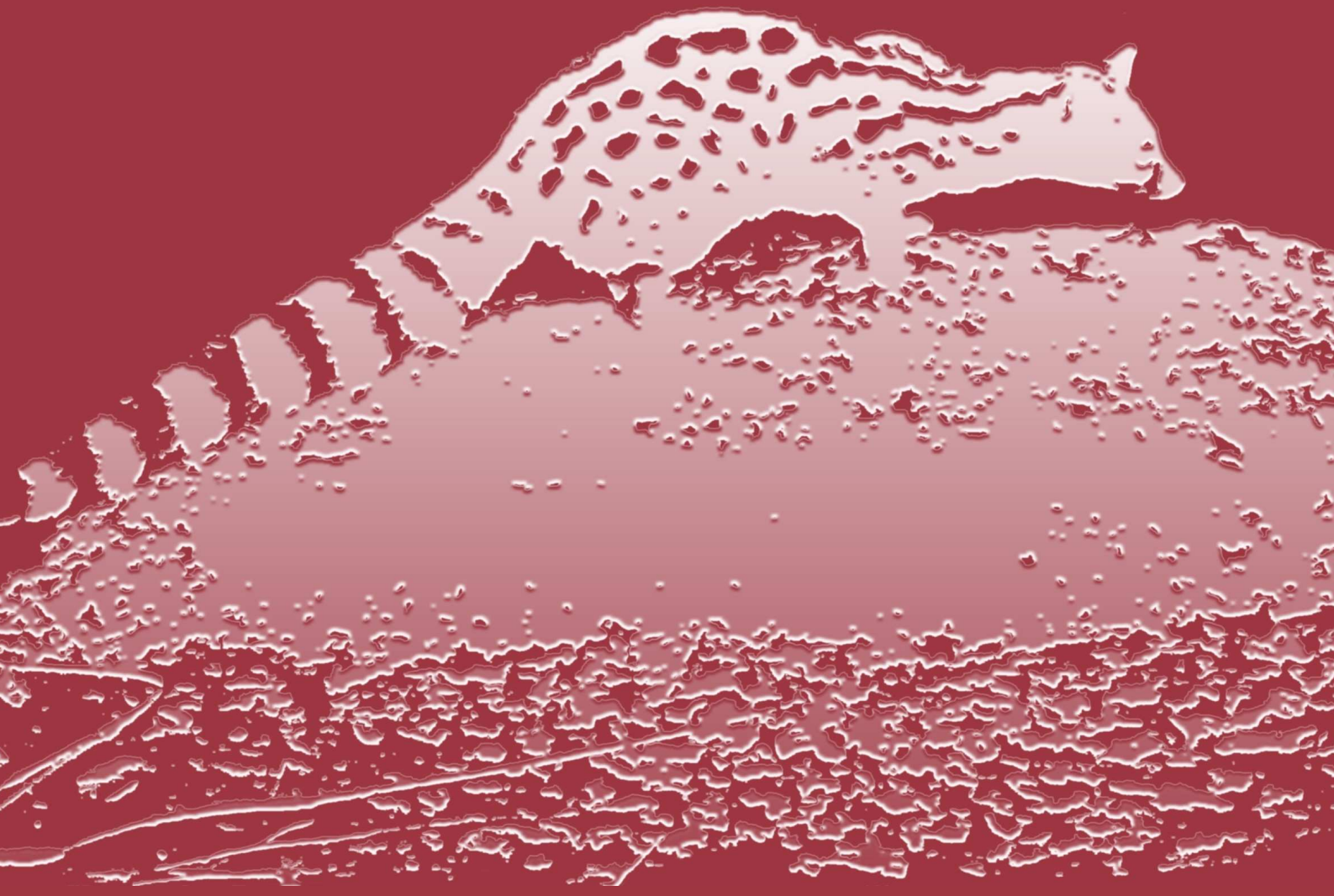
Mammal survey
Serra da Estrela
Portugal
2009



Zoogdiervereniging

RAPPORT 2009.49 Arnhem, december 2009

Uitgave van de Veldwerkgroep van de Zoogdiervereniging

MAMMAL SURVEY
SERRA DA ESTRELA
PORTUGAL
2009

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SUMMARY

by: Jeroen Willemsen and Kees Mostert

From July 28th till August 6th 2009, the Field Study Group of the Dutch Mammal Society (Zoogdier-vereniging) paid a visit to the Natural Park "Serra da Estrela", in the central-east of Portugal. A summer camp is a traditional part of the Field Study Group's yearly program, aimed at surveying mammal species which are rare or absent in the Netherlands, and to extend and exchange knowledge of survey methods geared to diverse species. Secondly, the Field Study Group summer camps abroad aim to enlarge the knowledge of presence and abundance of mammals, and to a lesser extent other fauna groups, in a given area. Foreign summer camps invariably take place in co-operation with local organizations in order to fulfil not only the aims of the Field Study Group, but also those of the counterparts working and living in the area. In this way the information gathered is more likely to find its way in the protection and management of the area in general, and of mammals in particular.

The summer camp in Serra da Estrela was prepared by the Serra da Estrela Information Centre (CISE). The Serra da Estrela (Star Mountain) is a *Natura2000* area of more than 100,000 hectares and holds the highest mountain on the mainland of Portugal: 1,993 meters above sea level. The Serra da Estrela covers vast areas of open, bare rocks but on the slopes agricultural land and forests can be found. Within the Natural Park some special areas of interest were indicated by CISE, where data on the occurrence of mammals was needed the most – for various reasons. In general almost nothing was known on the occurrence of small mammals such as bats and mice in these areas. From the camp base in the town of Loriga, the aim was to collect data on the presence of mammals in the Natural Park in general and in the areas of special interest in particular. As usual a large number of resources and techniques were used to collect as much data as possible. A part from the 30 Dutch, Belgian and Portuguese participants some activities were visited by local people working with mammals and a group attending an invasive tree-control project week.

Especially the use of mist nets to catch bats proved to be a valuable method for the survey of bats. The use of mist nets was also highly appreciated by the summer camp participants. Almost every night mist nets were set up on many locations, such as near streams and rivers, in water reservoirs for fire helicopters, on forest paths and at the entrances of caves and mines. This resulted in a list of 19 different bat species. The most prominent species were three types of Horseshoe bats, Barbastelle, Bechstein's bat, Soprano pipistrelle and Savi's pipistrelle. The use of bat detectors produced additional data on bats, such as Leisler's bat and European free-tailed bat. Searching empty buildings and sheds for bats lead to the finding of several groups of both Lesser and Greater Horseshoe bats, many times with young. Also Daubenton's bat and Common pipistrelle were found in objects like bridges and culverts.

Small mammals were surveyed at several locations by setting out lines of different types of live traps. This resulted in the recording of five different mice species, in small amounts. Along small streams, several Miller's water shrews were caught and in grassy fields the Spanish shrew and Algerian mouse were recorded. The correct determination of Greater and Lesser white-toothed shrew appeared to be a problem. As usual the species that was caught the most was the Wood mouse. Traps placed in old Chestnut trees were meant to prove the occurrence of Garden dormouse, but unfortunately nothing was caught in these traps. At various places pellets were found. Checking these pellets for the skulls of mice sometimes results in unexpected findings and is therefore an interesting addition to the results obtained by using live traps.

In addition to the direct survey of bats and mice, a lot of sightings were recorded. Alongside small streams droppings of Otter and Pyrenean desman were found. Attempts to capture the latter species failed unfortunately. Camera traps were placed for this species, but also did not lead to the expected result. Several times Common genet was recorded by the cameras, as was the case for Wild boar. A mysterious large plume tail on a photo finally appeared to be Stone marten.

A total of 40 mammal species was recorded during the summer camp in Serra da Estrela. Table 1 shows the list of species and the observation types. The Dutch, English and Portuguese names of the recorded species are presented in appendix 1. Also observations of birds, amphibians, reptiles, butterflies and dragonflies were recorded. This resulted in a file with more than 1,000 observations.

Scientific name	Mist net	Live trap	Sighting	Dead	Camera	Droppings or rracks	Detector	Owl pellet
Erinaceus europaeus			◆					
Sorex granarius		◆						◆
Neomys anomalus		◆						
Crocidura russula / suaveolens		◆				◆		
Crocidura russula								◆
Crocidura suaveolens								◆
Galemys pyrenaicus						◆		
Talpa occidentalis						◆		◆
Rhinolophus euryale			◆				◆	
Rhinolophus ferrumequinum			◆			◆	◆	
Rhinolophus hipposideros			◆					
Myotis bechsteinii	◆							
Myotis blythii			◆					
Myotis daubentonii	◆		◆				◆	
Myotis emarginatus	◆							◆
Myotis myotis	◆						◆	
Myotis nattereri incl. M. escalerai	◆							
Pipistrellus pygmaeus	◆							
Pipistrellus kuhlii	◆						◆	
Pipistrellus pipistrellus	◆			◆			◆	
Hypsugo savii	◆							
Nyctalus leisleri	◆						◆	
Eptesicus serotinus	◆			◆			◆	
Barbastella barbastellus	◆						◆	
Plecotus auritus	◆		◆					
Plecotus austriacus	◆							
Tadarida teniotis							◆	
Oryctolagus cuniculus			◆	◆		◆		
Sciurus vulgaris			◆	◆	◆	◆		
Arvicola sapidus			◆			◆		◆
Microtus agrestis								◆
Microtus lusitanicus				◆				◆
Apodemus sylvaticus		◆		◆				◆
Rattus spec.						◆		
Rattus rattus				◆				
Mous musculus domesticus								◆
Mus spretus		◆						◆
Vulpes vulpes			◆	◆	◆	◆		
Martes spec.			◆			◆		
Martes foina					◆			
Lutra lutra						◆		
Genetta genetta					◆	◆		
Sus scrofa			◆		◆	◆		

Table 1. Observed mammal species in Serra da Estrela, Portugal 2009. English, Dutch and Portuguese names of the species are presented in appendix 1.

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APPENDICES

1 INTRODUCTION

by: Jeroen Willemsen

This report presents the results of the summer camp that was organized by the Field Study Group of the Dutch Mammal Society (Zoogdiervereniging) from July 28th till August 6th 2009. The aim of this summer camp was to obtain information on the presence of mammals in specific parts of the "Serra da Estrela" Natural Park, located in the central-east of Portugal. In the area of interest little was known so far about the presence and abundance of mammal species. Apart from mammals many sightings of birds, reptiles, amphibians, butterflies, dragonflies, grasshoppers and crickets in the area were recorded.

The landscape of Serra da Estrela is varied: the highest point is at an altitude of 1,993 meters above sea level and the slopes of the Serra descend steeply to much lower altitudes. Lakes –some artificial–, small streams, deciduous forests and pine-forests are found within the borders of the Natural Park. The area is used for agriculture as well: pastures, fields and vineyards can be found throughout the lower parts of the park, mostly situated on terraces. Small streams form an important source of water during the entire year and also serve an ecological function as connection between the lower parts of the Park and the higher regions. The result of this combination of landscapes is a high level of biodiversity.

The 2009 summer camp is more or less a result of the visit to Alvão Natural Park in 2003, when Paulo Barros demonstrated techniques to catch the Pyrenean desman *(Galemys pyrenaicus)*. The Dutch Mammal Society stayed in touch with Paulo since then. In the autumn of 2008 Paulo asked if the Society would be interested in visiting the Natural Park Serra da Estrela and established contacts with José Conde of the Serra da Estrela Information Centre (CISE) in Seia. With the invaluable help of his CISE-colleague Filipe Martins, preparations for the summer camp were made. The sisters of the church in the village of Loriga provided two buildings that could be fitted up as a camp site: with the help of the Portuguese army, one building was furnished with mattresses and reserved to sleep in and one building was set up specifically for mammal research purposes.

The summer camp participants could cover the area of study from the base camp in Loriga by car or by foot. Most of the recordings were made in the south-western part of the Park, both in the higher regions of the Serra da Estrela and on the slopes around Loriga and Seia. Bat detectors were used to identify bats and in several cases sound recordings had to be analyzed to identify the species. Mist nets were used to catch bats, mostly above water tanks and sometimes near the entrance of deserted mines. Visiting the lofts of churches proved not to be an interesting option in Serra da Estrela because all the churches were recently renovated and entries for bats were closed off. Visiting old buildings and deserted houses however, produced several mammal observations and some owl-pellets as well. Live traps were used to catch other small mammals. Sightings and the use of inconspicuous camera traps also contributed to the list of species that could be identified. All recordings were noted on special forms and processed in a laptop computer. A database that contains all the collected data has been compiled and will be sent to CISE. With the use of Global Positioning equipment, the exact locations of the findings were recorded.

Photo: Jan Boshamer

The hosts: Paulo, José and Filipe.

After the description of the area of study in chapter 2 of this report, an overview will be given of the bats that were recorded in Serra da Estrela (chapter 3). In chapter 4 the small mammals (mostly mice) that were caught by setting out lines of live traps are discussed. Small mammals that were found in owl pellets are discussed in chapter 5 and all other mammal observations are presented in chapter 6. Chapter 7 will concentrate on the collected bat parasites and recordings of other taxonomic groups like birds, reptiles, amphibians, butterflies, dragonflies and plants are described in chapter 8. Finally chapter 9 will discuss the ecological impact of water canals on the wildlife of the Serra da Estrela.

The summer camp was attended not only by Dutch and Belgian people, but also by many Portuguese. José and Filipe, Paulo and two of his colleagues, a number of biology-students and bat-workers all joined in the activities and made the stay in Loriga very pleasant. More than once, animated conversations could be heard on the camp site grounds. The group consisted of 30 people in total; their names are presented in appendix 2. Apart from these "die-hards", who attended all or most of the camp, a number of people visited mist netting activities during one or two nights. They were a group attending an invasive tree-control project week and a group of employees of a local Animal Recovery Centre. One of the Portuguese students, Cláudio Álvaro, kindly agreed to give a short impression of the students' view on the summer camp (see text box below).

Photo: Jeroen Willemsen

One of the campsite buildings.

