

## **Alpine Bearded Vulture Project: If Ending Releases Signifies Success of Project**

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### **Abstract**

A hand full of scientists started with the reintroduction project in the year 1978. Today the project has reached international significance with more than a dozen of experts which coordinate more than 5000 voluntary working observers throughout the entire Alps. Thus success control is well based and monitoring is carried out on entire population level, however it needs huge enthusiasm and long term finances to assure high quality of communication flows within the monitoring network. This article shall summarize the knowledge collected within the last 20 year. Methods of project evaluation as well as possibilities of communication are presented. GIS-Analyses give a better idea of the way the Alps have been re-colonised and enable the interpretation of delayed reproductive success in the northern Alps. The aim of the reintroduction is to stop release! This will be the case if annual reproduction success has reached the average number of birds released every year. In this case one might expect continuous population growth without human intervention. Relying on the development of pair formations this will come true very soon. The issue of alpine bearded vulture reintroduction is a success story: 10 couples started with incubation in the year 2005; continuously new pair formations can be registered. It seems the population shortly will be self sustaining and will replace the contingent of released birds (7 chicks/a).

### **Keywords**

bearded vulture, *Gypaetus barbatus*, release project, monitoring, GIS analyses, population modelling, evaluation methods

### **Project Aims**

- ◆ Re-establishment of a self-sustaining bearded vulture population in the Alps
- ◆ Development of a long-term Monitoring
- ◆ Analyses of observation data and population modelling

### **Duration**

Since 1986 (first release in Hohe Tauern National Park)

### **Study Area**

In Austria the project is divided into three parts: release (study area is the heart of Hohe Tauern National Park), national monitoring (study area extended to the alpine part of western Austria and International Bearded vulture Monitoring (IBM). In the latter case all observations collected on national level are joined for the entire Alps (study area ~150.000km<sup>2</sup>).

### **Material and Methods**

Observation data of bearded vultures have been collected in the Alps since 1986 (n = 30.698, July 14<sup>th</sup> 2005). A territory was defined if at least one adult bird remained resident (e.g. sleeping places) for more than a year or nest building was observed. Every nest site was localised and described as precise as possible. On that data base the following factors were investigated:

- ◆ Distribution of birds in the Alps
- ◆ Migration due to age
- ◆ Dispersal depending on release area
- ◆ Survival of birds released (population modelling)
- ◆ Relevance of release areas for settlement
- ◆ Mortality risks

Release

Release sites were chosen following mainly the historical distribution of the species and favourable food conditions (figure 1). For release, nestlings were put into natural cavities in the age of about 3-month. During this stage of life birds totally rely on food offer. It takes some weeks until they fledge for the first time. After fledging, supplementary feeding was continued up to an age of about six months.

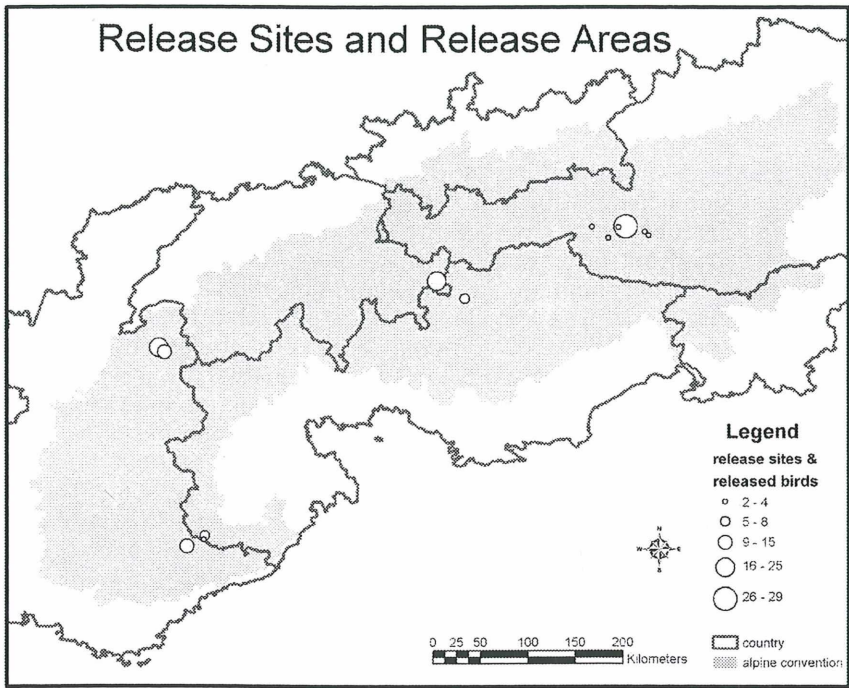


Fig. 1: Release areas and location of release sites in the Alps.

