

PROJECT REPORT

Expedition dates: 1 – 14 June 2008 Report published: October 2010

The challenge of climate change and conservation: lammergeyer, capercaillie and snow partridge (ptarmigan) in the Pyrenees mountains of Spain.

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The challenge of climate change and conservation: lammergeyer, capercaillie and snow partridge (ptarmigan) in the Pyrenees mountains of Spain.

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Authors:

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Matthias Hammer (editor)
Biosphere Expeditions

Abstract

The mission of the participants in the voluntary scientific work programme between Biosphere Expeditions and FCQ was to contribute actively to obtain data on the basic parameters of presence/absence, survival, juvenile dispersion, vital areas, etc, for the management of four threatened species of mountain birds: the lammergeyer (*Gypaetus barbatus*), the capercaille (*Tetrao urogallus*), the snow partridge (*Lagopus mutus pirenaicus*) and the boreal owl (*Aegolius funereus*).

The lammergeyer (*Gypaetus barbatus*) is a specialized bone-eating vulture, distributed along the mountainous regions of Eurasia and Africa. In Europe it came very close to the point of extinction and the Pyrenean population is the species last stronghold with 483 individuals in 2005. Despite the fact that the population is growing thanks to intensive conservation actions, the lammergeyer is still threatened in Europe and in a precarious conservation state. The expedition team's work with the lammergeyer involved visual and radio monitoring, reproduction control, hacking control, marking of individuals, and the collection of data related to the use of supplemental feeding points.

On the other hand, the capercaillie, snow partridge and the boreal owl are species that maintain relic populations in the Pyrenees, occupying the subalpine forest and alpine areas. The populations of these species are in decline and are highly affected by global warming and climate change. The expedition team's work with these species involved contributing to annual population monitoring by surveying their natural habitats during the mating period.

Valuable data were collected by the expedition team contributing to FCQ's data collection efforts. However, because of the low interest from the public in the project versus the very high effort required and the very high costs associated with running the expedition, it was decided to discontinue the project after its first trial year.

Resumen

La misión de los participantes al programa de trabajo voluntario científico de Biosphere Expeditions y FCQ era de la de contribuir activamente a la obtención de datos acerca de los parámetros básicos de presencia/ausencia, supervivencia, dispersión juvenil, áreas vitales, etc. para la gestión de cuatro especies amenazadas de aves de montaña: El Quebrantahuesos (*Gypaetus barbatus*), el Urogallo (*Tetrao urogallus*), la Perdiz nival (*Lagopus mutus pirenaicus*), y el Mochuelo boreal (*Aegolius funereus*).

El Quebrantahuesos es un buitre osteofago altamente especializado, distribuido por las montañas de Eurasia y África (DEL HOYO, 1994). En Europa llegó muy cerca del punto de extinción y la población pirenaica, la única que no se llegó a extinguir, se quedó con 483 individuos en 2005 (Anton y Díez 2005, no publicado). A pesar del hecho de que ahora la población está creciendo gracias a las acciones de conservación intensivas, el Quebrantahuesos sigue amenazado en esta región y tiene una situación de conservación delicada.

El trabajo con el Quebrantahuesos consistió en el seguimiento visual y por radioemisores, control de la reproducción, control del "hacking", marcaje de individuos, y la recolección de datos relacionados con el uso de los puntos de alimentación suplementaria.

Por otra parte, el Urogallo, la Perdiz nival y el Mochuelo boreal son especies boreoalpinas que mantienen poblaciones relícticas en el Pirineo, ocupando las masas forestales subalpinas y las zonas de alta montaña con vegetación alpina. Las poblaciones de estas especies sufren una regresión pronunciada y se encuentran afectadas por el calentamiento global y el cambio climático (CANUT 2002). El trabajo con estas especies consistió principalmente en completar el seguimiento anual de las poblaciones y el censo en su hábitat natural durante la época de celo.

Dada la escasez de las especies estudiadas, todos los datos obtenidos por los participantes en la expedición tienen un importante valor, contribuyendo a mejorar la información de las bases de datos de la FCQ. Sin embargo, dado el elevado esfuerzo necesario para la coordinación del grupo de voluntarios por parte de la FCQ, se decidió no continuar el proyecto después del primer año de prueba.

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1. Expedition Review

M. Hammer (editor) Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This project report deals with an expedition to the Pyrenees mountains of Spain that ran from 1 to 14 June 2008 with the aim of monitoring the effects that climate change has on endangered lammergeyer populations as well as capercaillie and snow partridge (ptarmigan). The lammergeyer is Eurasia's largest bird of prey and together with marmots, chamois, capercaillie and ptarmigans inhabits the spectacular cliffs and gorges of the Pyrenees mountains. The expedition's aim was to survey lammergeyers by direct observation and by radio tracking them. Also to assist local conservationists by helping at lammergeyer feeding. Another aim of the expedition was to look for snow partridge and capercaillie above and below the tree line to help local scientists ascertain population numbers and trends as indicators of climate change in the Pyrenees. All this as part of a large concerted effort with local partners, and in the face of the negative effects of climate change, to ensure the survival of Europe's largest bird of prey as well as the other fauna associated with this flagship species.

Lammergeyers or *quebrantahuesos* (bone breakers) as they are known in Spanish are the largest bird of prey in Eurasia, and Europe's rarest vulture, around 70% of which live in the Aragonese Pyrenees, where the expedition takes place. They feed on marrow which they get by dropping bones repeatedly onto rocks, as their Spanish name aptly suggests. Their old name in English of ossifrage also refers to this habit. They are also known in English as bearded vultures. This is in reference to the ochre ruff of quills they sport around their necks. They are not born this way, but acquire the colour by actively seeking out iron-rich muds and rubbing their feathers in them. The theory goes that in a stand-off, the redder the feather, the tougher the lammergeyer.

The lammergeyer population was decimated in the 20th century by poisoning, hunting, electrocution from power lines and habitat destruction. Much of the local persecution was due to the totally mistaken but incredibly widespread belief that lammergeyers take young lambs. Lammergeier or lammergeyer (both correct) comes from the German *Lämmergeier*, meaning "lamb-vulture", presumably for the same reason.

An old legend from the Alps tells that many years ago in the mountains there was bird capable of plucking lambs from their flocks, and lifting them hundreds of metres up in the air, before smashing them on the rocks below. The bird would then swoop down and feast on their still-warm entrails. Some said they had seen these massive birds do the same with young children. Others still claimed they were partial to the adult human flesh of climbers, who when out looking for eggs on the crags, would be knocked off by these birds and fall to their deaths!

Climate change is one of the most critical global challenges of our time. Recent events have emphatically demonstrated our growing vulnerability to climate change. Climate change impacts will range from affecting agriculture, sea level rise and the accelerated erosion of coastal zones, increasing intensity of natural disasters, species extinction and the spread of vector-borne diseases.

Capercaillie and ptarmigan all serve as indicators of an intact ecosystem and information on the distribution of ptarmigan is particularly useful as a local indicator for climate change in the Pyrenees. Cold winters and snow partridges go hand in hand and as such it is important to record any reduction in their numbers so that adequate conservation measures can be taken.