For the first time in long years, the camp site was located right in the middle of a village. This situation did lead to some minor parking issues, but also to interesting contacts with several local inhabitants. People were aware of the presence of the group thanks to the church of Loriga and the very friendly sisters. We probably don't know half of the people who helped preparing the summer camp, the accommodation and the permits (see appendix 3), so we would not only like to thank Paulo, José and Filipe for their enthusiastic help, but also everybody else who has contributed to the summer camp and helped it become a big success.

Serra da Estrela Summer Camp 2009 by Cláudio Álvaro

Last summer we had the bliss of participate in the annual camp of the Dutch Mammal Society. Back in April, Hans Bekker gave a speech in our University in which he told us about this camp. As students of biology, and mammals' fans, we were very interested in it straight away and therefore we had great expectations about this activity. As the first day of the camp was arriving, our excitement increased: in one hand we got very anxious to get in the place and to meet everybody, but in the other hand we were also a bit afraid because of our lack of experience and knowledge.

When we arrived to the camp base in the beautiful village of Loriga we started to see everybody with lots of traps, maps, cameras and lots of sophisticated things and we thought at the moment: "what the hell are we doing here?". But then, as the time was passing, we realized that everybody was very friendly and helpful and that we could learn millions of things from them. We started to ask questions and to get included in the "mammals spirit", and in the end we realized that it was really an amazing experience. We participated in all kinds of activities, like mist netting, desman trapping, searching for bats shelters, small mammals trapping… and it was very exciting to see lots of new species (for us and also for the Park). But beyond all the species that we found, the most rewarding thing about this camp was to have the privilege of working and learning with incredibly professional people and to see the passion and dedication that they put in their "work". It was a pleasure to meet those people and to learn from them. The only negative point in all the camp was not to have found the fleeting desman! Well, better luck next time…

A big THANK YOU to everybody and we hope to see you more times.

2 DESCRIPTION OF THE AREA OF STUDY

by: Jeroen Willemsen

2.1 GEOGRAPHY AND GEOLOGY

Serra da Estrela ("Star-Mountain"), in the central-east of Portugal, is the most western part of an east-west stretched mountain range, called the Central Range (see map 1). An area of about 100,000 hectares is declared a Natural Park. Serra da Estrela Natural Park is situated roughly in the area between the towns of Seia, Gouveia, Guarda and Covilhã and holds the highest mountain peak on the Portuguese mainland. The "Torre" has an altitude of 1,993 meters above sea level. Several well-maintained roads give access to the area, even up to the highest regions. The mountains consist mainly of granite rock, but on the slopes also schists can be found. In the past small and large mines have been excavated in both the granite and the schists. Water mines are usually not very large: a small tunnel of about 1,5 meters high only leads several meters into the ground, forming a well. However, in the area there are also old mines were once wolfram was yielded. These mines are very large; tunnels with a length of hundreds of meters can be found. Not all the mines are easily accessible. Apart from the bramble shrubbery that bars the way, the entrance sometimes consists of a vertical shaft that can be entered only by experienced people with professional cave exploration gear.

2.2 LANDSCAPE

Because of the variety in altitude a lot of different landscape types can be found in Serra da Estrela. The highest parts of the Park consist of bare rocks covered with a dwarf shrub vegetation, but sometimes without any vegetation at all. On places where water stagnates bogs, wet grasslands and small lakes are formed. For hydro-electric purposes massive dams are built, thus creating several small and large water reservoirs. The largest reservoir of the Serra da Estrela is "Lagoa Comprida", at an altitude of about 1.600 meters above sea level. The smallest reservoirs are made of concrete and have a surface area of only a couple of square meters. These small reservoirs are used by the helicopters of the fire department in case of an emergency. Lots of birds and other animals use these tanks to drink water and many amphibians can be found in the water as well.

Photo: Jeroen Willemsen

One of the small bogs near Lagoa Comprida.

The slopes of the mountain are usually very steep. Shrub vegetation can be found here, and on the lower parts both pine-forests and deciduous forests are present. As is the case for many parts of Portugal, these areas are unfortunately under constant threat of fires. In recent years the entire vegetation has disappeared at some locations. However in the surroundings of Lapa dos Dinheiros a forest with very old chestnut trees still can be found. This area is very valuable for mammals and most likely for other animals as well.

Several small rivers run down the mountain, providing nature and humans with valuable water. The Loriga river, located near the camp site, is known to be an important ecological connection between the lower parts of the park and the higher areas. Small water canals are used to lead the water to agricultural fields. Agriculture, mostly the production of potatoes and rye, takes place on small fields, which are often situated on terraces. On suitable places vineyards can be found as well, but not all vineyards are used for the production of wine and port anymore.

Photo: Cláudio Álvaro

The U-shaped valley near Manteigas.

Villages are located in the valleys. Some of these valleys are remains of large glaciers, such as the valley southwards of Manteigas. The characteristic U-shape of this valley can be recognized in the field easily. But also smaller valleys with steep slopes occur in Serra da Estrela. These valleys are formed by small streams that eroded the slopes of the Serra. The villages in the valleys are usually not very large. One of the largest villages in the Natural Park is Loriga, where the camp site was located. Most of the houses and other buildings are maintained well, but on several locations deserted factories and other buildings can be found. Some deserted villages such as Varzea and Serapitel proved to be important hiding places for bat colonies.

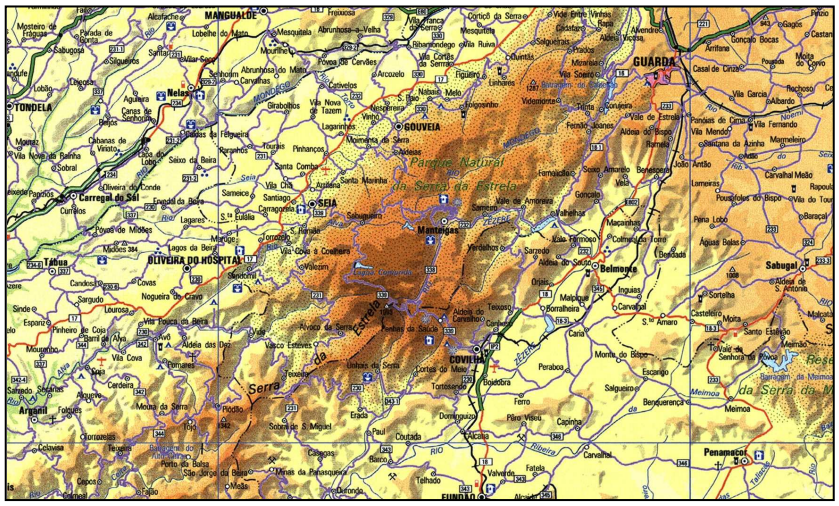
2.3 CLIMATE

Serra da Estrela forms an obstacle for the winds coming from the Atlantic Ocean. The western slopes of the Serra as well as the higher parts of the park are therefore influenced by an Atlantic climate. The observations described in this report were mostly made in this western part of the Serra da Estrela. A more Mediterrane climate can be found on the eastern slopes of the mountain. In the highest parts of the park the lowest temperatures are recorded. Snow is common during the winter season (some ski accommodations are present) but in the summer temperatures up to 20°C are reached. On lower altitudes the slopes of the mountain are heated by the sun and temperatures can rise to much higher levels.

Because of the large amount of precipitation in the higher parts of the area (up to 2,500 mm a year – mainly during the winter season), small water streams run over the slopes of the Serra during a large part of the year. One day of the camp proved to be the exception to the rule which says that rainfall in summer is low; it rained almost all day and dense fog formed in the area around Lagoa Comprida. Sometimes the valleys have their own micro-climate. During the summer camp clouds could be observed which seemed to be "stuck" in a valley. The water temperatures are very low, even in the summer. Most streams and lakes are to cold to be entered with bare feet. However, smaller ponds that are exposed to the sun proved to be comfortable swimming places.

Photo: Pedro Alves

Clouds are filling the valleys at lower altitudes.



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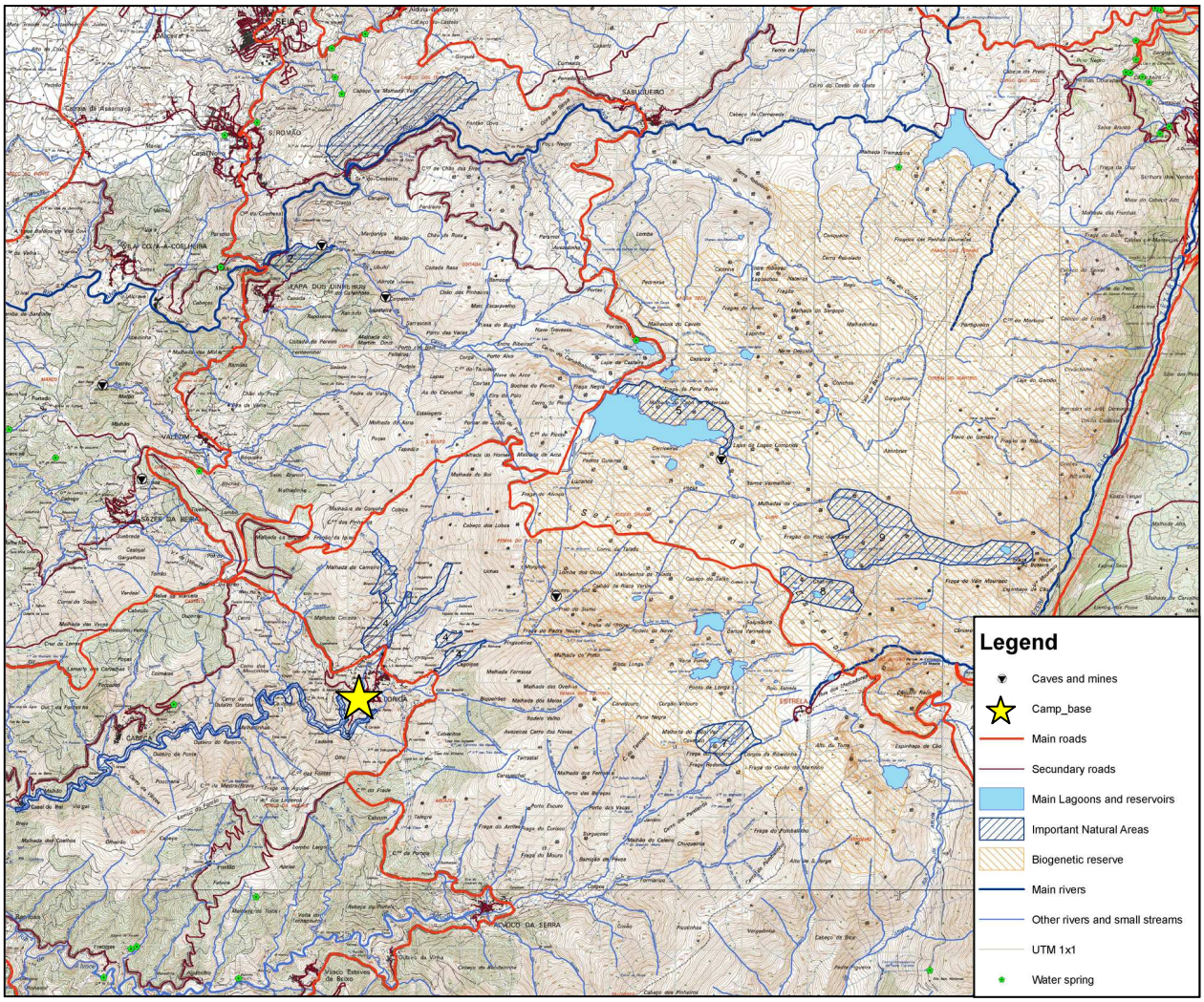


Map: Filipe Martins / CISE

Map 1. Location of the area of interest: Serra da Estrela. The camp site was located in the village of Loriga.

3 BATS

by: Jasja Dekker

3.1 SURVEY METHODS

Various techniques were used for the survey of bats present in the Natural Park. In this chapter these techniques are discussed first. Next the results will be presented for each of the techniques and finally the recorded species will be discussed.

Inspections of man-made structures

Many bat species spend the day in man-made structures, which can be checked for their presence. Summer camp members clambered onto church attics, crawled through culverts, entered abandoned buildings (such as farms, barns and stables), examined other man-made structures such as bridges and rappelled down mine shafts.

Serra da Estrela knew a lot of mining for tungsten (wolfram; Dutch: *wolfraam*, Portuguese: *tungstênio* or *volfrâmio*). Mining for tungsten started in the 19th century in the Serra and resulted in extensive mine systems in parts of the area. During the summer camp the smaller, older mines were inspected on foot; a larger system at Sazes da Beira was also inspected, using specialized speleological equipment. At one of the entrances of this mine system, bats were also surveyed with mist nets.

Photo: João Gaiola

Looking for sleeping bats underneath a bridge.

Finally, a number of water mines were inspected. There is little surface water in the area but a lot of water infiltrates at the Torre and finds its way down through porous layers between the granite. For centuries, the people of the Serra have dug tunnels to tap into these water flows: the water mines. At the entrances of these water mines a small wall is constructed to form a basin, so that the water is stored and can be used for irrigation. The tunnels are humid and cool, and were inspected for bats on foot. On two occasions, the owner of the water mine was kind enough to empty it before it was entered: the owner assured us that the basin would be full again by the next morning!