Up to now 137 birds have been released in the Alps. The proportion of birds released in each of the four participating countries is shown in figure 1.

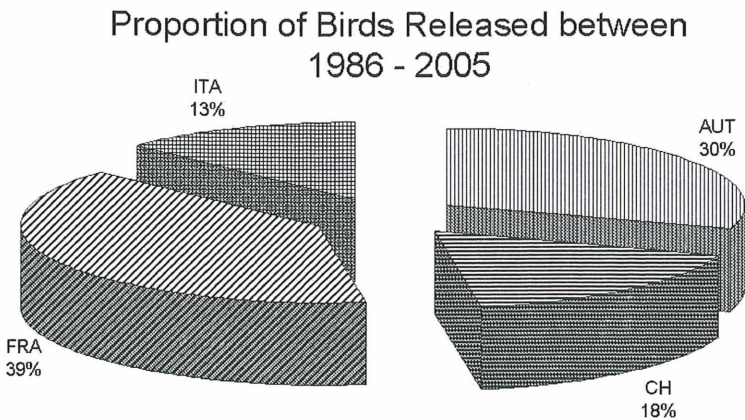


Fig. 2: Proportion of released individuals (1986-2005) in each of the four alpine countries.

Distribution of bearded vultures in the Alps

Considering all verified observations regardless age of birds, the distribution generally equals more or less the distribution of release areas. However, as shown in figure 3 two additional "hot spots" could be identified. The first one is the region of Vanoise- (FRA) and Gran Paradiso National Park (ITA) the second is situated in the area of the Swiss- (CH) and the Stelvio National Park (ITA). It is remarkable that these areas have been foraged intensively soon after the first releases. Today both regions are the heart of the Alpine population hosting 86% of successfully reproducing pairs.

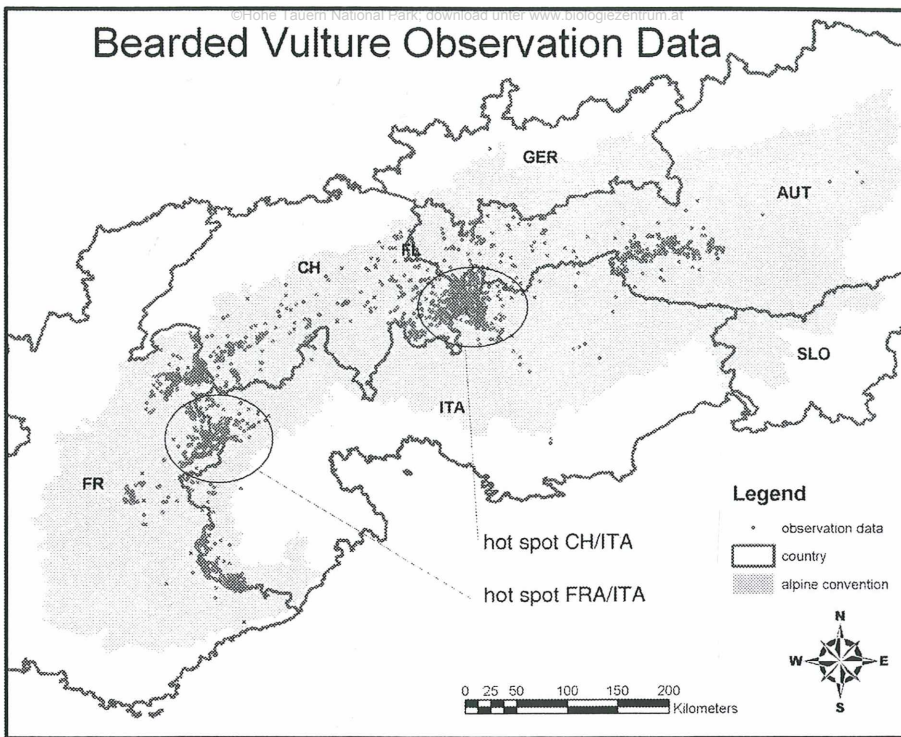


Fig. 3: Distribution of bearded vulture observation data ( $n = 30.698$ ) in the study area.