1.2. Research area

The Pyrenees are a range of spectacular mountains, grandiose cliffs, deep gorges and towering waterfalls in southwest Europe that form a natural border between France and Spain. They separate the Iberian peninsula from France, and extend for about 430 km from the Atlantic to the Mediterranean. For the most part, the main crest forms the Franco-Spanish border, with Andorra sandwiched in between. The highest mountain is Aneto (3,404 m) and Monte Perdido, which overlooks the study site, reaches 3,355 m.





Flag and location of Spain and study site.

An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at Google Maps.

The Pyrenees are named after Pyrene (fire in Greek), who was the daughter of Bebryx, and are older than the Alps: their sediments were first deposited in coastal basins during the Palaeozoic and Mesozoic eras. Between 100 and 150 million years ago, during the Lower Cretaceous period, the Gulf of Gascony (Bay of Biscay) fanned out, pushing present-day Spain against France and putting large layers of sediment in a vice grip. The intense pressure and uplifting of the Earth's crust first affected the eastern part and stretched progressively to the entire chain, culminating in the Eocene epoch.

Much of the study sites was within the Ordesa and Monte Perdido National Park, which was added to the UNESCO list of World Heritage Sites in 1997 and is an area rich in ethnology and folklore. In it survive about 75 mammal species of which the chamois, marmot and brown bear are probably the best known. The native Pyrenean brown bear was hunted to near-extinction in the 1990s but was re-introduced in 1996 when three bears were brought from Slovenia. The population has bred successfully and there are now believed to be about 15 re-introduced brown bears in the central region around Fos and a handful of native bears around the Aspe valley.



Spanish Pyrenees with the location of the research area

Many of the study sites lie within the Ordesa and Monte Perdido National Park, which was added to the UNESCO list of World Heritage Sites in 1997 and is an area rich in ethnology and folklore. In it survive about 75 mammal species of which the chamois, marmot and brown bear are probably the best known. The native Pyrenean brown bear was hunted to near-extinction in the 1990s but was re-introduced in 1996 when three bears were brought from Slovenia. The population has bred successfully and there are now believed to be about 16 brown bears in the Pyrenees.



Research locations and park limits. 1 Viewpoints of Revilla (lammergeyer), 2. Lammergeyer hide of Escuaín , 3. San Vicenda, canyon of Añisclo (lammergeyer), 4. Urdiceto lake (snow partridge), 5. Gistaín valley marking action (lammergeyer), 6. Puerto de Sahún, Sierra de Cazania (Capercaillie), 7. Collado de Cullibert (boreal owl), 8. Cuello Bail supplemental feeding point (lammergeyer).

1.3. Dates

The project ran over a period of two weeks divided into two one-week slots, each composed of a team of international research assistants, scientists and an expedition leader. Slot dates were:

2008: 1 – 7 June | 8 – 14 June.

Dates were chosen to coincide with the summer peak of nesting activity when working conditions were also best.

1.4. Local conditions & support

FCQ and LGF

Biosphere Expeditions collaborated on this project with the FCQ (Fundación para la conservación del Quebrantahuesos = Lammergeyer conservation foundation), a Spanish non-profit research and conservation organisation that was created in order to develop research, conservation and public education programmes with the aim of securing the lammergeyer's survival in the Spanish mountain habitats. The expedition base is run by LGF (LammerGier Fonds = Lammergeyer foundation) a Dutch NGO.

Expedition base

The expedition team was based in the remote mountain village of Revilla, which consists of only a handful of traditional stone houses. The last permanent resident left in 1960 and the village is now home to a recently created, modern research station with all modern amenities such as a lecture room, solar heating and hot water, showers, toilets, kitchen, lounge and dining room. Inside the research station two to four team members shared a room, each with an on-suite shower and toilet. Breakfast and dinner was provided at base by a cook and a lunch pack was supplied for each day spent in the field. Vegetarians and vegans could be catered for. There was 220V solar-generated electricity from continental European-style plugs at the research station. Weather

In early summer the maximum daytime temperatures can reach up to 30° C and at night they drop to 1° C. During the early summer weather, heavy rain and thunderstorms can be expected intermittently. At the top of the mountains it is breezy and completely calm days are rare. The weather during the expedition was unusually cold for the time of year.

Field communications

Mobile phones worked at base, but in many spots around the study site signal reception was poor or absent. When working in groups during the day, contact between groups and the base was by hand-held radio or mobile phone. Expedition team members also carried as part of your safety equipment a set of flares for emergency communication.

Transport & vehicles

Team members made their own way to the city of Reus, which was the assembly point. From there onwards and back to Reus all transport was provided for the expedition team courtesy of Land Rover, who kindly supplied a number of vehicles (Discovery and Defender to the expedition).

Medical support and insurance

The expedition leader and the expedition scientist were trained first aiders, and the expedition carried a medical kit. Further medical support was provided via a network of mountain rescue stations and helicopters. The nearest doctor was in Lafortunada (14 km from base) and there was a medical centre in the town of Aínsa (30 km from base). The nearest hospital was in the nearby town of Barbastro (90 km from base). In case of immediate need of hospitalisation, and weather permitting, helicopters of the mountain rescue service were available, but not required. Safety and emergency procedures were in place. There were no significant medical incidences during the expedition.

1.5. Local scientists

Biosphere Expeditions was working with Oscar Díez, Nina Kaptein and Diego Martin of FCQ, and Juanjo Nevado of the SoloMonte.

Oscar Díez is the acting president of the Foundation for the Conservation of the Lammergeyer (FCQ) and founding member of it. He was born in 1970 in the Spanish Pyrenees. An ornithologist by vocation, he has been doing research on Alpine birds (capercaillie and snow partridge) and birds of prey, primarily vultures. He has introduced modern research methods into the study of wildlife in Spain (e.g. radio-tracking) and has made a considerable contribution to lammergeyer conservation in the Pyrenees. He currently works in the environmental education area, in an awareness-raising campaign of the FCQ. A tireless traveller, he has traversed mountains in Asia, Africa and Europe to find out about the distribution and conservation of the lammergeyer around the world.

Diego Martín is a geologist and operated many years as a tour operator in eco-tourism projects. For several years he has been a specialized technician of the FCQ, working in the reintroduction project of the lammergeyer in "Picos de Europa" in the Northwest of Spain.

Nina Kaptein graduated in biology. She has worked in nature conservation and environmental education programmes and is now active as environmental educator at the FCQ.

1.6. Expedition leaders

This expedition was led by Matthias Hammer and Malika Fettak.

Biosphere Expeditions was founded in 1999 by Dr. Matthias Hammer. Born in Germany, he went to school there, before joining the Army at 18, and serving for several years amongst other units with the German Parachute Regiment. After active service he came to the UK and was educated at St Andrews, Oxford and Cambridge. During his time at university he either organised or was involved in the running of several expeditions, some of which were conservation expeditions (for example to the Brazil Amazon and Madagascar), whilst others were mountaineering/climbing expeditions (for example to the Russian Caucasus, the Alps or the Rocky Mountains). With Biosphere Expeditions he has led teams all over the globe. He is a qualified wilderness medical officer, ski instructor, mountain leader, divemaster and survival skills instructor. Once a rower on the international circuit, he is now an amateur marathon runner and Ironman triathlete.