Bat detector and Car transects

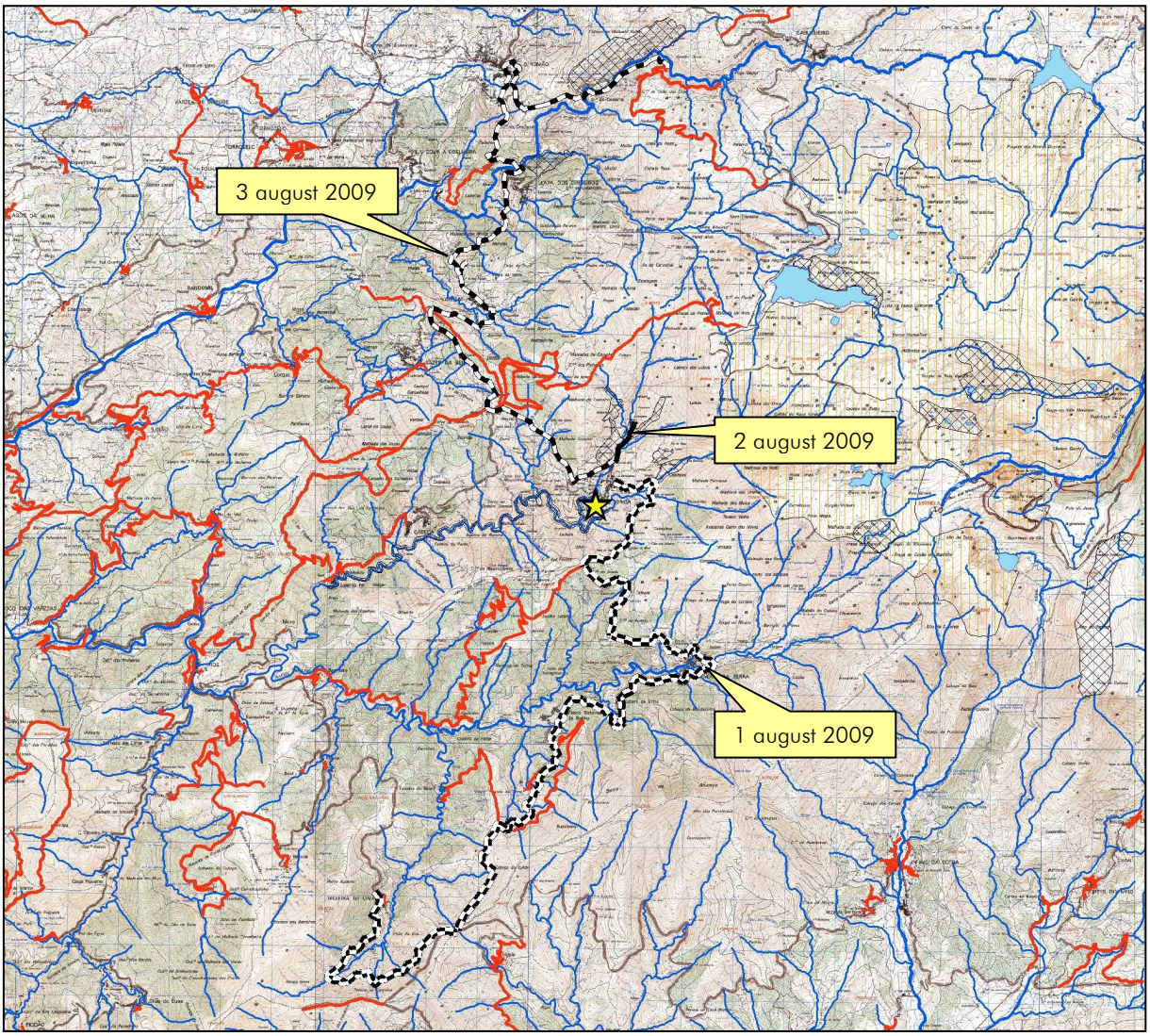
Bats form an image of their surroundings using the echoes of their calls, made in the ultrasonic range. As these calls differ between species, many species of European bats can be reliably identified with the use of a bat detector. Some species, however, call very softly and can easily be overlooked when a bat detector is used. Other bat species (such as those of the genus *Myotis)* have very similar calls and their sounds on the detector can easily be confused. During the summer camp, bat detectors were used in three different ways:
- at mist net sites and live trap sites;
- direct identification of hunting bats;
- on car transects.

Several bat detector observations were made from cars. This technique was used sometimes while returning to the camp after mist netting, but on two occasions, transects with the express purpose of surveying bats were driven (see map 2). On the 1st of August, a car transect towards the south from Loriga was made, through the village of Alvoco da Serra in the direction of Teixeira. On the 3rd of august, the north was surveyed, driving through Valezim and Lapa dos Dinheiros towards the live trap sites in the north. On the 2nd of August, a few additional observations at the Loriga river (north of Loriga) were made.

A benefit of this type of research is that many bat observations can be collected within a short period of time. Another interesting aspect is that one can get a good impression of the relative abundance or rareness of certain bat species.

Disadvantages of this method however, are that it can only be applied where there are accessible (and therefore often lamp lit) roads and that identification must be done very quickly. Consequently mistakes are made more readily than with other detector-based methods. It is difficult to make recordings and analyse them on the spot, as passes are often quick and animals are heard for only a short period of time.

The survey therefore was limited to species which are relatively easily identified: *Pipistrellus pipistrellus*, *Pipistrellus kuhlii*, *Tadarida teniotis*, *Eptesicus serotinus*, *Nyctalus leisleri*, *Myotis myotis* and *Myotis daubentonii*. Other *Myotis* species were not identified, and observations of *Myotis daubentonii* were only accepted when the identification of echolocation calls was supported by sightings of the animal, flying low over the water.



Map: Filipe Martins / CISE

Map 2. Car transects.

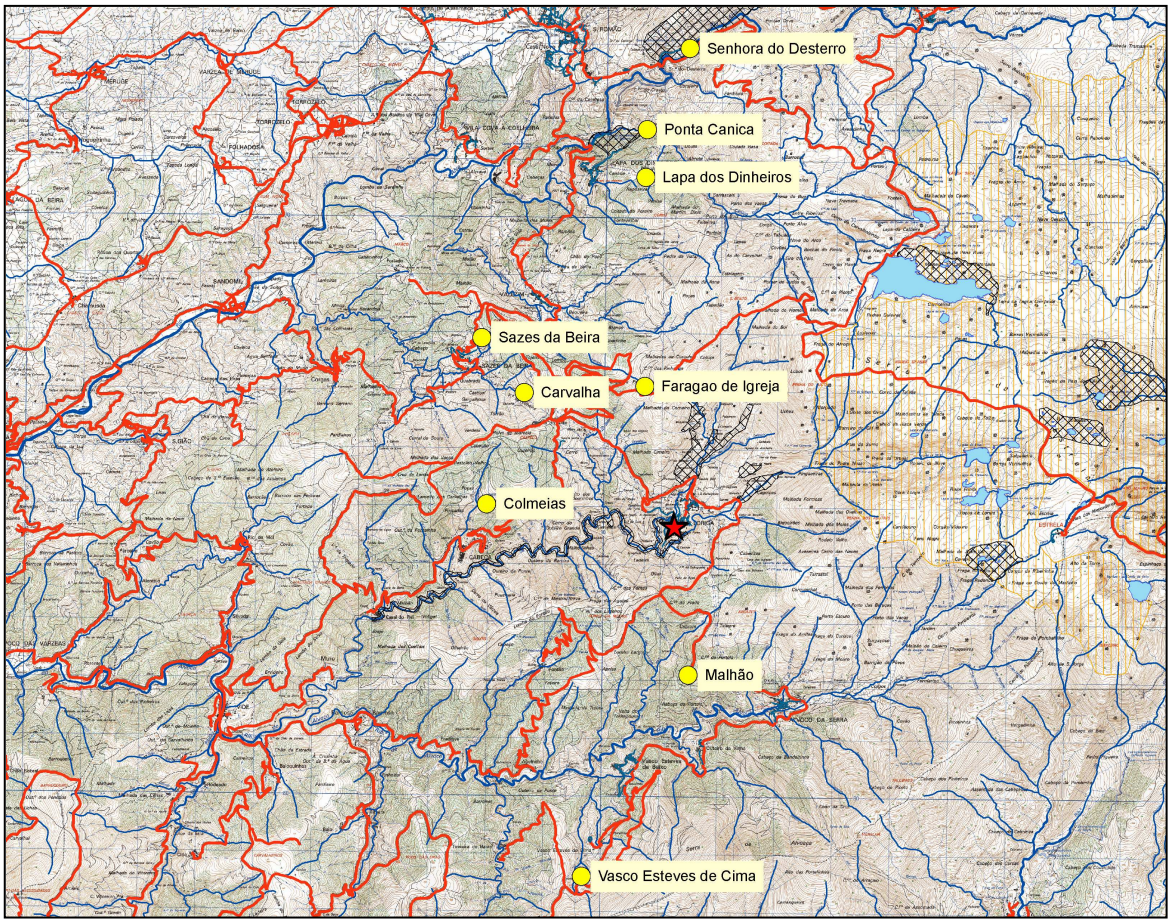
Mist nets

Since the echolocation calls of several bat genera (such as *Barbastella*, *Plecotus* and some *Myotis*) are very soft and therefore difficult to receive with a bat detector, mist nets were used in selected locations. Mist nets are made out of a very fine material. Bats which fly into the net get tangled and can then be removed and handled. During most nights, the nets were set up over water courses. Bats need to drink every night and often do so by scooping up water in flight. In the Serra da Estrela region, water can be found in reservoirs for fire-fighting helicopters, but nets were also placed by an artificial swimming pool in a river bed and over a stream. On the last night, the nets were used to close off a mine entry. Usually, additional nets were set in gaps in the vegetation or on forest paths, as bats tend to use such structures frequently during the night. The mist net locations are presented on map 3.

Photo: Jan Buys

DNA samples were taken from every bat caught.

All bats captured were weighed, underarm length was measured and the sex was determined. Next, animals were examined for parasites (these were collected for further investigation as is described in chapter 7) and for reproductive status. A DNA sample was taken for further investigation. The DNA material was sent for further study to Irene Salicini of the Doñana Biological Station (part of the Spanish Council for Scientific Research CSIC) in Sevilla.



Map: Filipe Martins / CISE

Map 3. Mist net locations.

3.2 RESULTS

Using the techniques described above, a total of 19 bat species were found in the Natural Park (table 2). First the results will be presented for each method, and then the observed species will be discussed.

Species	English name	Mist net	Live sighting	Dead find	Droppings	Detector
Rhinolophus euryale	Mediterranean horseshoe bat		◆			◆
Rhinolophus ferrumequinum	Greater horseshoe bat		◆		◆	◆
Rhinolophus hipposideros	Lesser horseshoe bat		◆			
Myotis bechsteinii	Bechstein's bat	◆				
Myotis daubentonii	Daubenton's bat	◆	◆			◆
Myotis emarginatus	Geoffroy's bat	◆				
Myotis myotis	Greater mouse-eared bat	◆				
Myotis blythii	Lesser mouse-eared bat		◆			
Myotis nattererii/escalerai	Natterer's bat	◆				
Pipistrellus pygmaeus	Soprano pipistrelle	◆				
Pipistrellus kuhlii	Kuhl's pipistrelle	◆				◆
Pipistrellus pipistrellus	Common pipistrelle	◆		◆		◆
Hypsugo savii	Savi's pipistrelle	◆				◆
Nyctalus leisleri	Leisler's bat	◆				◆
Eptesicus serotinus	Serotine	◆		◆		◆
Barbastella barbastellus	Barbastelle	◆				◆
Plecotus auritus	Brown long-eared bat	◆	◆			
Plecotus austriacus	Grey long-eared bat	◆				
Tadarida teniotis	European free-tailed bat					◆

Table 2. Bat species found in the Sera de Estrela National Park.

Myotis nattereri/escalerai
It has been suggested that the French, Spanish and North-African *M. nattereri* are genetically, morphologically and ecologically different from *M. nattereri* elsewhere in Europe (Dietz et al., 2007; Ibanez et al., 2006). Consequentially, some consider French and Spanish populations to be *Myotis escalerai* (Aulagnier et al., 2009). However, the species remains to be formally described and clear morphological characteristics were unknown during the camp. The two sibling species were therefore not distinguished, and in this report the name *Myotis nattereri/escalerai* is used. Future DNA analysis might reveal the exact species name.

Buildings and wolfram mines

Churches in the area were often modernized, rendering the attics of these churches unsuitable for bats. No animals were discovered in any of the churches visited. In some of the abandoned farms and barns visited, *Rhinolophus hipposideros, Rhinolophus ferrumequinum* and *Rhinolophus euryale* were seen or heard. During the inspections of the large tungsten mine systems, only *Myotis myotis* and *Myotis blythii* were seen. In water mines *Rhinolophus euryale* and another *Myotis blythii* were spotted. The often uncomfortable inspections of cramped culverts yielded one observation of *Rhinolophus hipposideros*.