### Reproduction

Pair formations took place first in Austria in the year 1989. However, successful reproduction could not be registered before 1997 (France). Since then nest building has been observed in 41 cases and territorial behaviour was registered in 24 cases. A total of 27 chicks was successfully reared in seven different territories (figure 4). The proportion of naturally fledged offspring per country is shown in figure 5.

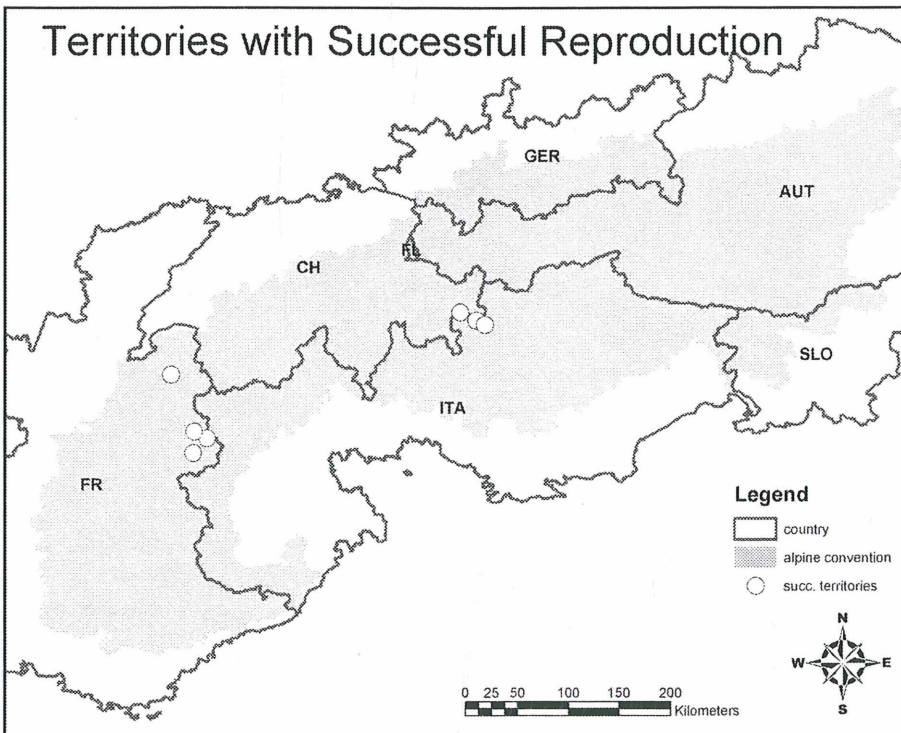


Fig. 4: Distribution of territories with reproduction success in the Alps.



## wild offspring born in the Alps (n=27)

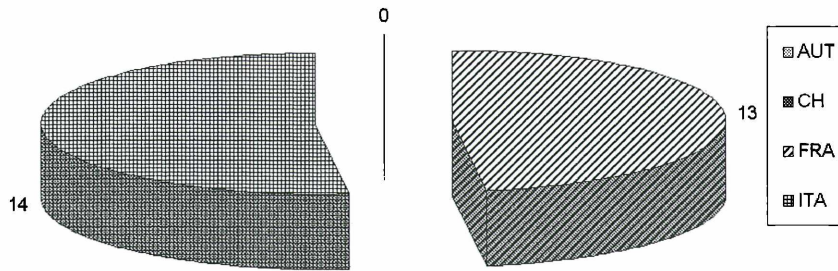


Fig. 5: Proportion of successfully reared chicks (1997-2005) in the four alpine countries.

### Dispersal and Migration

Soon after the release the birds emancipate and become independent of any human intervention. Usually in late autumn they undertake their first long distance flights (>100km). For the birds this exploration phase is of high relevance as far as concerns orientation, habitat selection and pairing. Considering the hypothesis of philopatry they should return and settle in their former release area some years later for reproduction purpose.