Malika Fettak is half Algerian, but was born and educated in Germany. She majored in Marketing & Communication at the University of Frankfurt, which led her to jobs in PR & Communications. She has travelled widely, especially in Africa and Northern Europe. Her love of nature and the outdoors, and taking part in a few Biosphere expeditions, persuaded her that a change of career was in order and here she is since 2008, leading expeditions and desperately trying to make herself useful around the office:) Malika is a keen sportswoman - triathlon, skiing, volleyball, etc. and enjoys the outdoors.

1.7. Expedition team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were (with countries of residence):

1 - 7 June 2008

Marjorie Beebee (UK), Jane Eades (UK), Christine Johnson (UK), Birgit Mandl (Germany), Martyn Roberts (UK), Ian Taylor (UK), Jennifer Tondu (USA). Also cameraman David Kahl (Germany).

8 - 14 June 2008

Jane Eades (UK), Astrid Geimer (Germany), Andrew Harries (UK), John Moss (Israel), Kathleen Xie (USA). Also Biosphere Expeditions staff member Claudia Krejci (Germany).

Other staff during the expedition: Javier Castaño (cook).

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £790 per person per 7 day slot. The contribution covered accommodation and meals, supervision and induction, special non-personal diving and other equipment and air, and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	10,373
Expenditure	
Lodging and food includes all board & lodging	1,810
Transport includes fuel UK – Spain return, fuel during the expedition, other travel expenses	2,054
Equipment and hardware includes research materials & gear, etc. purchased in UK & Spain	284
Staff includes Biosphere Expeditions & FCQ staff salaries & associated staff costs	5,063
Administration includes registration fees, sundries, etc.	252
Team recruitment Spain as estimated % of PR costs for Biosphere Expeditions	2,840
Income – Expenditure	- 1,930
Total percentage spent directly on project	119%*

^{*}This means that the expedition ran at a loss and was supported over and above the income from the expedition contributions by Biosphere Expeditions.

1.9. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members (who are listed above) who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff (also mentioned above) were central to making it all work on the ground. Special thanks also to the providers of the accommodation and base camp services, the Lammergier Fonds. Thank you to all of you and to the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank members of the Friends of Biosphere Expeditions and donors, as well as Land Rover, Swarovski Optik, Motorola, Cotswold Outdoor, Globetrotter Ausrüstung and Snowgum for their sponsorship.

1.10. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given below.

2. Lammergeyer study

Oscar Díez & Nina Kaptein FCO

2.1. Introduction

Lammergeyers or quebrantahuesos (bone breakers), as they are known in Spanish, are the largest bird of prey in Eurasia, and are Europe's rarest vulture, around 70% of which live in the Aragonese Pyrenees, where the expedition took place.

Their wingspan ranges between 2.35 and 2.82 m, their size contrasting with their low weight of about 5700 g. Their tail has a characteristic rhomboid shape that gives this vulture a great acrobatic flight capacity.

Their diet exists of bones, which they obtain mainly from wild or domestic hoofed animals after having been gobbled up by other vulture species. This makes them the only bone-eating birds in the world. Their Spanish name "bone breakers" aptly suggests their habit of dropping bones that are too big to ingest directly on the rocks to break them. Their old name in English of ossifrage also refers to this habit. They are also known in English as bearded vultures. This is in reference to the thin feathers that stick out in a beard-like shape.



Figure 2.1a. Adult and juvenile imperfect adult lammergeyers feeding.

A young lammergeyer passes through various stages of plumage until reaching maturity: from mainly dark brown with a greyish brown breast in the youngest specimens until obtaining the characteristic black wings and dorsal zone with a white breast and head at about seven years of age. Remarkable is the ochre colour of the breast with a more intense ruff around their necks. The feathers do not originate this way, but acquire the colour when their owner actively seeks out iron-rich mud and rubs its feathers in them to clear itself from parasites. The theory goes that in a stand-off, the redder the feather, the tougher the lammergeyer.

The lammergeyer population was decimated in the 20th century by poisoning, hunting, electrocution from power lines and habitat destruction. Much of the local persecution was due to the totally mistaken, but widespread belief that lammergeyers take young lambs. Lammergeier or lammergeyer (both correct) comes from the German Lämmergeier, meaning "lamb-vulture", presumably for the same reason.

Worldwide the lammergeyer is considered a rare species in regression, and in Europe it is recognized to be "in danger of extinction". In 1994, only 36 "reproductive units" - being pairs or trios - were left in the Aragonese Pyrenees, being the core of the last viable population of the European subcontinent. Getting to that critical point, a close cooperation between the FCQ and local government started up a campaign intensively working around their conservation. Supplemental feeding points were opened; specimens were continuously marked and followed up (see below) to investigate their biology, reproduction and unnatural death causes; some non-productive nest eggs are bread out artificially in a "hacking" site; main survival threads are tackled in various ways; and a lot of other projects promoting their habitat conservation are executed. As a result the population doubled its numbers with about 130 "reproductive units", being pairs or trios.

2.2. Research goals

Most of the topics considered as important in the conservation of threatened species concern the study of survival, vital areas, juvenile dispersion, sample acquisition for genetic and toxicological analysis, and population management studies. All of these require specimen marking and follow up. Marking of Spanish lammergeyers started in 1989 with several marking campaigns organised by the government. With the approval of the Bearded Vulture Recuperation Plan of Aragón in 1994, the Department of Environment of the Government of Aragón and the FCQ started an intensive cooperation. Its first objective was to mark and follow up the lammergeyer in Aragón, with the main goal of studying its demography and patterns of juvenile dispersion. Within the framework of this programme, 97 Bearded vultures were marked (1993-2008) by FCQ technicians and collaborators. Initially specimens were marked with rings and coloured wing bands for direct visual recognition; progressively more techniques and devices were incorporated and optimised (terrestrial and aerial telemetric radio monitoring and satellite tracking) improving considerably the follow up of this species. In 1999 the first lammergeyers were marked with satellite transmitters in the Pyrenees, a world premiere. In late 2006, the first transmitters with GPS technology were employed, and in 2007 the first permanent radio tracking stations were opened, one of which is situated at the expedition base in Revilla. The data collection through these techniques - after processing and analysis - resulted in a wealth of information about the number of pre-adults, juvenile survival, floating population size, death causes and processes of dispersion.



Figure 2.2a. Marking methods: wing bands, feather decolouration and radio transmitter in young specimens.

The Biosphere Expeditions team took part in the process of data collection by visual recognition of wing band colour codes, and terrestrial radio tracking - permanent as well as mobile. The intensive participation of a group of people in a coordinated radio tracking exercise allowed the updating of the information related to survival and distribution of the marked individuals with a better detail than in the standard procedure carried out by FCQ staff during the year. The volunteers also helped in surveillance and control of the cabin and cages of the "hacking site", where young lammergeyer chicks are brought up artificially in a specially equipped installation, as well as in daily feeding tasks of the young chicks. Finally they performed identification tasks at the supplemental feeding point, where a lot of marked lammergeyers gather. Below the general results of the year 2008 are presented, indicating the contribution of the Biosphere Expeditions volunteers to the total.