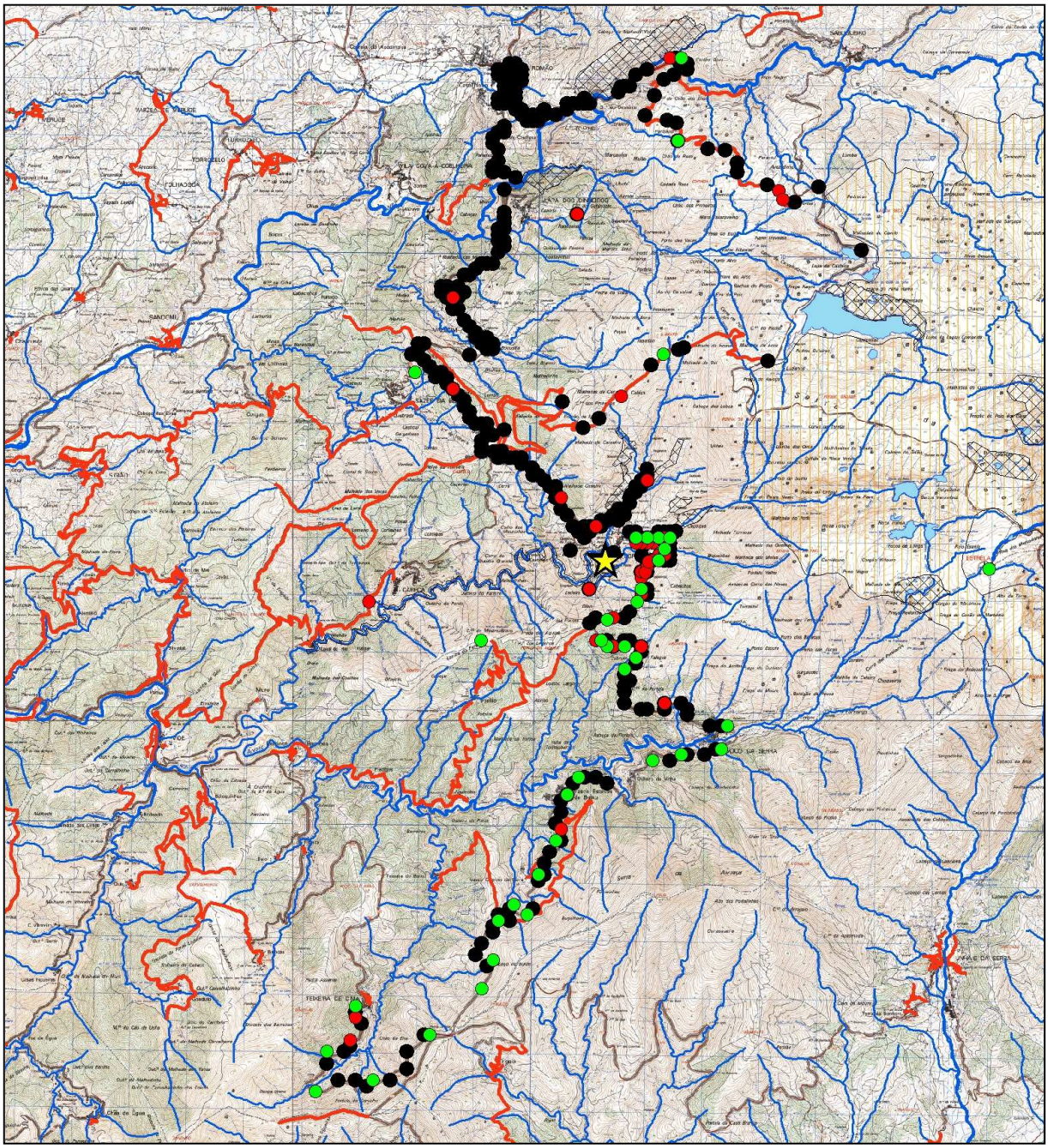
Bat detector and Car transects

11 different species were observed with the use of bat detectors. Especially species with a rather loud call (*Eptesicus serotinus*, *Pipistrellus pipistrellus*, and *Tadarida teniotis)* were also heard from moving cars. Of the Myotis species, only *Myotis daubentonii* was identified using bat detectors. The two Noctules, *Nyctalus leisleri* and *Nyctalus noctula* were both reported to be heard. These two species have very similar echolocation call and *N. noctula* is a rare species in Portugal. Therefore some recordings were put though a blind test by a number of experts after the summer camp. This did not lead to a positive identification of *N. noctula*.

During the car transect sessions on 1st and 3rd August many bats were heard (table 3). This resulted in a nice map of observations (map 4). Of course, with this technique one is limited to those sections of the park that are accessible by car. *Pipistrellus pipistrellus* was the most numerous species with 298 observations. As was to be expected, far fewer individuals were either found roosting in buildings or captured in mist nets. In four cases, it was found that the sound was of a lower frequency, louder, and slower in rhythm than *Pipistrellus pipistrellus*, leading to the conclusion that this must be have been *Pipistrellus kuhlii*. Unfortunately not all identifications were quite as precise as that. The identifications of *Tadarida teniotis* are the most reliable, as these bats can actually be heard with the naked ear. A total of 31 observations were made, most of them south of Loriga. This was also the case for *Eptesicus serotinus,* (32 registrations), which was the most numerous in the first kilometers south of Loriga. *Nyctalus leisleri* was most often heard south of the watermill (20 of the 22 registrations). Numerous animals were observed here, hunting during the early evening. Clearly, there must have been a (breeding) colony nearby. In two cases, bat calls were heard with clear characteristics of *Myotis myotis / Myotis blythii*. Other species were observed incidentally, such as a few *Myotis daubentonii* over a stream. In seven cases, a *Myotis* species was heard where no further analysis was performed.

Species	1 august: Loriga - Teixeira	2 august: Loriga river	3 august: Loriga trap location	TOTAL
Pipistrellus pipistrellus	94	12	192	298
Pipistrellus kuhlii	4			4
Eptesicus serotinus	26	1	5	32
Nyctalus leisleri	2		20	22
Tadarida teniotis	29		2	31
Myotis myotis/blythii	1		1	2
Myotis daubentonii			2	2
Myotis spec.	4		3	7
TOTAL	160	13	225	398

Table 3. Number of bats recorded in car transects.



Map: Filipe Martins / CISE

Map 4. The tree most recorded species during car transect countings. The black dots indicate recordings of Pipistrellus pipistrellus, the green dots represent Tadarida teniotis and the red dots indicate Eptesicus serotinus. The camp site in Loriga is marked with a yellow star.

Mist netting

No less than 14 bat species were captured in the mist nets (table 4). Full data on the animals caught is included in appendix 4. The number of species and individuals captured differed between locations, ranging from 1 species or even just 1 individual to 5 different species at one site, and 17 individuals at another. During one session, no bats whatsoever were caught.

During three sessions, particularly large numbers of a single species were recorded: at Malhão, 15 female *Eptesicus serotinus* were caught. At Senhora do Desterro, 14 *Myotis daubentonii* were caught in a net spanning the river. At Sazes da Beira 4 *Myotis myotis* and 12 *Myotis nattereri* flew out of the tungsten mine entrance and into the mist net.

Location	*Myotis bechsteinii*	*Myotis daubentonii*	*Myotis emarginatus*	*Myotis myotis*	*Myotis nattereri*	*Pipistrellus pygmaeus*	*Pipistrellus kuhlii*	*Pipistrellus pipistrellus*	*Hypsugo savii*	*Nyctalus leisleri*	*Eptesicus serotinus*	*Barbastella barbastellus*	*Plecotus auritus*	*Plecotus austriacus*	Total number of individuals	Total number of species
Sazes da Beira - Viveiros Florestais (night 1)	1		2					3		1			4		11	5
Ponta Canica		3								1					4	2
Carvalha							1								1	1
Faragao de Igreja				1											1	1
Vasco Esteves de Cima															0	0
Malhão									2		15				17	2
Sazes da Beira - Viveiros Florestais (night 2)								1			1	1			3	3
Colmeias									3		4				7	2
Lapa dos Dinheiros					1	1				2	5				9	4
Senhora do Desterro		14						1				1		1	17	4
Sazes da Beira - Mine entrance				4	12									1	17	3
TOTAL	1	17	2	5	13	1	1	5	5	4	25	2	4	2	87	14

Table 4. Results of mist netting sessions. Full data can be found in appendix 4.

3.3 RECORDED BAT SPECIES

Mediterranean horseshoe bat *(Rhinolophus euryale)*

This species was observed twice: once it was found in a water mine, and once it was heard in or near a deserted building.

Greater horseshoe bat *(Rhinolophus ferrumequinum)*

The largest of the horseshoe bats, *Rhinolophus ferrumequinum*, was found in deserted buildings three times and once heard on a detector. Probable droppings of this species were found near a bridge.

Lesser horseshoe bat *(Rhinolophus hipposideros)*

Lesser horseshoe bats were found in 7 derelict farms or barns. In five cases, there were one or two individuals, in the other four cases there were 2 females with 3 juveniles, 26 females with juveniles, and 19 females with juveniles. This is not surprising: they are known to hunt in small villages, in stables, cattle sheds or chicken coops. One animal was found sleeping in a culvert.

Photo: Jeroen Willemsen

Lesser horseshoe bat in a deserted house.

Bechstein's bat *(Myotis bechsteinii)*

One specimen of this rare species was caught in a net over a reservoir at the western border of the park (location "Sazes da Beira - Viveiros Florestais"). This is only the second record for the north of Portugal. The first record was an animal found dead close to Marão (Braz *et al.*, 2009). There are more records from the south and centre of Portugal indicating that, as elsewhere in its range, Bechstein's bat may occur throughout Portugal, but at a very low density.

Lesser mouse-eared bat *(Myotis blythii)*

The Lesser mouse-eared bat was found in daytime, during an inspection of a water mine. It was not caught in mist nets or heard on the detector.

Daubenton's bat *(Myotis daubentonii)*

Daubenton's bats hunt over rivers, small ponds and streams, but also in woodlands. 10 animals were seen hanging under a Roman bridge. At Ponta Canica, 3 males, one of which was less than one year old, were caught. At Senhora do Desterro, a net was placed across the stream and 14 *Myotis daubentonii* were caught. Of these, 3 were adult males, 6 were adult females, and two were juvenile (under 1 year old) females. Two of the adult females were lactating, indicating that a breeding colony site was probably close by (upstream).

Geoffroy's bat *(Myotis emarginatus)*

Two Geoffroy's bats were caught in the woods, over a water basin at Sazes da Beira - Viveiros Florestais. The bat produces very soft echolocation sounds, so it is hardly a surprise that it was not observed with bat detectors. It lives in rocks crevices, caves and houses, but was not spotted during visits. However, males often live solitary and then can also hang in or on the outside of buildings, and are then seldom spotted.

Greater mouse-eared bat *(Myotis myotis)*

One Greater mouse-eared bat was found during the inspection of the tungsten mine and three males and one female were caught in mist nets when flying out of a mine. A fifth animal, an adult female, was caught at Faragao de Igreja, a rather exposed location close to a basin. Vegetation at this site was short and the animal was caught low in the net, nearly on the ground. It was probably hawking for coleopterans or other ground-dwelling insects which live in the short vegetation.

Natterer's bat *(Myotis nattereri)*

Natterer's bat was only observed through mist netting, and at just two locations. During one session, one male was caught. During a second session, at Sazes da Beira, 13 males were caught, mostly while flying out of the mine. Females were probably still in the breeding colonies elsewhere in the area during our camp: *M. nattereri* is known to form breeding colonies in crevices and walls (Dietz et al., 2007). They probably come to the mines to swarm, mate and hibernate. The males don't need to leave the mines in favor of warmer locations, like the females do, and can simply "wait" at these sites during the summer until the females come back from breeding.

Soprano pipistrelle *(Pipistrellus pygmaeus)*

This species was caught once. In contrast to it's sister species the Common pipistrelle *(Pipistrellus pipistrellus)*, it was not heard on bat detectors during the camp.

Kuhl's pipistrelle *(Pipistrellus kuhlii)*

Only one individual of Kuhl's pipistrelle was caught, at a somewhat exposed water reservoir. This was a more or less atypical catch, as the species is very synanthropic: it is most numerous in cities and villages. Surprisingly, it was observed on bat detectors at only three sites.

Common pipistrelle *(Pipistrellus pipistrellus)*

The Common pipistrelle was found at numerous sites with the use of bat detectors (see map 4), mostly during car rides. It was caught in mist nets in low numbers at three sites and one individual was found which had been killed by traffic.

Savi's pipistrelle *(Hypsugo savii)*
This Mediterranean species was caught in mist nets at Malhão and Colmeias. It was heard on a bat detector at one site. It is surprising that it was not caught or heard more often, as it is a species that occurs in rocky environments with shrubs at up to 3300 meters altitude, although it reaches it's highest density in karstic areas.

Leisler's bat *(Nyctalus leisleri)*
Leisler's bat was heard on detectors, in several locations. The calls of this species are very similar to *N. noctula,* but *N. leisleri* produces shorter pulses with a higher pulse repetition frequency. *N. noctula* is however very rare in Portugal. For example, until the summer of 2009 surveys of wind turbine victims had produced 18 individuals of *N. leisleri* against 1 *N. noctula* (Rodriguez, 2009). *N. leisleri* was frequently heard during the car transects. Four males *Nyctalus leisleri* were captured, at three sites. All of these sites were in the woods.

Serotine *(Eptesicus serotinus)*
Serotine bats were frequently heard on the bat detector and caught in mist nets often, at four sites. At the mist netting session in Malhão 15 females were caught, of which 8 were lactating. This clearly indicated that the mist netting took place on a flying route close to the breeding colony of a group of this bat species.

Barbastelle *(Barbastella barbastellus)*
The Barbastelle is a spectacular bat with a strange face, shaped to optimize the reception of sounds. It has a very soft echolocation call and was therefore heard only once with bat detectors, but it was caught twice during mist netting: both times on wood lanes of approximately 3 meters wide, with a close canopy above.

Brown long-eared bat *(Plecotus auritus)*
This attractive bat was caught on one site only: four males at Sazes da Beira - Viveiros Florestais. One animal was found in a concrete alley near Lagoa Comprida, at an altitude of 1,564m. Recordings from altitudes up to 2,000 meters are known from Switzerland (Mitchell-Jones et al., 1999). The brown long-eared bat is a bat with a very quiet echolocation, and it was never heard on detectors during the camp.

Grey long-eared bat *(Plecotus austriacus)*
Two Grey long-eared bats were captured in mist nets during the camp. Both were adult males. Like *Plecotus auritus,* it is a very quiet bat and therefore it was not heard on the bat detector.

Photo: Rob Koelman

Barbastelle caught in a mist net.

European free-tailed bat *(Tadarida teniotis)*

European free-tailed bats were observed visually, in flight, both with bat detectors and with the naked ear: the echolocation is in the range of 10-14 kHz, i.e. within human hearing range. This interesting species is the only European representative of the *Molossidae* family, which is numerous in species in the tropics. It was heard on many locations in the Serra da Estrela. In Europe it occurs at altitudes up to 2,000 meters and as it hunts in wide open spaces, it is a strong flyer. European free-tailed bats spend the day in rock crevices. They can even occur in open, windy places with little vegetation. It is therefore no surprise that the species was also heard around the Torre and other barren locations, though it was also often observed flying over the wooded parts of the region. Many observations were made during the car transects (map 4).

3.4 DISCUSSION

A total of 19 bat species were found in the Serra da Estrela, representing almost all of the 24 bats that are currently known to occur in Portugal (Rodrigues, 2009). Only *Rhinolophus mehelyi* (reported to be critically endangered), *Myotis mystacinus, Nyctalus lasiopterus* (data deficient)*, Nyctalus noctula* (rare) and *Miniopterus schreibersii* (vulnerable) were not encountered during the camp.