To better understand the role of each release region dispersal of surely identified birds is shown depending on release site (figure 6a-d). Due to the lack of observers the dispersal in south-eastern direction (the Balkan region belongs to the historical distribution range of the species) might be underestimated.

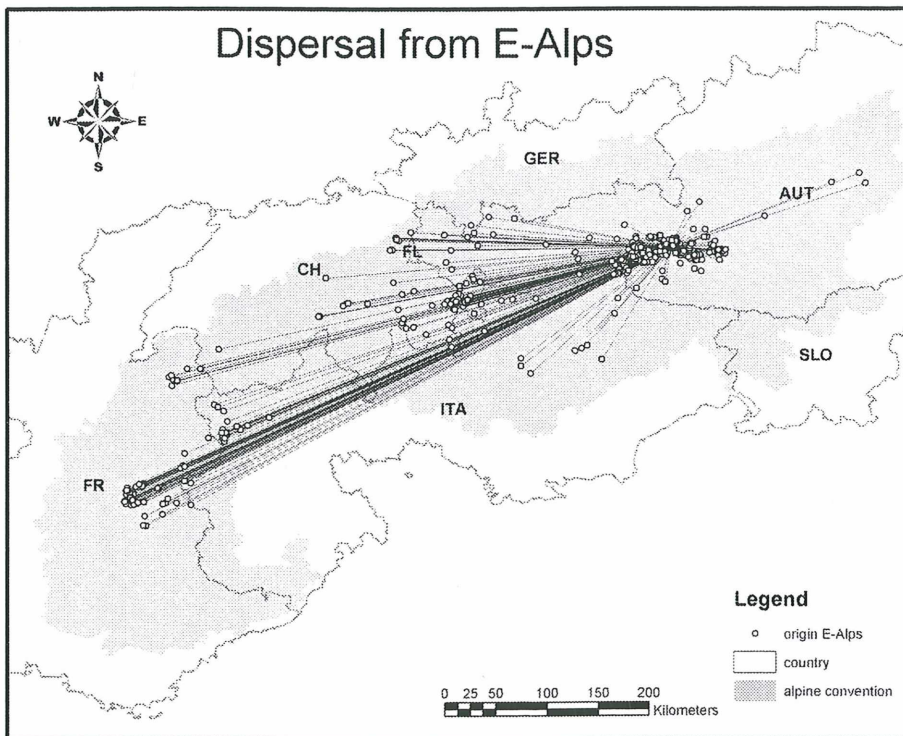


Fig. 6a: Dispersal of birds originating form release area E-Alps

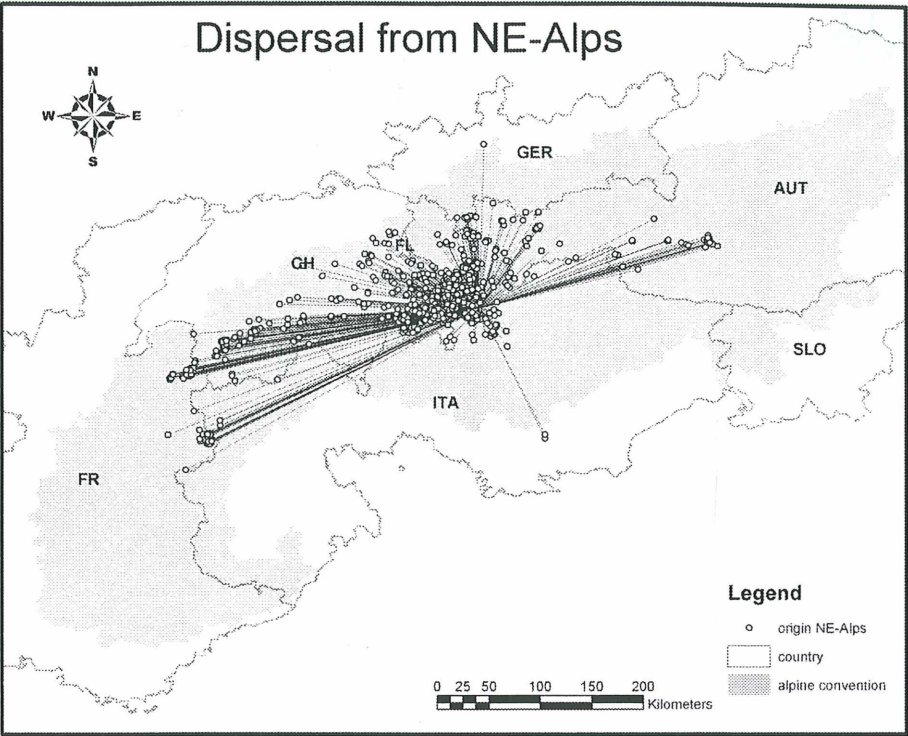


Fig. 6b: Dispersal of birds originating form release area NE-Alps

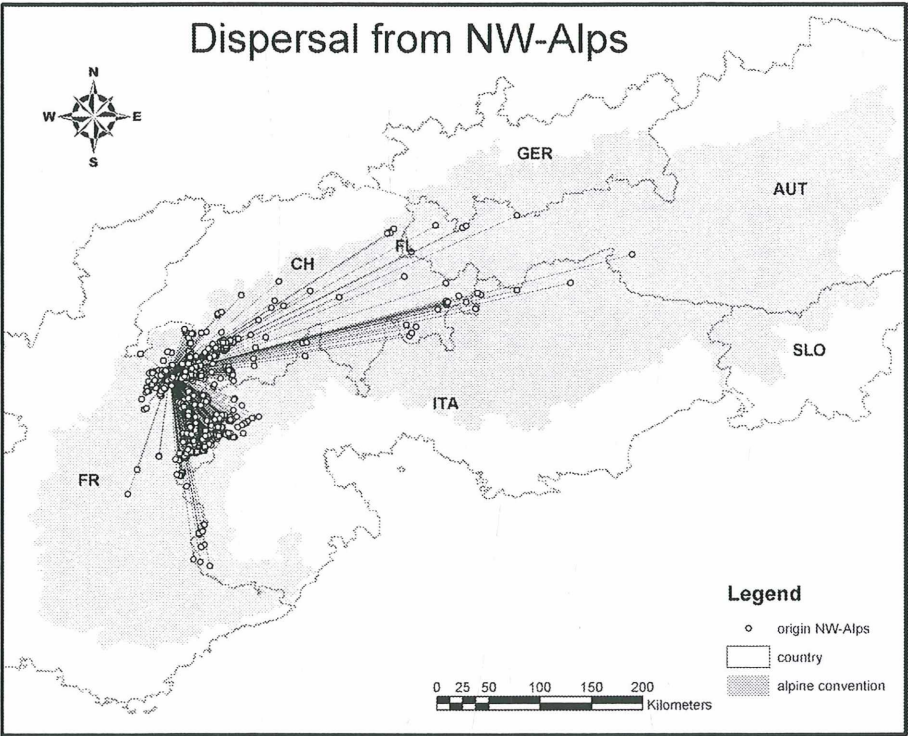