2.3. Methods

The expedition team was divided into various groups, depending on the activity on each day, and performed different tasks in rotation.

Radio tracking

In one activity a group set up an observation point at the "viewpoints of Revilla" at the border of the Natural Park of Ordesa y Monte Perdido, 2 km from a feeding point – a place where goat and sheep legs are left regularly as extra food for the birds in critical periods to back up food shortages caused by changing ecosystems. This observation point gave a good overall view over the canon of Escuaín so that lammergeyers that regularly fly in this area at great densities could be recorded.

The team was equipped with three telescopes (Kowa, 20 x 60 x magnification), two radio trackers (model TRX 1000, Wildlife Materials Ltd.), visual recognition sheets, compasses, and topographic maps of the area. For each lammergeyer observation various data were taken down: time; observation method (visual contact/radio contact); bearing; comments on markers or behaviour; and if possible bird name and bird location name.



Figure 2.3a. Radio tracking close to Revilla.

A second activity brought a group to Sierras y Cañones de Guara Natural Park, at Cuello Bail, to an observation cabin next to a lammergeyer supplemental feeding point. They arrived just after food distribution. Here the feeding lammergeyers and other vultures, such as Egyptian vultures (*Neophron percnopterus*) and Griffon vultures (*Gyps fulvus*), were observed in order to include these observations in later evaluation reports about the use and efficiency of the feeding point. It is important to study these topics as the supplemental feeding is one of the most important conservation actions. There is currently a debate on their size and the amount of food provided and our results will help to co-ordinate strategies between different feeding points and point out areas in which conservation actions are necessary or could be improved upon.

The observed lammergeyers were also checked for the state of their different markings and their health.

In a third activity a group was brought to a meadow at the Ordesa and Monte Perdido National Park, 1 km from the supplemental feeding point of Escuaín. Here they set up an observation point with three telescopes, individual binoculars and two radio antennas (brands and types described before), visual recognition sheets, compasses, and topographic maps of the area. Of each lammergeyer observation various data were taken down: time; observation method (visual contact/radio contact); bearing; comments on markers or behaviour; and if possible bird name and bird location name.

Reproduction state



Figure 2.3b. Observing a nest site.

Another group was sent out to check the reproduction state of two lammergeyer reproductive units: one in the valley of Gistaín, and one in the canyon of Añisclo. Reproduction observations in this period of the year complete two earlier observation periods executed by FCQ technicians; a first one to check pair formation and successful a breeding start, a second one to check presence, feeding frequency and physical state of the chick, and now a third one to confirm its presence and health just before flying out. The observation method consists of visual control by telescope of each nesting site, registering nest enters and exits of the parent adults, feeding characteristics, and direct observation of the chicks.

The action with the reproductive unit in the valley of Gistaín was not an ordinary reproduction control. In this reproductive unit the nest was estimated to have a relatively good access, so that apart from a visual check of the chick's health state, an attempt could be made to mark it before flying out. For doing this, precise preparation is required and the action has to be quick. One or two professional rock climbers of the national mountain police force (GREIM) and one or two FCQ members descend to the nest, pick up the chick and ascend. The chick is marked marking systems as describe above and measurements and a blood sample are taken. After confirmation of its health status, it is returned to the nest. Subsequently, during a period of 3-4 hours the nest is kept under surveillance to confirm the return of the parent birds and observe their feeding actions. Additionally, the rest of the week following this action the nest will be kept in close observation.

The Biosphere Expeditions team was to witness the marking, and its task was to carry out the subsequent surveillance period. They installed three telescopes at an observation point that gave a good view of the nest and recorded the parent bird actions during the marking action and for four hours afterwards.

The action with the reproductive unit in the canyon of Añisclo was not an ordinary reproduction check either. The exact nest location of this reproductive unit was unconfirmed. An extra effort is normally required to track these nests sites. The Biosphere Expeditions team was assigned an unchecked area of the Añisclo canyon to search for the nesting site.

Hacking control





Figure 2.3c. "Attended Raising in Human Isolation Conditions", Escuaín, Monte Perdido National Park.

A group was brought to the "hacking site" close to Escuaín, at the National Park Ordesa y Monte Perdido. Here they were allowed to get to know the methods of "attended raising in human isolation conditions". They observed the health state of the chick and a feeding session. Afterwards from the window of the "hide" or artificial nesting place they collected visual data about the marked lammergeyers that visited the feeding point just in front of the hide.

2.4. Results

Radio tracking

During 2008 the FCQ and the SPMAH (Provincial Environmental Service of Huesca) compiled 4181 contacts with marked lammergeyers (visual and radio tracking). The FCQ obtained 46% (n=1926) of these contacts, corresponding to 41 specimen. 74.6% were contacts through radio localization (n=1437), 24.6% were visual contacts (n=15). In the permanent radio stations a total of 992 contacts were compiled (51.5% of the total of contacts by the FCQ): 673 in Revilla and 319 in San Juan de la Peña. The hours in which most contacts took place are within 12:00/13:00, with 400 contacts (20.7%). The time of the year with most contacts was spring, more precisely the month of May (n=257). The lammergeyers with the highest number of contacts were: "Ana Cris" (269), "Jaca" (225) and Ohian (188). Of the 97 marked lammergeyers since 1993, in 2008 48 ones were alive, 25 had disappeared and 23 had died. Of the marked live specimen in 2008, 20 retain an active radio transmitter (19 VHF and 1 satellite GPS): Delpiero, Ebro, Enma, Jaca, Rover, Fabana, Ixeia, Oturia, Petronila, Ana Cris, Lucía, Juanlu, Ohian, Mar, Trini, Kuntur, Félix, Teresa and Erica.

The Biosphere Expeditions team had a total number of 47 contacts with marked lammergeyrs, that is 1.12% of all contacts with marked lammergeyrs in 2008 and 2.44% of the contacts by the FCQ. 38 of these were radio tracks and 10 were visual contacts. They had contact with: Felix (1), Kuntur (2), Ixeia (16), Chelo (4), Ana Cris (13), Jaca (2), Delpiero (4), Lucía (2), Juanlu (1) and Fabana (2). The specimens with the highest number of contacts were Ixeia (11 radio and 5 visual contacts) and Ana Cris (10 radio and 3 visual contacts).

Number of contacts (visual and radio) 2008

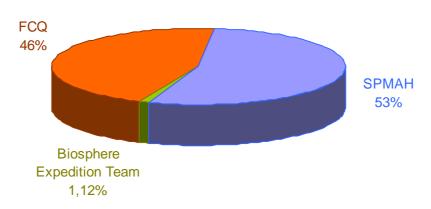


Figure 2.4a. Contribution of each investigation team to the total of observations of lammergeyers in 2008.

Reproduction state

The planned marking of the chick of the nest in the valley of Gistaín could not be carried out. The descent to the nest site was technically more complicated than expected and had to be cancelled after various attempts.