During inspections of the large tungsten mine system, only *Myotis myotis* and *Myotis blythii* were seen. However, the mines seem a very suitable hibernation site, and it is strongly recommended that the mines are inspected during the winter season.

Apart from one *Pipistrellus pipistrellus* colony in the village of Loriga, no special attention was given to finding colonies and therefore none more were found. Some lactating females of Savi's bat *Hypsugo savii* were found. Very little is known about the sort of sites and type of breeding colonies of this species, so it should be interesting to search for the location of this colony.

Although there was some discussion about possible recordings of *Nyctalus noctula* it is not very likely that this species was heard during the camp. It was definitely not caught in a mist net. As this species is very rare in Portugal and has a very limited distribution there, it would be worthwhile to focus attention on getting pictures or reliable sightings of flying animals or better yet, concentrate mist netting efforts on this species.

Photo: Jan Buys

Grey long-eared bat caught in a mist net. Note the red marking for recognizing animals caught more than one time.

4 MICE

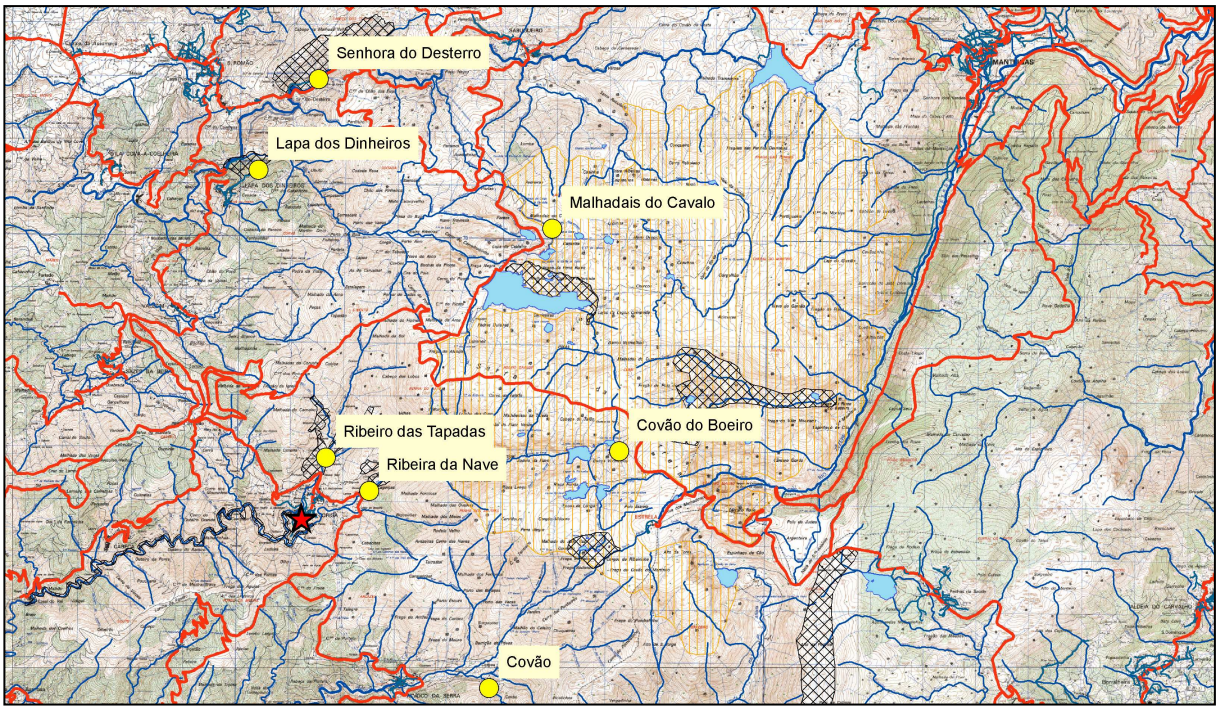
by: Kees Mostert

4.1 SURVEY METHODS

As part of the summer camp, a large number of traps were placed in several locations in order to capture terrestrial small mammals (see map 5). Mainly Longworth traps were used (150 units) besides smaller numbers of pit-falls and some Sherman traps, which were placed in trees in the hope of catching the Garden dormouse *(Eliomys quercinus)*. Wooden mole traps were also used for a few days. The bait that was used consisted of a standard mixture of peanut butter, oatmeal and apple. Live mealworms were added to the traps to increase survival rates of shrews. In placing the traps, a few simple principles were followed: the traps were numbered consistently and placed at 5 to 10 meter intervals. Traps were placed in the shade where possible and tagged with a small piece of aluminum foil in the vegetation in order to facilitate retrieval of the traps at night.

The first lines of Longworth traps were placed alongside streams: the Ribeiro das Tapadas and Ribeira da Nave northeast of Loriga and Covão more to the south. Because the streams were frequently used by the inhabitants of the villages as well (for irrigation), it was not always easy to place the traps inconspicuously. Wood mouse, Algerian mouse, Greater or Lesser white-toothed shrew and several Miller's water shrews were caught here.

After a few nights, most of the traps were moved to locations in the higher parts of the mountains. Traps were placed in the vicinity of the highest peak of the Estrela (Torre), near Covão do Boeiro at an altitude of 1750 meter and also in an area of rocks and small bogs close to the Lagoa Comprida at Malhadais do Cavalho, 1,580 meter above sea level. The traps were placed here in the hope of catching Snow vole *(Chionomys nivalis)*, a species that is not known to occur in Portugal (yet?), but that has been found in mountainous areas in Spain similar to Serra da Estrela. However, hardly anything was caught at these trap sites (only some Wood mice and one Iberian wall lizard). During the last nights of the summer camp several lines of traps were placed in open fields with herbaceous vegetation in a wooded area near Senhora do Desterro (at the hydropower station Camara de Carga). Apart from Wood mice and Algerian mice, several Spanish shrews were caught here. In the chestnut forest near Lapa dos Dinheiros 12 tree traps were placed, but unfortunately nothing was caught.



Map: Filipe Martins / CISE

Map 5. Live trap locations.

4.2 RESULTS

A total of 1039 trap nights (number of traps times number of nights) were made during the summer camp (see table 5). Of these, 960 trap nights concern the Longworth traps, 55 the pit falls and 24 the tree traps. A total of 58 small mammals and 3 reptiles were captured and six small mammal species were recorded: Spanish shrew, Miller's water shrew, Greater or Lesser white-toothed shrew, Wood mouse and Algerian mouse. Unfortunately, no voles whatsoever were caught. Four of the 58 small mammals were found dead in the trap. All captures were in Longworth traps, the tree traps and the pitfalls yielded no extra information in this case. Results are discussed below separately for each of the species caught. Full details on the results can be found in appendix 5.

Location	# traps	Trap type	# nights	Altitude (m)	*Sorex granarius*	*Neomys anomalus*	*Crocidura russula/suaveolens*	*Crocidura russula*	*Crocidura suaveolens*	*Apodemus sylvaticus*	*Mus spretus*	TOTAL
Ribeiro das Tapadas 1	20	Longworth	4	850		4				14		18
Ribeiro das Tapadas 2	20	Longworth	4	852		1	1	1		2	2	7
Ribeiro das Tapadas 3	10	Longworth	4	847		2	2		1	5	2	12
Ribeira da Nave 1	30	Longworth	3	883								
Ribeira da Nave 2	10	Longworth	3	905			1					1
Ribeira da Nave 3	10	Longworth	3	883			1		1			2
Covão	50	Longworth	3	-			3	1				4
Malhadais do Cavalo 1	10	Longworth	4	1577								
Malhadais do Cavalo 2	20	Longworth	4	1583								
Malhadais do Cavalo 3	9	Longworth	4	1577								
Malhadais do Cavalo 4	10	Longworth	4	1577								
Malhadais do Cavalo 5	5	Pit fall	3	1577								
Covão do Boeiro 1	50	Longworth	4	1767						3		3
Covão do Boeiro 2	10	Pit fall	4	1722								
Senhora do Desterro 1	16	Longworth	2	1103						7	1	8
Senhora do Desterro 2	16	Longworth	2	985	2						1	3
Lapa dos Dinheiros	12	Treetrap	2	739								
TOTAL					**2**	**7**	**8**	**2**	**2**	**31**	**6**	**58**

Table 5. Results of the use of live traps. More details on the locations can be found in appendix 5.

4.3 RECORDED MOUSE SPECIES

Spanish shrew *(Sorex granarius)*
Two specimens of Spanish shrew were caught in the open area with herbaceous vegetation near Senhora do Desterro. One of the animals was taken to the camp to be photographed and filmed and released afterwards it in it's natural habitat.

Miller's water shrew *(Neomys anomalus)*
Miller's Water Shrew was caught 7 times in traps along the Ribeiro das Tapadas northeast of Loriga. Unfortunately, two animals were found dead in a trap. During the last check on August 1st, three specimens were caught.

Greater and Lesser white-toothed shrew *(Crocidura russula / suaveolens)*
On 12 occasions a Greater or Lesser white-toothed shrew was recorded. One animal was found dead in a trap. As usual, it was often difficult to distinguish between the two species. In theory and as the names suggest, the Lesser white-toothed shrew is smaller than the Greater white-toothed shrew, but there are no other clear field characteristics. Possibly the difference between the species can be established with fully grown animals, but with juveniles it is virtually impossible.

On two occasions, a capture of a Greater white-toothed shrew was recorded. Both these animals were captured on July 31st, one at Ribeiro das Tapadas and one at Covão. The animals were brought to the camp in order to take a closer look and to discuss the characteristics relevant to identification. A captured Lesser white-toothed shrew was recorded twice as well. Both were captured on July 29th, one at Ribeiro das Tapadas and one at Ribeira da Nave. These animals were also taken to the camp to be examined by several people. If the identifications are correct, these results mean that the Greater and the Lesser white-toothed shrew both occur in Serra da Estrela. More information on the presence of the two species can be gained from analysis of owl pellets. Measurements on the skulls can provide characteristics that more clearly point to either one of the species.

Photo: Walter Heijder

Greater white-toothed shrew or Lesser white-toothed shrew…?

Wood mouse *(Apodemus sylvaticus)*
The Wood mouse was, as usual, by far the most commonly captured species during the summer camp and more than half of the total number of captures concerned Wood mice. Wood mice were caught 31 times, but the observations were limited to only 3 locations: Ribeiro das Tapadas (21), Covão do Boeiro (3) and Senhora do Desterro (7). In the traps placed at high altitudes the Wood mouse was the only species caught. Yellow-necked wood mice do not occur in the Serra da Estrela, therefore no identification difficulties were encountered.

Algerian mouse *(Mus spretus)*
A total of six specimens of Algerian mouse were captured: 4 along the Ribeiro das Tapadas and 2 in the open field near Senhora do Desterro. Algerian mice are generally very easy to catch. One Algerian mouse was found dead in a trap.

Other captures
On two separate occasions, a Schreiber's green lizard *(Lacerta schreiberi)* was caught in a trap and once an Iberian wall lizard *(Podarcis hispanica)* at Covão do Boeiro. Also, numerous slugs were found in the taps, but these captures were not always recorded. On five occasions, a closed trap was found with no animal inside.

5 OWL PELLETS

by: Jan Piet Bekker

5.1 SURVEY METHOD

During the summer camp owl pellets were collected at five different locations. The locations were a school building, some old abandoned houses and somewhere in a forest. In table 6 some of the most striking characteristics of the owl pellet locations are listed. All pellet collections contained mammal remains. Three collections were barn owl *(Tyto alba)* pellets, while two were tawny owl *(Strix aluco)* pellets.

Nr.	Date	Location	Predator	Elevation	Number of pellets
1	29-07-2009	Forest	*Strix aluco*	665	6
2	02-08-2009	Gouveia	*Tyto alba*	609	?
3	02-08-2009	Vinho, school	*Tyto alba*	517	1
4	02-08-2009	Vinho, Quinto de Passerela	*Tyto alba*	512	±50
5	03-08-2009	Cativelos	*Strix aluco*	519	4

Table 6. Some characteristics of owl pellet locations.

Occasionally, definite determination was problematic, because of interspecies similarity. The exact differences, for example, between *Crocidura russula* and *Crocidura suaveolens* and between *Mus musculus* and *Mus spretus* remain troublesome. The used possibilities in discrimination of the different species are as follows:

Some of the characteristics of *Crocidura suaveolens* are in the middle of those of *Crocidura russula* and *Crocidura leucodon*; this is especially true for the degree of inward bending of the processus zygomaticus and the ridge over the inner side of the processus angularis of the mandible. In *Crocidura suaveolens* the height of the processus coronoidius varies from 3.9 till 4.7 mm, whilst in *Crocidura russula* these heights varies from 4.6 till 5.1 mm. So these two species show an overlap of the height of the processus coronoidius. Only clearly outside the zone of overlap a right determination is possible.

Mus spretus had to separated from the subspecies *Mus musculus domesticus*, both present on the Iberian peninsula. *Mus spretus* can be distinguished from *Mus musculus domesticus* by several characteristics.
First, in *Mus spretus* the front knobs on the first molar in the lower mandible shows four lobes, imitating the petals in a flower. Secondly the notch in the upper incisive teeth is absent, although sometimes a vague indentation can be observed. As a third characteristic for *Mus spretus*, the ratio of the breadths of the front part and the lateral part of the zygomatic arch is greater than 0.70.
In *Mus musculus domesticus* the front knobs shows only three lobes, whilst the fourth one, the anterior buccal lobe, is very inconspicuous. The notch in the upper incisive teeth is present, although sometimes the indentation is vague. The ratio of the breadths of the front part and the lateral part of the zygomatic arch is smaller than 0.70.
The most reliable results can be achieved when it is possible to have a close look on the skull and both of the mandibles. In heavily defragmented pellet collections in which the structure of the pellet is disintegrated and where also the skull and the both mandibles loose the usual anatomical position, the proper determination easily flows away. The combination of upper and lower skull fragments can lead to the highest level of certainty of determination of the involved species.