Fig. 6c: Dispersal of birds originating form release area NW-Alps

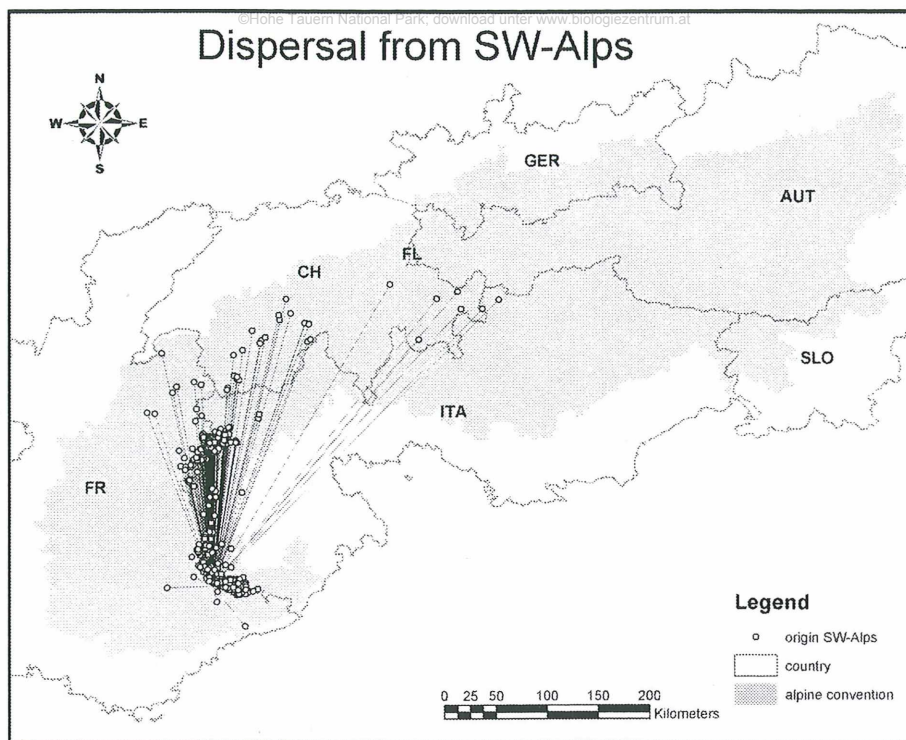


Fig. 6d: Dispersal of birds originating from release area SW-Alps

Especially in the immature phase (2<sup>nd</sup> and 3<sup>rd</sup> year of life) it appears that dispersal of bearded vultures follows a seasonal shift. During winter they stay mainly in the south-western Alps whereas they favour northern slopes (Switzerland and Austria) during summer (see figure 7). This could not be observed in other age classes. The area of Hohe