The prospection of the Añisclo canyon area had no results. One lammergeyer was seen passing by, but no possible nesting location could be identified.

Hacking control

The group entered the hide and observed the healthy state of the young chick, a feeding session, and was explained the techniques and objectives of this breeding method. The observations of the marked feeding adult specimens in front of the hide are included in the general results above.

3. Capercaillie study

Luis Lorente FCQ/Government of Aragon

3.1. Introduction

The Western capercaillie (*Tetrao urogallus*) is the biggest bird species of the grouse family (Phasianidae). It reaches a head-to-tail length of 1.10 m in males. and 0.70 m in females. It is distributed through large parts of boreal Eurasia (Scandinavia, the Baltic region and Russia), and found in small mountain enclaves in more temperate zones such as Cantabria, the Pyrenees, and the Alps. Biologically, it is considered a relic of the last ice age, with populations becoming progressively more isolated in cold or high mountain regions.





Figure 3.1a. Capercaillie males displaying

For the past decades, the Spanish populations have show a continuous decline, especially in Cantabria. Capercaillie are listed in the National Catalogue of Endangered Species as "vulnerable" or "in danger of extinction" (depending on the region). Capercaillie hunting was prohibited nationally in 1979 and since 1986 the species is catalogued as a "protected species", although until now this has not resulted in any population increase. The species is still in steep decline due to habitat loss and lately, presumably, climate change influences.

Capercaillie live in mature conifer forests with an open canopy structure and with plenty of herbal undergrowth, water, and blueberries (*Vaccinium myrtillus*). Its feeding habits are strongly seasonal and specialised. It feeds largely on blueberry leaves and berries along with some grass and plant sprouts, acorns and insects in summer; in winter pine needles dominate its diet. Most of the year the droppings are solid, but during the mating season, they turn liquid and formless. This makes time-dependent identification by faeces possible.





Figure 3.1b. Solid capercaillie droppings throughout the year (left) and liquid ones during the mating season (right).

The Western capercaillie mating season starts between March and April and lasts until May or June. Three-quarters of this long mating season consists of mere territorial competition between neighbouring cocks or cocks on the same courting ground. The cock postures himself with raised and fanned tail feathers, erect neck, beak pointed skywards, wings held out and drooped and starts his typical aria. Towards the end of the courting season. the hens arrive in the courting/display areas. (meaning play in Norwegian). The cocks continue displaying on the ground, leading to subsequent pair formation, copulation and breeding. At the beginning of the breeding season, the hens are very sensitive towards disturbances and leave the nest quickly.

The Capercaillie, as a species extremely sensitive to habitat alteration, is commonly used as a bio indicator species to understand better, gather valuable information about, or predict the response of animals with highly specialised habitat use to global climate change.

3.2. Research goals

Proper follow up is one of the priorities in the management and conservation of this species. To obtain information about the status and evolution of the populations it is necessary to conduct annual or regular inventories, which is most adequately done by censusing the displaying males during the courtesy period. The direct objectives of this method are the following:

- Obtain up-to-date information about the presence of courting activity and the number of males present at known or potential lekking sites.
- With the gathered information observe the evolution of the lekking sites and the number of active leks during the monitoring period.
- Gain information about possible negative elements that can affect the species (disturbance, illegal hunting, habitat management, presence and abundance of predators, etc.) and identify challenges for conservation measures.

In this particular case the task of the Biosphere Expeditions team was to check an area in the mountains, were researchers suspected that a known lekking site had moved uphill since the last survey. The team checked if this was indeed the case, prospecting the potential new area.

3.3. Methods

The expedition team was brought to Sierra de Cazania, in the valley of Gistaín, from where subalpine mountain pine forest zones, which support a capercaillie population, were accessed.

The group was split up into sub-groups of 2-3 persons each. Each subgroup was assigned a starting point at approximately 15 metres from each other and followed a contour. That way an observation grid was created as a standard census methodology for this species (sampling by transects). The groups registered all possible signs of presence of the capercaillie on the observation grid. Valid sign were remains such as feathers or droppings (solid vs. liquid), or an individual of the bird itself. The main objective of these surveys was to elucidate the presence or absence of the species in the area. For each sign the GPS position, altitude, characteristics and description was recorded.



Figure 3.3a. Recording capercaillie sign.

3.4. Results

In the first slot, two valid observations of both feathers and droppings were registered. In the second slot 14 valid observations were registered. Based on the total of these observations a new lekking site was positively identified, replacing the former one further downhill (some 300 m below). The data was also added to a long term investigation in this area to monitor the use of lekking sites and the estimated population size. Global data confirm a sharp descent in both.

4. Boreal owl study

Luis Lorente FCQ/Government of Aragon

4.1. Introduction

Tengmalm's owl, *Aegolius funereus*, is a small owl species also known as the boreal owl. The species is part of the family of owls known as "true owls" or Strigidae, which contains most owl species. The other family is the barn owls, Tytonidae.

The boreal owl breeds in dense coniferous forests across northern North America and Eurasia. In Europe it is found in the northern forests and in mountain ranges such as the Alps, the Pyrenees and the Balkan region. Like the capercaillie, it is considered a relic species of earlier glacial periods. In 1963 it was discovered to be present in the French Pyrenees and twenty years later its presence on the Spanish side was confirmed. In 2002 the presence of 142 breeding territories was discovered. 5 in Navarra, 14 in Aragón, and 123 in Catalonia. In 2008 the number of localised territories in Aragón increased up to around 50, mostly thanks to the placement of nest boxes and better monitoring of owl habitat. Because the owl's presence in the Spanish Pyrenees was only discovered recently, there is still much need for research about its habitat use, ecology and population dynamics, also because, like the Capercaillie, the boreal owl can provide interesting information on climate change responses of rare and specialised species.



Figure. 4.1a. The boreal owl.

At present, lacking thorough taxonomical studies, the boreal owl is considered to be a nominal subspecies *Aegolius funereus funereus*. However, it seems that the Pyrenean population has remained isolated for at least 8000 years when the ice withdrew to the north because of global warming during the last interglacial period. This has lead to processes that contributed to a differentiated evolutionary history of this small population.

Currently a research team of Oulu University (Finland) is conducting a study on the phylogeographic structure of the species in Europe, including the recently discovered Pyrenean population. The taxonomic study is an aspect of great importance to species management and conservation measures. If the region's boreal owl is a different subspecies with a very small, fragmented distribution area and with a small numbers of individuals, then it is in much higher danger of extinction. The results will thus be of great significance to the national Red Lists and catalogues of endangered species in France,, Andorra and Spain.

In the spring of 2005 a systematic survey of abandoned black woodpecker nests (which are utilised by the boreal owl) was started to check their occupation, with the objective of capturing and obtaining boreal owl blood samples for genetic studies. This was carried out by different institutions in Andorra, the Catalan Pyrenees and Aragón (FCQ with financial help of the government of Aragón). Through this survey other interesting information about the species' characteristics is also obtained: reproduction zone, phenology, reproductive success, as well as the density of suitable woodpecker holes. Simultaneously data are gathered about the biometrics and shedding patterns of specimens in captivity.