5.2 RESULTS

In table 7 the results of the pellet analysis are differentiated wherever possible. A total of 434 mammalian skull remains were found, involving a minimum of eleven small mammal species. One collection contained 12 birds and 1 amphibian, while in two collections beetle remains were found. The largest collection was found in an abandoned house in Vinho. It yielded 370 partly intact mammalian skulls.
In the next paragraph the species will be mentioned as well as the number of specimens in the total. The percentage is the number of the species as part of the total of small mammals. Where relevant the inclusion criteria listed in the first paragraph of this chapter are used.

Species	Forest	Gouveia	Vinho, school	Vinho, Quinto de Passerela	Cativelos	TOTAL
Sorex granarius				2		2
Talpa occidentalis	2					2
Crocidura russula			2	95	1	98
Crocidura russula / suaveolens		2		37		39
Crocidura suaveolens		1		4		5
Chiroptera spec.	1					1
Microtus agrestis		3		18		21
Microtus lusitanicus	2	19	1	94		116
Arvicola sapidus				1		1
cf Mus musculus				4		4
Mus spretus		14		65		79
Mus spretus /domesticus				9		9
Apodemus sylvaticus	7	8		44		59
Amphibia	1					1
Aves	1			12		13
TOTAL	**14**	**47**	**3**	**382**	**1**	**447**
Coleoptera	present	present				

Table 7. Breakdown of small mammal fragments over owl pellet locations.

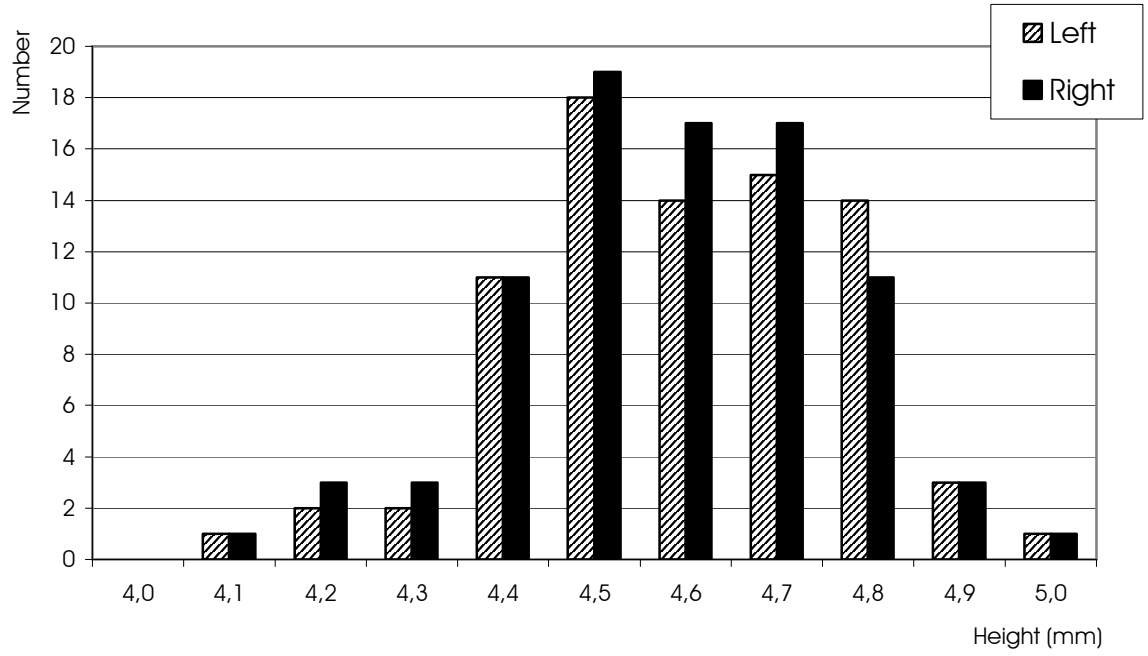
5.3 RECORDED SMALL MAMMAL SPECIES

Spanish shrew *(Sorex granarius)*
Skull remains of this shrew were found in one out of the five pellet collections. In total 2 (0.4%) specimens could be identified.

Greater white toothed shrew *(Crocidura russula)*
Skull remains of this shrew could be established in 98 (20.9 %) cases out of the five pellet collections. Determinations were based on the height of the processus coronoidius (see graph) together with other characteristics as the outward curved processus zygomaticus and the relative small M^3.

Lesser white toothed shrew *(Crocidura suaveolens)*
In only small numbers this shrew could be recognised: 5 (=1.1 %) in the five collections contained this species. In 4 specimens the height of the processus coronoideus was small (see graph) and in 1 specimen also the processus zygomaticus was clearly bended inwards.

Greater and Lesser white toothed shrew *(Crocidura russula / suaveolens)*
In 39 specimens (= 8,3%) it was not possible to make an alignment into the proper species *Crocidura russula* or *Crocidura suaveolens*.



Graph: Height of the processus coronoidius in Crocidura spec. from pellet collection 4 (Vinho).

Iberian mole *(Talpa occidentalis)*
Talpa occidentalis is almost the only Talpida species (except the aquatic *Galemys pyrenaicus*) below the Pyrenees and the Cantabric mountain ridges. Only in the pellets of the tawny owl 2 (= 0.4 %) of these moles were present. The absence in barn owl pellets of this species presumably is due to another hunting strategy.

Geoffroy's bat *(Myotis emarginatus)*
As a surprise bat species fragments were discovered in the pellets of a tawny owl. The battered fragments revealed only 2 mandibles, left and right, both had a length of 11.2 mm and most probably of the same specimen. The dental formula of this mandibula is (for both): 3-1-3-3. This formula excludes most of the European genera, only Myotis can be included. Of this genus only *Myotis nattereri* and *Myotis emarginatus* meet the criteria of the mandibular length. A closer look at the outline of the processus coronoidius reveals a relative low height, that is compatible with *Myotis emarginatus* and make *Myotis nattereri* not likely. This one specimen contributed just 0.2 % of the prey items of the owls.

Southern water vole *(Arvicola sapidus)*
Arvicola sapidus is almost the only Arvicola species below the Pyrenees and the Cantabric mountain ridges; only in the far North eastern part of Portugal *Arvicola terrestris* had been found. Of the skull the incisors were missing, but facing the general distribution of *Arvicola terrestris*, it is more then likely this specimen is *Arvicola sapidus*.

Lusitanian pine vole *(Microtus lusitanicus)*
This species has been established in three out the five collections. The pattern of M^3 clearly shows the simplex-form in which the middle dental spike at the buccal side is shorter than the first and last spike. M_1 also shows the typical fused triangle halfway this molar. In total 116 Lusitanian pine vole skull remains (24.7 %) were found. This is the most frequent observed small mammal in the owl pellets.

Field vole *(Microtus agrestis)*
The pattern of M^3 clearly shows the normal-form, with four dental spikes at the lingual. Further on, M^2 clearly shows the agrestis lobe at the backside. The field vole was found regularly, although not frequent in two out of the five pellet collections: in total 21 skulls were found (4.5 %).

Wood mouse *(Apodemus sylvaticus)*
Of the genus Apodemus only *Apodemus sylvaticus* occurs in the southern part below the Pyrenees and the Cantabric mountain ridges, leaving *Apodemus flavicollis* well in that area and upwards to the North. This species has been found in three out of the five pellet collections. In total 59 remains of skulls (12.6 %) could be identified as *Apodemus sylvaticus*.

Algerian mouse *(Mus spretus)*
Although only in two collections out of the five, *Mus spretus* had been identified positively, the total number of 79 specimens (= 16.8 %) makes up the third most frequent found specimen in the whole pellet collection.

Cf. House mouse *(Mus musculus domesticus)*
In one collection only 4 specimens, most possibly, had to be assigned to *Mus musculus domesticus*; however in not any case of those 4, a clear positive determination had been possible, because not all characters could be checked in skull and mandibles that were retrieved from one specimen. Therefore an uncertainty remains.

House mouse / Algerian mouse *(Mus musculus domesticus / spretus)*
Of the five collections, only two contained skulls of the genus *Mus*. In 9 specimens out of 92 Mus specimens in total (= 9.8 %) no proper determination could have been made.

5.4 DISCUSSION

During other summer camps analysing owl pellets proved to be a significant factor in broadening mammal research most of the times. In the Serra da Estrela the results out of this method were however a bit modest. Only two species not yet found during the regular camp were discovered in pellet form – *Microtus agrestis* and *Mus musculus domesticus*. On the determination of Greater and Lesser white toothed shrew *(Crocidura russula and Crocidura suaveolens)* caught in live traps was some discussion, as is described in chapter 4. The occurrence of both species is confirmed by owl pellet analysis.

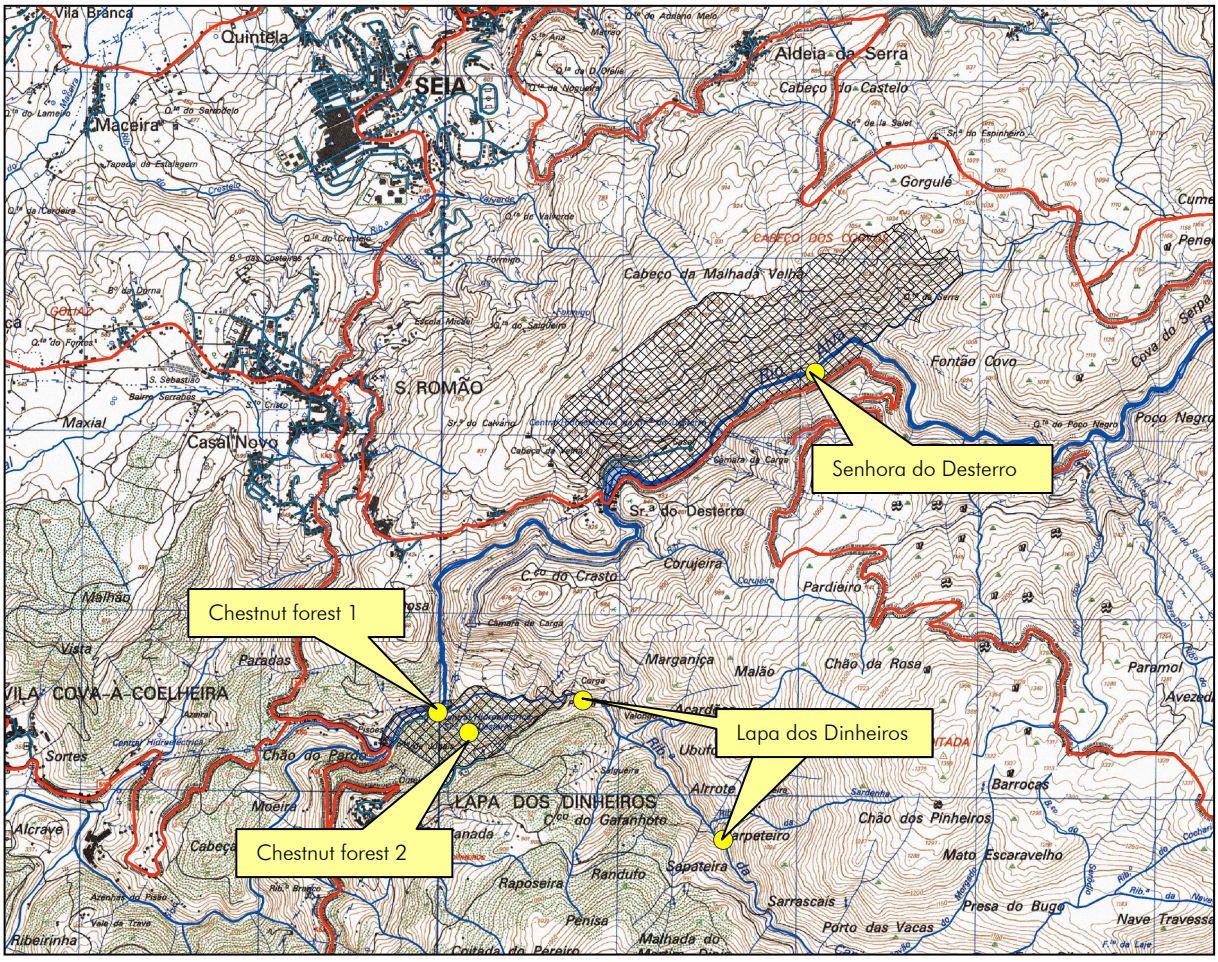
As pointed out in a previous report of the Field Study Group (Willemsen & Thomassen, 2009) for future analysis of owl pellets it is strongly recommended to keep the contents of each pellet strictly apart, thus making it possible to sort out the fragments of the different mammal specimens.

6 OTHER MAMMAL OBSERVATIONS by: Kees Mostert and Jeroen Willemsen

6.1 CAMERA TRAPS

The use of camera traps has become a regular part of the yearly summer camps. These camera traps consist of a digital camera with an infrared motion-detection sensor in a portable, light-weight and weather resistant housing. They are available with either infrared LED or regular flash illumination and either a 4 mega pixel or a 6 mega pixel sensor. About 2000 photos of reasonable quality can be stored on a 2 gigabyte memory card. This means that once a camera has been installed, it will record data without someone having visit the site daily, thus minimizing any potential disturbance of animals. It is also possible to set the camera traps to record short films.

The camera traps were hidden in the vegetation and some bait was placed in front of the sensor in order to attract mammals and make them "pose" for the camera. Four different cameras were used in four locations. Two of them were placed in old Chestnut forest and the other two were placed alongside streams near Senhora do Desterro and Lapa dos Dinheiros (see map 6). At the locations in the forest, apple, salmon oil and a muesli bar were used for bait. About half-way through the camp, the settings were altered so that the camera shot both film and stills. At the cameras near the stream, tinned sardines, salmon oil and fermented shrimp paste were used for bait. Here the cameras only recorded still images. Both the interval between pictures and the length of the film are adjustable; they were set to series of three pictures with a time interval of 10 seconds. The cameras were set to pause for 1 minute (the minimum) after taking the last picture before re-activating the sensor. The length of the movies was set to 15 seconds.