Tauern National Park thus plays an exceptionally important role for immature birds. During that phase the suitability is underlined by the fact that flocks of griffon vultures (*Gyps fulvus*) show a very similar dispersal pattern even though they stay in Croatia and in the Balkan region during winter. It appears to be mainly climate and food conditions that generally cause such migration patterns.

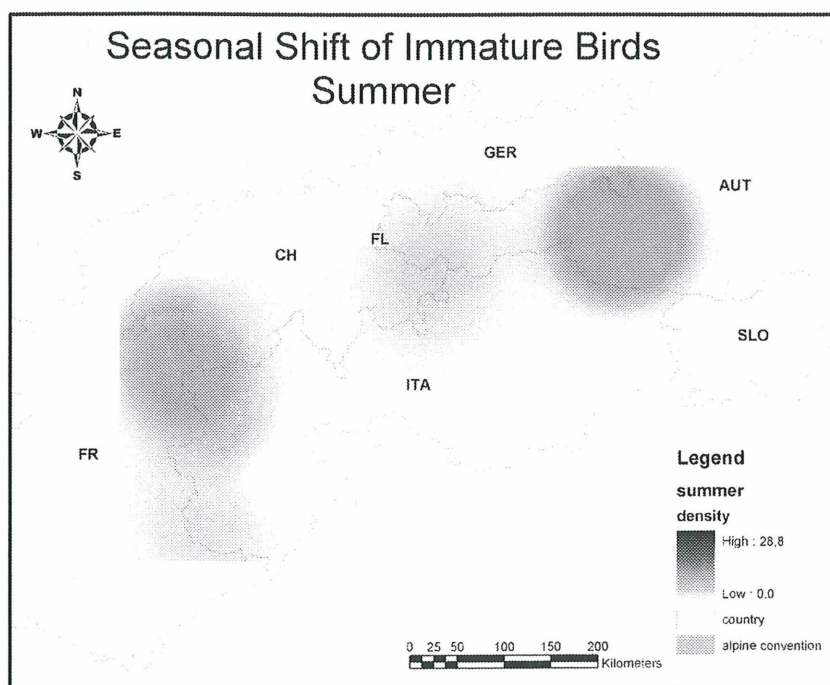


Fig. 7: Seasonal shift of immature bearded vultures between (a) northern (summer) and (b) southern (winter) Alps.



