BG065	2001, 2002, 2005
Heitzing	Male	GT025, offspring of BG019/BG021	2006
	Female	GT015, offspring of BG019/BG021	2006
Livigno	Male	GT005, offspring of BG051/BG049	1999, 2006
	Female	GT006, offspring of BG017/BG070	2002, 2003, 2007
Maira Valley (Trio)	Male	GT030, offspring of BG051/BG049	2006
	Male	Roubion (BG311)	2006
	Female	Roure (BG370)	2006
Moëde-RN Passy	Male	Montblanc (BG361)	2006
	Female	Veronika (BG321)	2006
	Male	Sereno (BG348)	2003, 2004
Ponte Bernardo	Female	GT017, offspring of BG131/BG132	2003, 2004
	Male	GT023, offspring of pair Livigno	2006, 2007
Serraglio	Female	Rätia (BG357)	2006
	Male	Tell (BG283)	2002
Sinestra (before 2004)	Female	Sina (BG285)	2002, 2003
	Male	GT002, offspring of BG150/BG151	2004
Sinestra (from 2004)	Female	Rätia (BG357)	2003, 2004
	Male	GT018, offspring of GT001/GT002	No date
Termignon	Female	Gelas (BG279)	2003
	Male	Louis (BG364)	2007
Val Chamuera	Female	GT004, offspring of GT002/GT003	2007, 2008
	Male	GT009, offspring of BG009/BG041	2001, 2005
Val d'Isère	Female	GT010, offspring of BG019/BG021	2001, 2005
	Male	GT026, offspring of GT001/BG264	2006, 2007, 2008
Val Tantermozza	Female	Martell (BG395)	2007, 2008
	Male	Mauritio (BG264)	2002, 2003
Zebbru	Male	GT029, offspring of GT001/GT002	2006, 2007, 2008
	Female	GT001, related to BG034/BG054	2002, 2003, 2004, 2007, 2008