In Aragón three female boreal owls were captured and sampled in 2005, adding up to a total of 15 with those in Catalonia and Andorra. In the coming years, the aim is to increase this sample to some 50 specimens, but with this year's results it will already be possible to confirm whether we are dealing with an exclusive Pyrenean subspecies or not.

4.2. Research goals

The objectives of this study were:

- to increase knowledge about boreal owl presence in potential habitats and confirm its presence in some known territories.
- to increase knowledge about population densities and status in the region.
- to contribute to the genetic study that aims to determine the possible existence of a Pyrenean subspecies.
- to identify its dispersion movements in the Pyrenees.

4.3. Methods

The boreal owl is a small owl species (22–27 cm) and very difficult to see directly, because of its cryptic behaviour and because of its low abundance. Terrain prospection therefore often consists of checking cavities and holes in trees, as the boreal owl often nests in old black woodpecker nests.

The research zone was a subalpine forest of mainly white fir and mountain pine in the mountain pass of Cullibert. The expedition team did a terrain prospection, spreading out and walking in parallel through the forest, looking for cavities that were susceptible to be recent or old Boreal owl nest sites. Discovered sites were recorded using GPS, also taking note of the direction and height of the nest entrance, and controlled for occupation. If positive, the present specimen(s) was(were) marked and a blood sample taken.



Figure 4.3a. Nest check (left) and marking of a boreal owl (right).

4.4. Results

During both slots nest were checked. In the sampled area the forest was observed to be a beech-fir vegetation system with relatively young trees (mainly *Fagus sylvatica*, *Abies alba*, *Pinus silvestris*). Being still thin, these offer little opportunity to make holes big enough for the black woodpecker to nest. During both slots no hole was found that could potentially be a boreal owl residence. The boreal owl was therefore judged to be absent from the area sampled.

5. Snow partridge study

Juan Antonio Gil FCO

5.1. Introduction

The snow partridge's scientific Latin name is Lagopus muta; Lagopus is derived from ancient Greek, lagos meaning "hare" and pous "foot" in reference to the bird's feathered legs. The species name muta comes from New Latin and means "mute", referring to the simple croaking song of the male.

This species is a medium-sized (31–35 cm) game bird in the grouse family. It is known as rock ptarmigan, or colloquially snow chicken or partridge in North America, where it is the official bird for the territory of Nunavut, Canada. A sedentary species, the snow partridge breeds across arctic and subarctic Eurasia and North America (including Greenland) on rocky mountainsides and tundra. It is widespread in the Arctic cordillera and is found in isolated populations in the mountains of Scotland, the Pyrenees, the Alps, Bulgaria, the Urals, the Pamir mountains, the Altai mountains and Japan. During the last ice age, the species was far more widespread in continental Europe.

The rock ptarmigan is seasonally camouflaged; its feathers moult from white in winter to brown in spring or summer. The breeding male has greyish upper parts with white wings and lower parts. In winter its plumage becomes completely white except for the black tail.



Figure 5.1a. Snow partridge in summer to winter colours.

The male's comb has been the focus of studies regarding sexual selection. Because of the remote habitat in which it lives, it has only a few predators, such as golden eagles, and can be surprisingly tame and approachable. The rock ptarmigan feeds primarily on birch and willow buds and catkins when available. It will also take various seeds, leaves, flowers and berries of other plant species. Insects are taken by the developing young. The male's song is a loud croaking only heard in springtime to attract females.

5.2. Research goals

Casual observations suggest that the species has declined over the last 20 years, but no proper study has been done for 15 years. The feeling amongst researchers is that the species is in rapid decline due to climate change and human activities such as ski resort development and tourism. Before any conservation strategies can be developed, a proper scientific study needs to be done and the Biosphere Expeditions team was to assist with this by establishing reliable estimates of individuals as a baseline.

5.3. Methods

The expedition team was driven and walked to a high mountain breeding site (2400 m) in the Alpine zones of Urdiceto Lake and the Minas de Liena, checking for droppings on the way. Possible zones with species presence were prospected during daytime, resulting in a selection of 6 sites for setting up listening stations. Camp sites were also set up. One or two persons per listening station, 500 m from each other, listened for vocalisations for 1 hour before sunset and then the next morning for from 1 hour before sunrise to 1.5 hours after sunrise (2.5 hours total). A total surface of 10 hectares for each listener was covered this way. Recorded data were hour, estimated distance and direction from listening station, and number of verses. The next day the team planned to search the zones were males were heard, but this part had to be cancelled because of bad weather.

5.4. Results

The first slot encountered very bad weather that complicated reaching the research site and made the proper set-up of the listening stations almost impossible. In the first morning hour one boreal owl call was registered, but as it was not possible to distinguish direction or distance of the call and the data had to be rejected as a result. During the second slot the bad weather persisted and the research activity had to be cancelled as being too dangerous. No valid data were generated for this research activity.

6. Expedition leaders' diary: Spain 2008 by Matthias Hammer and Malika Fettak

24 May

Hello everyone and welcome to the Spain 2008 diary. I'm Matthias, Biosphere's founder & managing director and also your expedition leader, and you will be hearing from me regularly over the next few weeks.

Expedition leader? Matthias? I thought it was Peter Schuette, I hear you cry, and you would be right. But nothing is as constant as the change of plan on expedition and so - guess what - the plan has changed! Peter is no longer able to do the expedition and had to pull out at short notice, so he is now my very special friend and you get me as your expedition leader for slot 1 at least. Whether this is a good thing, you'd have to ask Jane, Jennifer, Martyn or Marjorie, who have all been on expedition with me before and who will be part of the slot 1 team. Jane survived Slovakia, Jennifer some hardcore mountain overnight surveying in Oman & the Altai, Martyn more expeditions than I care to remember and Marjorie survived Brazil with me – just and with a broken wrist (get Marjorie to tell you the full story in Reus). If I now have you all quivering in your boots (not!), then this is intentional;)

Anyway, enough of this silliness (I am German and not supposed to have a sense of humour, you know). We've packed up our zebra Land Rover Defender to the hilt and it's about to set off down to Spain tomorrow. We'll pick up a shiny Land Rover Discovery there and proceed to our base at Revilla to set things up for you.

That's the plan, anyway. I hope your own planning is going well and you are starting to get excited. There is no chickening out now!

More in a few days from Revilla, I hope.

Safe travels & hasta la vista!

Matthias

26 May

So the zebra Defender has made it down to the Pyrenees and is having a bit of a well-earned rest near Reus before we meet up with our scientist Oscar tomorrow and move into Monte Perdido Research Station, our base for the next few weeks. If you haven't seen pictures of Monte Perdido yet, then take a look at www.biosphere-expeditions.org/spain. We have solar panels, presentation equipment, running water (hot if you are lucky) and, luxuries of luxuries, porcelain toilets & showers there. Also bunk beds in pretty small rooms and no wardrobes to hang your clothes in (so pretty much what you'd expect from a mountain hut), so best to stick one set of clothes on and stay in them for the expedition, lest you ruffle your bags too much ;))

As of tomorrow, our "official" expedition mobile phone number should be +34 689176217, but please remember that this is for emergency purposes only (such as for example if you are about to miss assembly, which I am sure you won't ;).