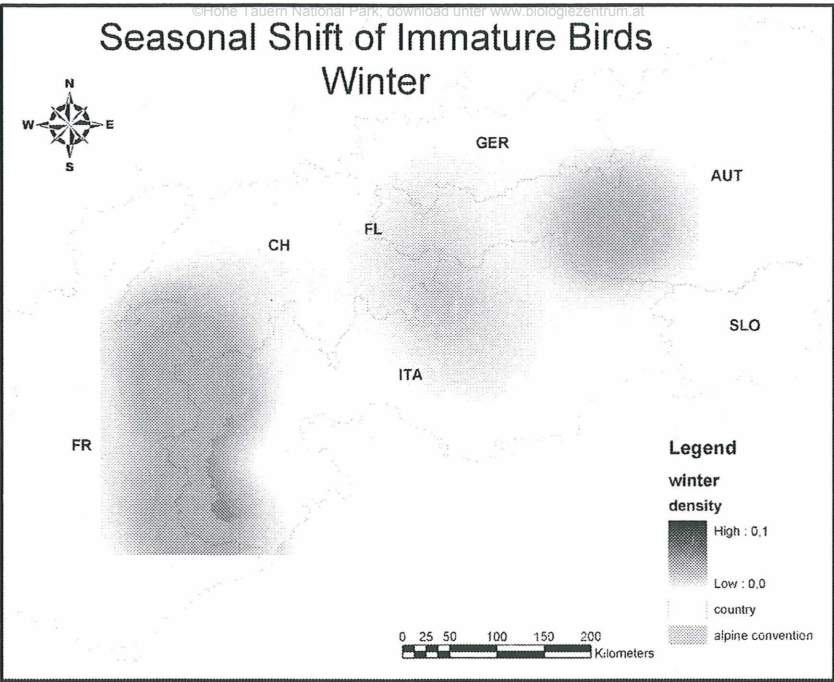


Fig. 7: Seasonal shift of immature bearded vultures between (a) northern (summer) and (b) southern (winter) Alps.

Survival

With help of unique identification pattern it was possible to analyse population size on base of observation data until 2004. Since the proportion of wild born birds increases steadily furthermore it was necessary to rely on population estimates based on survival data. Because birds sometime disappear for more than a year before they can be identified again survival data have been analysed for all birds released between 1986 and 1996 however, survival was checked until 2004. Survival was calculated for every year of life and a simplified survival model was built.

In the model we extrapolated survival rates to all birds released. We distinguish between 100% identification and serious identification hints. When assuming only 100% identification as a proof for survival the populations size was about 80 birds, additionally using identification hints population size was estimated to be 100 individuals (31.12.2004).