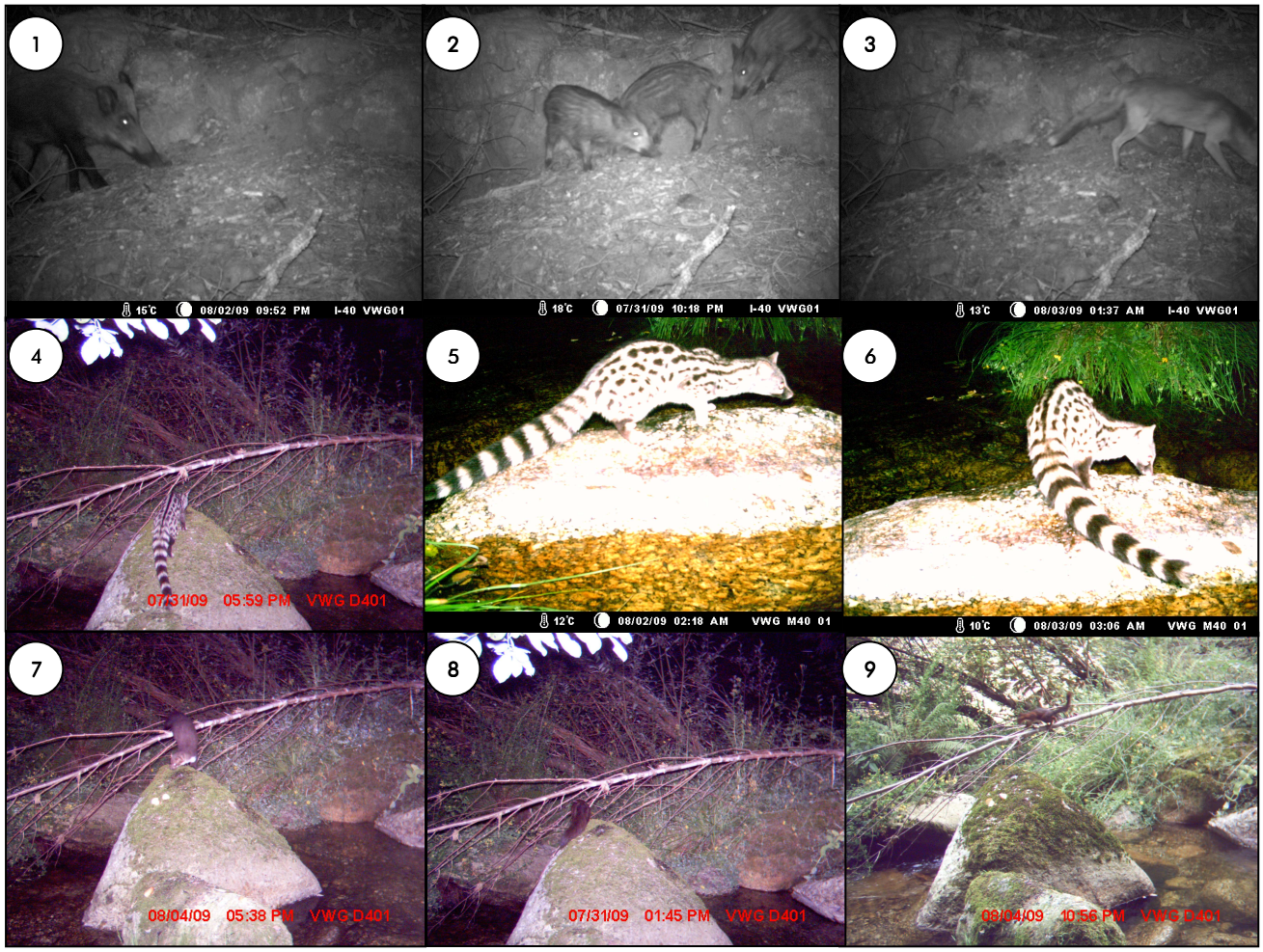
Map: Filipe Martins / CISE

Map 6. Camera trap locations.

The species recorded are summarized in table 8. The use of cameras produced recordings of 5 different mammal species: Wild boar, Common genet, Red fox, Stone marten and Red squirrel. The pictures of Common genet caused quite an excitement among the summer camp participants because in general it is not very easy to spot the species. The pictures and the film of the Stone martens were examined by a group of experts in the Netherlands to make sure no Tree marten was filmed. This appears not to be the case.

Location	Type of camera	Results (picture)	Results (film)
Chestnut forest 1	Infrared, 40 mega pixel	2x *Sus scrofa* (3 juv.) 1x *Sus scrofa* (ad.) 2x *Genetta genetta* 1x *Vulpes vulpes* 3x Bird	1x *Genetta genetta* 2x *Martes foina* 4x Bird
Chestnut forest 2	Infrared, 60 mega pixel	1x *Sus scrofa* (juv.) 1x Bird	1x Bird
Lapa dos Dinheiros	Flash light, 40 mega pixel	2x *Genetta genetta* 2x Bird	No films made
Senhora do Desterro	Flash light, 40 mega pixel	2x *Martes foina* 1x *Sciurus vulgaris* 2x *Genetta genetta*	No films made

Table 8. Registrations of camera traps.



Pictures taken by the camera traps. 1,2 = Wild boar, 3 = Red fox, 4,5,6 = Common genet, 7,8 = Stone marten, 9 = Red squirrel.

6.2 OTHER RECORDINGS

Besides the survey methods described above, (camera-traps to record larger mammals, traps to catch small mammals and mist nets and detectors for bat research), a considerable number of casual sightings, dead animals and observations of all kinds of tracks were recorded during the summer camp. In this chapter, a summary is given of these observations in Serra da Estrela. With these additional survey methods, 13 mammal species were recorded in the Serra da Estrela: Western hedgehog, Pyrenean desman, Iberian mole, Rabbit, Red squirrel, Southern water vole, Lusitanian pine vole, Black rat, Red fox, Stone marten, Otter, Common Genet and Wild boar. The presence of 7 of these species was not established with any other survey method (Hedgehog, Pyrenean desman, Iberian mole, Rabbit, Southern water vole, Black rat and Otter).

Hedgehog *(Erinaceus europaeus)*
Four sightings of hedgehogs were recorded, including locations near Avoco, in the old Chestnut forest and near the village of Loriga.

Greater and Lesser white-toothed shrew *(Crocidura russula / suaveolens)*
On July 29th, some shrew droppings were found which were attributed to a *Crocidura* species.

Pyrenean desman *(Galemys pyrenaicus)*
Droppings of the Pyrenean desman were found at various locations on stones in the streams northeast of Loriga. Several attempts to catch the Desman with fish traps (which are half above the water) in various mountain streams were unfortunately unsuccessful.

Iberian mole *(Talpa occidentalis)*
Four observations of the Iberian mole were recorded. All observations concern mole hills, mostly on grassy fields in agricultural areas.

Rabbit *(Oryctolagus cuniculus)*
During the summer camp, several sightings of rabbit were recorded and tracks were found in several locations (eight records). The sightings (up to three rabbits at the same time) were made in the vicinity of Loriga and on the way up to Torre. One dead rabbit was found.

Red squirrel *(Sciurus vulgaris)*
Twelve observations of Red squirrels were made. Half of these concern tracks (food remains). Four animals were actually seen and two road kills were found. The squirrel has expanded its distribution area in Portugal and has become quite abundant in the mixed and coniferous forests in and around Serra da Estrela.

Photo: Cláudio Álvaro

Red squirrel in the forest near Lapa dos Dinheiros.

Southern water vole *(Arvicola sapidus)*
During a trap inspection on August 3rd, a sighting of Southern water vole was recorded near Lagoa Comprida in the higher parts of the park. Many droppings were found here as well, but attempts to capture a water vole with pit-falls were unsuccessful.

Lusitanian pine vole *(Microtus lusticanus)*
On July 29th, a dead Lusitanian pine vole was found in a cave during a mist netting activity. Apart from the results of the examination of owl pellets, this is the only Lusitanian pine vole reported during the summer camp.

Rat spec. *(Rattus spec.)*
Droppings of a Rat were found in two places. It is unclear whether they were from a Brown or a Black rat.

Black rat *(Rattus rattus)*
On August 1st, a mummified rat was found in an abandoned house near Sazes da Beira and the remains were attributed to Black rat. This is a remarkable observation, because this species is not known from Serra da Estrela. However, after a thorough examination of the remains the species could be confirmed as Black rat. The mummy was preserved.

Red fox *(Vulpes vulpes)*
Foxes are quite common near Loriga. Many droppings were found, such as near the Loriga river, in the Sazes da Beira valley and southwest of Loriga. In addition to that, one sighting of a Red fox was recorded and one specimen was found dead.

Marten spec. *(Martes spec.)*
Six observations of Martens were made, but in each case it was unclear whether they concerned Pine or Stone marten. Faeces were found in various forests and in the agricultural area around Loriga. On August 1st, two Martens were spotted during a night excursion near Loriga as they crossed the road. Unfortunately in both cases the animal disappeared quickly, so again it was not possible to say if it was Stone or Pine marten.

Stone marten *(Martes foina)*
In one case, droppings were found that were attributed to Stone marten. It is not clear on what grounds the observers based their identification, but fact of the matter is that, based on existing data, the Stone marten is quite common in Serra da Estrela.

Otter *(Lutra lutra)*
At several locations, droppings and other tracks of Otters were found, for example near Loriga river. Unfortunately there were no actual sightings of this species.

Common genet *(Genetta genetta)*
While searching for owl pellets in abandoned houses on August 2nd, camp participants found significant quantities of Common genet droppings in both Villa Averia and Vinho. In a garden in Villa Averia, food remains were found as well, on the trunk of an old tree (including a bone, see photo below).

Wild boar *(Sus scrofa)*
Three records of Wild boar were collected. Two of them concerned tracks, found in the Chestnut forest. On one occasion, two animals were seen in this area.

Photo: Kees Mostert

Droppings of Common genet.

Photo: Kees Mostert

Feeding place of Common genet in Villa Avería.

7 BAT PARASITES

by: Jan Boshamer

7.1 RESEARCH ON BAT PARASITES

Bats are known to carry many ectoparasites, but little is known about these animals which live in a close relationship with bats. Ectoparasites can move from one bat to another. This mobility is facilitated by the fact that bats spend much time in colonies and it's been established that females and young carry more parasites than males, which often live solitary or in small groups. It remains to be clarified to which degree ectoparasites, besides being a nuisance, actually have a detrimental effect on bats.

By yearly collection of parasites from all bats captured during the summer camps, a contribution is made in the clarification of their distribution and this year, as in other years, bats captured in the Serra da Estrela Natural Park were carefully checked for the presence of parasites.

7.2 SURVEY METHOD

Bats captured go though a number of procedures in a fixed order. First of all, species, sex and age are determined. Then, depending on the species, some essential measurements and the weight are determined. For the collection of ectoparasites, a number of Eppendorf tubes with 2 ml of alcohol each are prepared on beforehand. While one person holds the bat firmly, another carefully removes the parasites with a pair of fine-tipped tweezers. Special attention is given to the insides of the ears, since some tenacious mites can be found there. Many mites crawl on the skin of the wings, usually on the underside. Bat flies however are mostly found in the fur. These wingless flies are very well adapted to their host and are difficult to remove since they run around though the fur at lighting speed. All parasites collected were sent on alcohol to Dr. Jan Kristofik of the Institute of Zoology of the Slovak Academy of Sciences, who took care of species identification. Specimens collected were added to the scientific collection of the institute.

7.3 RESULTS

Parasites were found on several bats that were captured with mist nets. Appendix 6 lists the captures and the parasites found on them. Several species of ectoparasites were found during this summer camp; only one bat fly *(Nycteribiidae)* was collected this time, four mite species *(Acari)* and three species of predatory mites *(Macronyssidae),* one of which was not identifiable to species level. One species of tick *(Ixodidae),* one species of flea *(Ischnopsyllidae),* the distribution of which is limited to the Iberian Peninsula, were also found. The larva of a single trombiculid mite *(Trombiculidae),* the species of which could not be established, was found on a Savi's bat. The number of bats with parasites and the number of parasites for each bat species are displayed in table 9.

Photo: Rollin Verlinde

Bat fly.

The degree to which the presence of mite is species-specific is quite remarkable. For instance, on Serotine bats, mites of the species *Spinturnix kolenati* were virtually the only parasites found and on Savi's bat it was *S. nobleti*. Large numbers of mites were found on almost all Daubentons bats as well and these were nearly all *Spinturnix andegavinus*. According to literature (Lučan, 2006), this mite is the only one in the group which parasitizes specifically on *Myotis daubentonii*. The precise taxonomical status of the species is undetermined; it is sometimes regarded as a subspecies of *S. myoti*, which is found on Natterers bats and Greater mouse-eared bats, among others (Baker & Craven 2003).

Photo: Jan Buys

Co-operation in processing the caught bats.

Mites *(Acarina)* families *Spinturnicidae, Macronyssidae*

These were found on nearly all bats captured. They are highly specialized parasites which are mostly found on the skin of wings and tail. It's known from literature that these mites mainly increase in number during the period when females have young, the colony is at its largest and many animals are in close contact to each other. Two species of predatory mites *(Macronyssidae)* were found: *Steatonyssus periblepharus* (Kolenati, 1858) and *Steatonyssus spinosus* (Willmann, 1936).

Diptera (flies) – family *Nycteribiidae* (bat flies)

One single species was found: *Nycteribia latreillii*.

Fleas - family *Ischnopsyllidae*

One single species was found: *I. hispanicus* (Jordan, 1942).

Ticks – family *Ixodidae* (hard ticks)

One single species was found: *Argas vespertilionis* (Latreille, 1802).

Arachnids – family *Trombiculidae*

One single species was found: *Willmannium carus* (?) (Kudryashova, 1992).

Bat species	#Different bats	# Parasites
Myotis daubentonii	9	15
Myotis myotis	3	15
Myotis nattereri	12	41
Hypsugo savii	5	10
Eptesicus serotinus	13	48
Barbastella barbastellus	1	4
TOTAL	43	133

Table 9. Collected parasites on different bat species.