Think of us over the next few days as we run around like headless chickens, desperately trying to get everything ready for you. Hard life, this expedition leader thing, you know.

More updates from the mountains to come, if I can find the time and internet connection!

29 May

Hello from a very cold Revilla. I have reports of more than 30 degrees C in Germany, but I am afraid here in Revilla, it's cold in the mountains (about 10 degrees C at our base at 1200 m) and it's also been raining a lot. So please come prepared for some cold and wet weather as well as warm/hot and dry weather. You never know what the Pyrenees will throw at us.

We've met up with Oscar and Diego, our scientist for this expedition. They have been joking that Spain will get its revenge on England and Germany and send over its pensioners if the weather stays like this;)

Other than that, we are as ready as we'll ever be with all the activities now worked out. Oscar and Diego wanted us to add Boreal Owl research to our tasks, so we have, and the resulting activities and a day-to-day plan are in the attachment. Please note that the "snow partridge listening stations" activity requires clothing and equipment for the cold in the high mountains and that there may well be snow at the 2400 m study site. You don't have to do any of the activities, of course, but the more people can join in, the better.

Of course we will also talk you through all the activities and the general plan in much more detail when you arrive, so no need to worry now – there'll be plenty of time for questions and to make decisions once you are here.

Now a word about meeting up. For the first slot, I'll be coming straight from our Monte Perdido base early in the morning on Sunday. But as I think most of you will be in Reus the day before assembly, I suggest you all meet up in the lobby of NH Hoteles at 20.00 on Saturday (31 May) to go out for a drink or a meal. This is only a suggestion, of course, but I think it's nice to get to know each other and you should all have a list of team members to make your own plan.

For slot 2, we will be in Reus on Saturday and wait for you in the lobby of NH Hoteles at 20.00 on Saturday (7 June). Anyone who would like to come and join us for a drink or meal is welcome to do so.

That's it. Looking forward to seeing slot 1 at 09.00 this Sunday.

3 June

The first team was all there, ready and waiting at Reus, and after a three-hour drive we arrived at FCQ's Eco Museo in Aínsa to meet our scientists Oscar and Diego and get an introduction to the area and its animals by getting our very own tour around the museum and its exhibits. We also had a quick stroll around Aínsa, one of the most beautiful villages in the Pyrenees with an unspoilt town centre from the middle-ages. Then the drive up to Revilla, along a steep mountain road with numerous switch-backs and good views of Monte Perdido, the second highest peak of the Pyrenees and backdrop to our home.

The weather was pretty kind to us on Sunday, but yesterday it showed us what it's capable of. The morning was sunny and pretty clear, but we were indoors finding out about our work here, the research activities, datasheets, the FCQ and the equipment that we'll be using. In the afternoon, as we were getting ready to practice our newly acquired skills in the field, the weather turned and by the time we were ready and all assembled in the yard, the skies were grey, visibility was down to a few hundred metres and it was pouring, and I mean pouring, with rain. Needless to say that we still braved the elements and went for a very wet walk where paths had turned into little alleys of big puddles or little streams. So we found a great rock overhang sheltering us from the rain and there practiced using the GPS, compass, spotting scope, binoculars and radio telemetry equipment. It was a pretty cold and wet affair, but we did manage to spot chamois with our scopes on the slope opposite. After a couple of hours of practice we started our walk back to base. As we did, gaps started to appear in the clouds, the rain eased and literally just as we got to base, a miserable day was transformed into a Pyrenean summer afternoon. So we walked straight past base and up the steep slopes behind it, boiling in our rain gear as we did. It's the mountains, you know;)

Within minutes, lammergeyers, Griffon and black vultures, honey buzzards and other birds were out and circling overhead. So more time and better weather to practice for another hour or so until dark grey clouds started rolling in again from the end of the valley and it was back to rain.

Wet but in good spirits we arrived back at base as the weather turned yet again and clouds and rain were replaced by sunshine and blue skies to dry ourselves and our clothes in whilst sitting in the yard and enjoying the view.

In the evening, there was more work to be done in the lecture room, reviewing the skills learned, finding out more about lammergeyer biology and planning the next day. Then a late dinner (or early if you are Spanish) at 20.00 with some birthday celebrations for Birgit, one of our team members.

Today we are out in two groups. One at a hide to record birds that come down to feed at a feeding place and one to watch and assist some climbers as they mark lammergeyer chicks in a nest on a rock face. More about all this in my next instalment of the diary.

5 June

Good news – the weather has improved! There's been little rain and the temperatures down in the valley have been positively soaring to 21 degrees yesterday. Almost spring here in Spain;) The better weather is meant to continue until the end of the week and until the beginning of next week too (see www.aemet.es/es/eltiempo/prediccion/localidades?l=22022 for a prediction).

Our research work is going well too. The day before yesterday the hide group were treated to displays of numerous vultures frolicking right in front of their noses and they were able to identify 12 lammergeiers by their wing markers during their 4.5 hour shift of sitting still in the hide. The nesting checks group witnessed an unsuccessful attempt of climbers trying to mark a lammergeier chick, which was getting too excited in its nest to be marked, and then continued onto radio telemetry work, checking the skies for passing birds with radio transmitters.

Yesterday the whole group spent the day sweeping a steep mountainside forest for capercaillie sign and our scientist Oscar was very pleased when we found droppings that confirmed that the remote site was used for courtship displays. When the work was done, we had a break at a spectacular mountain top site with stunning views of the central Pyrenees chain including its two highest peaks of Aneto and Monte Perdido.

Martyn, oh wise and mighty one, and veteran of this, his seventh expedition, outed himself as thoroughly English by falling asleep in the sunshine and then proudly displaying the bright red legs that are so closely associated with his fellow countrymen here in Spain. Sadly he did not bring a pair of Union Jack shorts to complete the picture :))

As I write this, people are floating in to breakfast and today is the day we leave for our overnight survey up in the snow at 2400 m at lake Urdiceto to study snow partridge. Pitching a tent in the snow, sitting on a snowfield for some hours before sunrise and surviving the night under those conditions will be a new experience for many, so there is a sense of expectation and trepidation in the air this morning.

I'll be off the air for the next couple of days and should be back Friday night or Saturday with reports of snow partridge and nights on the mountainside.

6 June

We're back from a true (snow partridge) expedition to the mountains, which had it all. Camping in a snow storm, snow partridge sign, a fall down a steep slope of snow and ice (by oh wise and might one) including a rescue, as well as some amazingly good spirits, stiff upper lips, guts and determination by the whole team.

Thursday started with clouds rolling in as we approached our research site at Lake Urdiceto. The Land Rovers took us up to the snow line and soon we were plodding along some pretty steep mountain sides to where we split into pairs to pitch our tents. By the time we were up there, the wind was howling, visibility was down to a few metres and it started to snow. Nobody complained, though, and so we pitched our tents and settled in for the night and some pretty cold and uncomfortable listening and data recording duties. I heard the calls of the territorial snow partridge male a couple of times and very close, but there was no chance of seeing the animal. And you simply have to take your hat off to this totally, absolutely hardcore mother-of-all-tough-guys bird! I was pretty cosy in my tent in the howling wind listening to the snow building up on one side of it. But this bird was out there singing away!