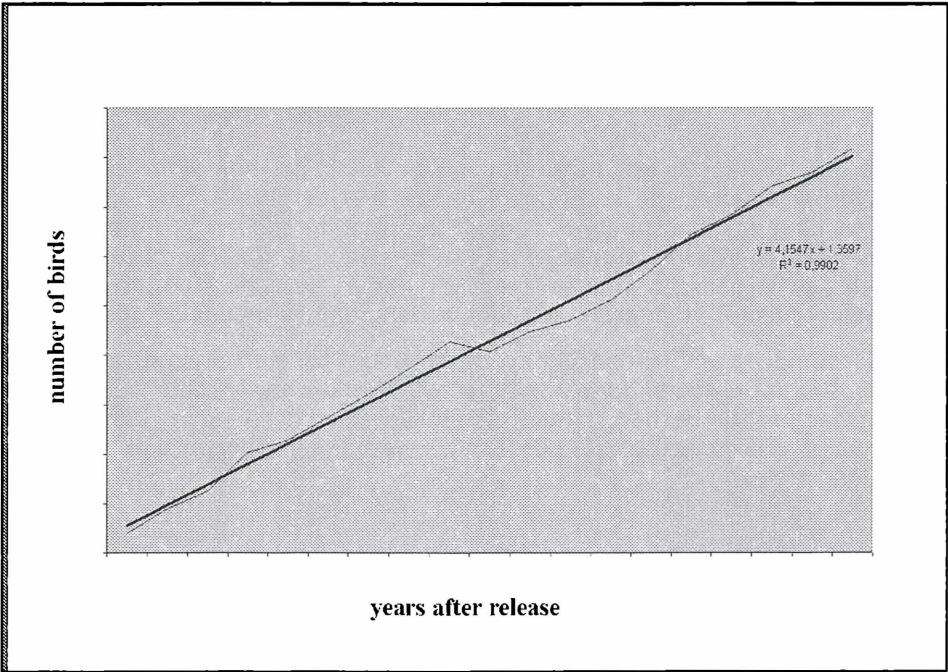


Fig. 8: Modelled survival rate using 100%-identifications

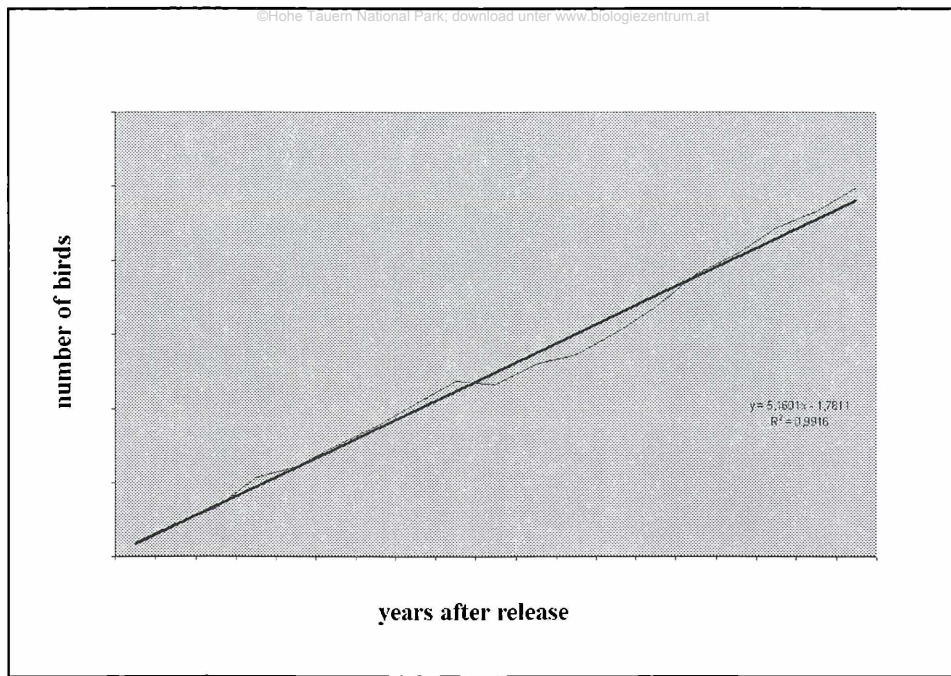


Fig. 9: Modelled survival rate using additionally identification hints

Out of 137 birds analysed only 18 (13%) had to be recaptured or were found dead. The reasons of mortality are tabulated in table 1.

Group	AUT	CH	FRA	ITA
Shooting		1	1 (2?)	1
Overhead wire			3	
Avalanche	1	1		
Disease	1		3	
Poison	1?		(?)	
Recapture	2		2	

Tab. 1: Mortality reasons in Alpine bearded vultures

## Discussion

Several aspects are crucial for successful reintroduction. Public relation work undoubtedly makes the project successful. It ensures the acceptance of the species all over the Alps and stimulates comments, while providing an opportunity of regular information exchange. Release sites must be chosen in favourable habitat. Often historical data can be useful to find the best locations. In wide ranging species such as the bearded vulture the study has to be understood in its entirety. As shown habitat suitability has to be differentiated and substantially depends on age and season.

Monitoring of released individuals turned out to be essential to measure project success on the long term. If the distribution range is huge and different people work on data collection in different languages, data format has to be harmonized. It should be agreed upon data publication- and copyrights. This might guarantee cross border co-operational efforts and the exchange of information on the long term.



Some key factors for successful reintroduction of the bearded vulture are primarily provided within protected areas:

- ◆ Save release sites and infrastructure for public relation work
- ◆ Huge areas without hunting activities (less risk to be shot for birds) especially in France, Italy and Switzerland
- ◆ Better acceptance and therefore better chance to work on the reduction of mortality risks (e.g. modification of dangerous overhead wire which frequently leads to collision)
- ◆ Better food supply is case carcass of domestic and/or wild ungulates are not removed
- ◆ Save nest sites is case there is surplus restrictions for climbing, paragliding and photography.

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