The next morning I had to dig myself and the tent out of the snow and was wondering/worrying how everyone else was. But when I called on the radio, chirpy voices came back from all tents / listening stations. It would be a lie to say that everyone had had a good night's sleep, but you have to hand it to the whole team – despite Jennifer's frozen fingers, Birgit's frozen feet, David's soggy pants, Martyn's fall, Ian's wonky tent, Christine's exhaustion, Malika's bad hair day, Jane's high-number birthday, good spirits, stiff upper lips, guts and determination abounded. Well done everyone!

As we got off the mountain, exhausted, glad to be back in once piece and pleased with the research results, the weather turned into a glorious day, just in time for all of us to dry our gear in a colourful display of tents, sleeping bags rucksacks, snow shoes and a multitude of other equipment.

I'm sure tonight will be a great last evening dinner and everyone will get back with some stories to tell!

8 June

Yesterday slot 1 travelled back to Reus in glorious sunshine with the best views of the mountains we've had all week. Today I have just waved slot 2, who have all made it safely to the assembly point, off on their journey to Revilla.

I have now handed over to Malika, who will be leading the second slot and writing further instalments of the dairy.

Thanks to everyone on slot 1 for your commitment, enthusiasm, determination and plain good company. I've really enjoyed my time with you and you have been a great team – and you all know I'm not just saying that.

All the best to Malika and her second slot – you're in good hands & enjoy.

9 June

Hello everyone, I'm Malika and I'm taking over the diary and the expedition from Matthias...

After an enjoyable evening at Reus with some members from teams 1 & 2, lots of pasta and red wine and of course - painful goodbyes from team 1, I took over team 2 on Sunday morning. Everybody was on time, so we had a relaxed journey to Ainsa. During our afternoon field walk later we watched a fantastic sunset (the first decent one of this expedition!) and after that we went through all the introductory stuff and risk assessment after dinner (Jane gave me 10 points of 10 for my performance!).

Having gone through more theory and equipment training today, everybody is ready to go out to the field tomorrow.

10 June

A great day, as we had a very close encounter with a lammergeier called Xielsa. She passed our observation point only a few meters from where we were standing - an exciting moment for the whole team. But also a bad day - as I didn't pass Jane's room check (by order of Matthias, she said) which reduced my points account;)

Fully equipped and trained up, we started our research at the feeding point in Escuain. While Astrid, Kathleen and I were inside the hide, the rest of the team settled down with their spotting scopes to record activities from further away. What an amazing experience seeing 30 - 40 griffon vultures coming down all at the same time fighting for food. And what a bloody cold, windy and wet place for us to stay for hours, frightened about every noise our waterproofs made with every movement. You can imagine that we were happy when Oscar came to pick us up.

Once there, he showed us the breeding unit. Astrid immediately fell in love with the chick but "Mama" Walter refused to let her take it home.

Beside the "big birds", Jane, Andrew and John had a lot of good bird sightings, such as rock bunting, rock thrush, white stork, bee eater and golden oriole and other such species that get birders going.

We ended our day at a bar in Ainsa discussing the "feeding procedure" deciding to do the chicken dance for Xavier when he serves dinner. You can imagine the look on his face - astonished owl! Big laughs at the end of a good day.

11 June

Lammergeyer nesting check and ID on Wednesday. One group went to Pena Guara, a remote feeding point about 140 km from base. The hide looked like a luxury apartment: a small wooden house equipped with solar panel, cooking facilities and even a bed in it! Big mirror windows for an excellent view. But none of the birds seemed to be hungry except one non-marked lammergeier picking up one single bone. While sitting nearby on a big rock for about two hours at least he allowed us a very close look and intensive studies.

USUALLY - Oscar tried to explain - there should have been much more activity. that's because USUALLY there is no rain in June and USUALLY it's much warmer. No need to say that all of us laugh these days when Oscar's talks begins with "USUALLY"

Team 2 went to Valle de Anisclo. After a one hour walk with fantastic views they reached the study site. Equipped with spotting scopes and binoculars they scanned the whole area, knowing that there ARE two breeding units somewhere, but unfortunately they couldn't find the nests. Still, everybody returned to base in great spirits & impressed by the breathtaking, beautiful area we are working in.

Well prepared for the arrival of big boss Matthias the whole team lined up at 19.30 in the lecture room, ready for the expedition presentation, dressed in Biosphere T-Shirts and wearing whistles. And guess what: HE was late (his excuse was giving some of us a ride on his motorbike round the windy mountain roads, which was actually great fun)! Anyway, he was late (one again for the record) and so was dinner:)))

12 June

Blue sky in the morning and only 35% chance of rain on Thursday - good conditions for a capercaillie signs survey. On our way to Valle de Chiu we stopped to observe a group of about 15 griffon vultures, sitting on a rock beside the road, very close. They then flew up to the top of the cliffs and came down again. Very impressive.

Only half an hour later we spotted a couple of golden eagles while parking up the Land Rovers and watched them for 20 minutes. Even Oscar, Nina and Luis were impressed by this rare spectacle.

We then spent three hours in the forest, surveying different areas up to 2100 m altitude and found a lot of droppings and capercaillie diarrhoea (which means they were excited and breeding). What a successful day! Don't you love this work;)

Back at base we enjoyed the afternoon sun in the yard, talked about plans for the next and also last day (already!) and agreed, that THIS may be the weather Oscar is talking about, when starting his sentences with "USUALLY ."

13 June

The whole group went out for a boreal owl survey this morning while I stayed back at base preparing all the stuff for leaving tomorrow. Almost three weeks but it feels like three months at Revilla, the time has gone so quickly! Everybody will help to pack up the zebra Defender later this evening, so that I can go straight back, passing through the tunnel of Bielsa to France and then on to Germany and the big wide world;)

But before leaving there's one last evening waiting for us, and I'm sure it will be a special one.

15 June

I made my way back to Germany, driving the zebra Defender through the Pyrenees and across France. Two days after team 2 left Revilla on Saturday morning, taken by Oscar to Reus: 7 persons in the Discovery and all the luggage packed on the roof rack.

We had a great last evening at base, enjoying another excellent dinner thanks to Xavier and emptying all left over bottles of wine © Needless to say that we forgot about the 23.00 bedtime rule...

Tired faces the next morning, but also happy about the good time we had. So let me say THANK YOU to everybody for taking part in our project, your enthusiasm, good spirit and work and for all your input to make it a successful expedition. A special thanks to Oscar and all of the FCQ staff for sharing their lives and work with us and untiringly answering all our questions in "Spanglish". And of course all team members for being flexible and dealing with whatever we threw at you (e.g. unusual bad weather!). You all made my job as expedition leader and/or assistant great fun!

Hope to see some of you sometime, somewhere. All the best to you all.

Malika Fettak Expedition leader

P.S. Don't forget to share your pictures (see www.biosphere-expeditions.org/pictureshare).