8 OTHER TAXONOMIC GROUPS

by: Kees Mostert

In this chapter, a brief overview is given of non-mammal species that were recorded during the summer camp in Portugal. Hundreds of observations of these other taxonomic groups were collected. Since the main purpose of the summer camp is mammal study, they are only discussed briefly in this report. Some groups like locusts and moths are not discussed at all in this chapter since virtually no attention was given to them during the summer camp. Most of the species recorded are listed in appendix 8.

8.1 BIRDS

A total of 91 bird species were observed during the camp. Many species which occur in the (warmer) Mediterranean area are absent from the higher and relatively cooler parts of the Serra da Estrela. Most of the species found in the higher parts of the Natural Park are therefore representatives of the Atlantic region of Europe, such as Sky lark, Blackcap, Chiffchaff, Wren, Dunnock, Robin and Linnet. In the lower, forested areas of the Natural Park some more Mediterranean species were seen or heard, such as Red-legged Partridge, Hoopoe, Eurasian scops owl, Dartford warbler, Sardinian warbler, Rock sparrow, Spotless starling, European serin and Cirl bunting. Bee-eaters were heard and seen very frequently, flying high up in the sky. On a few occasions, Red-rumped swallows were unexpectedly sighted.

Only a very limited number of raptor species were observed. Montagu's Harrier, Buzzard, Black kite and Peregrine falcon were seen regularly, hunting over the heath and the rocky slopes of the Serra and an occasional Booted eagle or Short-toed eagle flew by. Mixed in with the large groups of Common swifts hunting winged ants, small groups of Pallid swifts could sometimes be seen. Among the granite rocks in the higher parts of the Serra da Estrela, some "montane" species were present, such as Water pipit, Northern wheatear, Black redstart, Rock thrush and Rock bunting. Above the rocky slopes, Red-billed choughs and Ravens could sometimes be seen, besides small groups of Crows.

At night, Tawny owls could often be heard in the forests of Serra da Estrela. Unfortunately very few pellets of this interesting species were collected. Fortunately on the other hand, a good number of Barn owl pellets were collected at a few (previously known) locations in the area. In the lower parts of the area, both Scops owl and Little owl were seen. Nightjars could be observed everywhere and were even regularly spotted gliding by at only a few inches away from the mist nets, while one individual failed to avoid the net altogether and was actually captured. Along the streams to the northeast of Loriga, Grey wagtail, Dipper and some Kingfishers were seen.

Photo: Jan Buys

A swift got stuck on the loft of the camp site building, but could be rescued and released.

8.2 AMPHIBIANS AND REPTILES

A total of nine species of amphibians were found in the area of study, as well as fifteen reptile species. The water ponds and tanks which were visited to put up mist nets there proved to be particularly interesting for the observation of amphibians too. Especially at night, many animals could be found both in and around these reservoirs and Marbled newts, Bosca's newts and Fire salamanders (mostly larvae) were frequently recorded this way. Also, Midwife toads could be seen (and heard) here. At several locations a Viperine snake was also seen, swimming by underwater.

The Golden-striped salamander was seen alongside the streams northeast of Loriga. This species is endemic to north-western Spain and northern Portugal. Just as is the case for the Pyrenean desman, the area in which the Golden-striped salamander occurs is limited by the large amount of precipitation it requires. Iberian frogs could be seen everywhere in the small streams, while Perez's frogs and Tree frogs were locally abundant in the small bogs higher up in the mountains.

Photo: Bart Noort

Marbled newt could be found in several water tanks.

The Schreiber's green lizard could be found regularly, especially near streams and bogs in the high mountains. The species was even accidentally caught sometimes in one of the Longworth traps. Iberian wall lizards were very abundant on the walls alongside roads, in the vicinity of villages and on rocks. Sometimes a Large psammodromus was observed as well and in some locations high in the mountains, Iberian Rock lizards were seen. In Portugal this species is known only from the Serra da Estrela. In abandoned homes and buildings, Wall geckos were seen regularly.

Snakes were occasionally found, either alive or dead. Most of the time, it was either a Montpellier snake or a Ladder snake. Unfortunately, the European viper was seen only once. A relatively young Southern smooth snake was brought to the camp (see picture).

Photo: Kees Mostert

A young Southern smooth snake was brought to the camp site.

8.3 BUTTERFLIES

During our stay, 53 butterfly species were found. The most uncommon species were seen in the higher parts of the mountains in the area around Lagoa Comprida. Black satyr, Striped grayling, Large wall brown, Bath white, Southern brown argus, Silver studded blue, Esper's marbled white, Iberian marbled white, Dusky meadow brown and Lulworth skipper could be spotted there regularly. Many other species were observed in the lower regions of the park. Some of them were species which are widespread throughout a large part of Europe. The most numerous species were Scarce swallowtail, Gatekeeper, Southern gatekeeper, Great banded grayling, Clouded yellow and Lang's short-tailed blue.

The edges of the forests in the region are rich in herbs, on which Blue-spot hairstreaks were surprisingly abundant, particularly on Apple mint *(Mentha suaveolens)*. Also, False ilex hairstreaks were seen regularly here, as were Provençal fritillary and Queen and Silver-washed fritillary. In half-open landscapes, the Cardinal was abundant. Other species that could be found here were Small skipper, Dingy skipper, Purple-shot copper, Scooty copper, Spotted fritillary and Southern white admiral. In the old chestnut forests, Rock graylings were seen regularly.

8.4 DRAGONFLIES

In the area of study, 22 dragonfly species were recorded during the summer camp. Since very little is known about the dragonflies of the Serra da Estrela, many of the species recorded were welcome additions to the list of species already known from the park. Along the streams northeast of Loriga, White featherleg, Beautiful demoiselle, Copper demoiselle, Large pincertail and Golden-ringed dragonfly were abundant. Western spectres were also seen, although this species was not as numerous. In the bogs in the high mountains, lots of Robust spreadwings and locally also Small spreadwings were present. Above the ponds, mainly Four-spotted chaser, Common blue damselfly and Red-veined darter could be seen zooming around. At one location, both Large red damsel and Small red damsel were seen.

Photo: Kees Mostert

A Moorland hawker experienced some difficulties trying to creep out of its larval pellicle.

Two previously unknown sites for the Moorland hawker were found. This species is very rare in the Serra da Estrela and the Serra is the both the only location in Portugal and the south-westernmost location in Europe where this species is known to occur. While checking the live traps, summer camp participants found an individual which had been unable to fully emerge from the larval skin (see photo). In the lower parts of the Serra da Estrela, species such as Blue emperor, Keeled skimmer, Migrant hawker and Blue hawker were spotted.

8.5 PLANTS

Some attention was given to plants as well. Unfortunately, the end of July and the beginning of August are not very suitable for a plant survey of a southern European region. Nevertheless, 211 different species were recorded in the Serra da Estrela. Since this report is written mainly for the sake of mammal study, the different vegetation zones of the Natural Park and the characteristic plant species will not be discussed here, but a list of plant species can be found in appendix 8. One of the most valuable areas for plants proved to be the boggy area near Lagoa Comprida. Flowering specimens of *Veratrum album* could be found here, together with hundreds of Marsh gentians. Throughout the Natural Park, Ivy-leaved bellflowers could be found in damp and shadowed places. This species is almost extinct in the Netherlands.

Photo: Jeroen Willemsen

Hundreds of Marsh gentian could be seen near Lagoa Comprida.

9 ECOLOGICAL CONSEQUENCES OF WATER USE

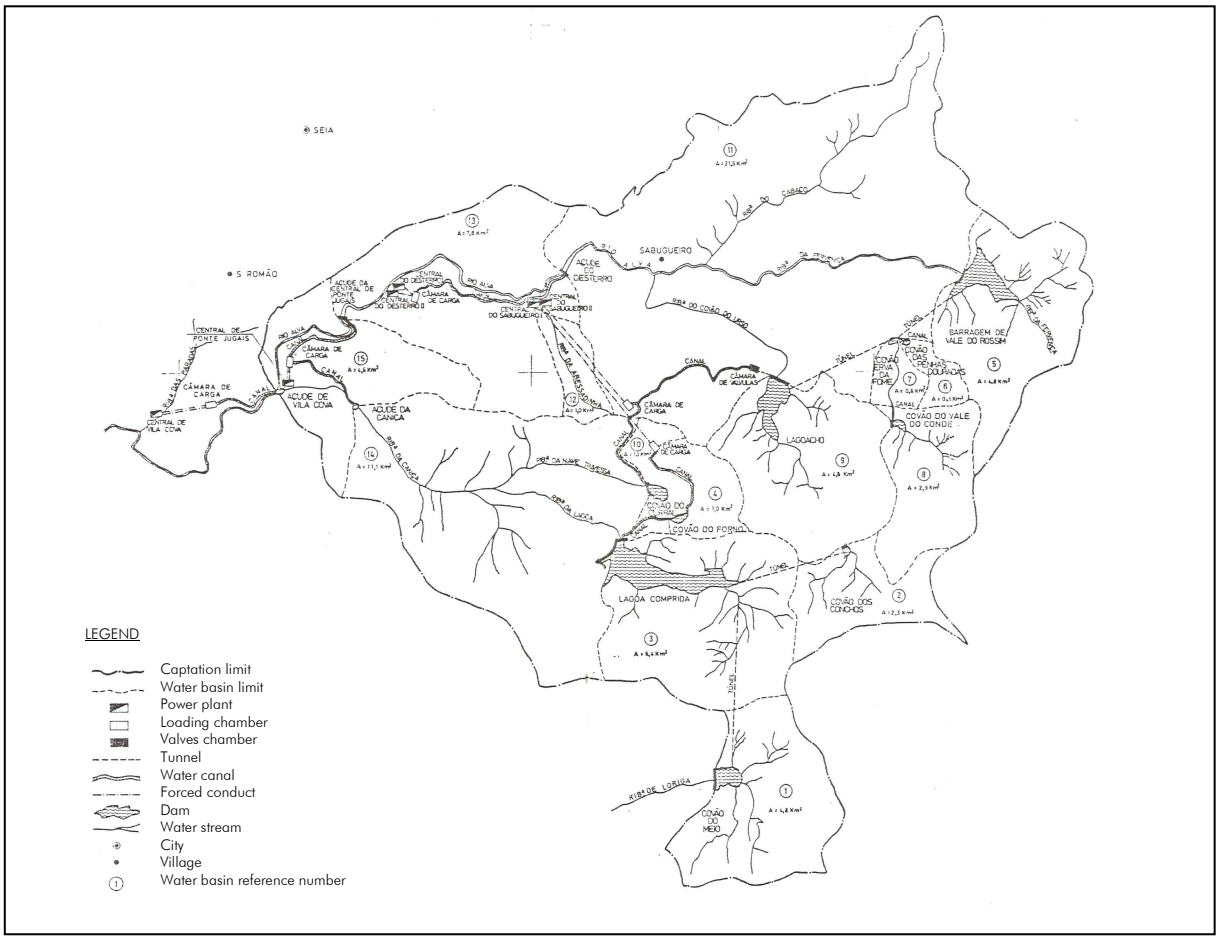
by: Hans Bekker, José Conde and Filipe Martins

9.1 WATER INFRASTRUCTURE

Precipitation levels in the Natural Park are relatively high: up to about 2,500 millimeters per annum at the top of the mountain, consisting of rain or fog, and snowfall in the winter. For ages, this water has been used by farmers for irrigation of the fields on the slopes of the mountain. To this end, water from small natural streams has been lead into an ingenious system of small watercourses with gates at each of the terraces on the slope of the Serra. The results of the summer camp survey give evidence of the rich variety of wildlife occurring in and around these watercourses, such as several amphibian species and Miller's water shrew.

The large quantities of water available in the area are used for the production of green hydroelectricity as well. High up in the mountains, several reservoirs with huge concrete dams have been constructed to detain the water. From these storage reservoirs, the water is transported by means of canals into pipes which run into a cascading line of turbines (see map 7). The transport of water through these canals is not constant, but depends on demand and the price people are willing to pay. A period with almost no water transportation can be followed by a period in which large amounts of water are distributed through the canals. Even within a period of 24 hours, the fluctuations in the water supply can be enormous.

The canals are made out of concrete and have a right–angled cross section with varying dimensions. Most of the canals are about 2 meters high and 1.5 to 2 meters wide. The canals usually follow the horizontal contour lines along the slopes of the mountain. Often there is a maintenance road or track beside it. The total length of the canals in the Alva basin of the Serra da Estrela is 9,986 meter. Only 2,170 meters of this is covered with concrete slabs, the rest of it is open on top. At the moment, some more canal sections are being covered, especially near the road.



Map 7. Water infrastructures in the Serra da Estrela.

9.2 ECOLOGICAL DISADVANTAGES

The canals have a negative impact on the ecology and biodiversity of the region. The problems can be divided into three sections:

1. The canals are a barrier for animals migrating up or down the slopes of the mountain (i.e. perpendicular to the canals). Animals are unable to pass the high walls of the canals. There are some underpasses and some overpasses which allow species to cross the canals (for example, sometimes the canal is constructed on poles) but it is not known whether these passing places are effective. The dirt roads beside the canals possibly add to the barrier effect and, as a side effect, they make larger parts of the Natural Park accessible for people, cars and flocks of sheep.

2. Animals can easily fall into the canals. Those that do, drown almost without exception because they are unable to climb out of the canals. The current is too strong due to the need for large quantities of water in the turbines and the walls are too steep.

3. The hydrology of many streams downhill from the canals is strongly disturbed. Some small streams are regularly completely cut off from water due to the canals while others flow directly into the canals. In both cases the amount of water running downhill is enormously reduced.

Photo: José Conde

The slope of the mountain ends directly at the edge of a canal, enabling animals to fall into the water easily.

9.3 SURVEYS ON DEAD ANIMALS

Two surveys were carried out to establish the magnitude of the ecological problems caused by the canals. One survey was carried out in the late nineties by Henrique Manuel dos Santos Azevedo Carvalho and Jacinto Luís Diamantino (Carvalho et al., 1996). During a period of 14 months, Carvalho and Diamantino made 165 visits to the water canals (with an interruption of 3 months due to snow blocking the roads). This produced records of 1746 dead animals of 69 species (24 mammals, 20 birds, 16 reptiles and 9 amphibians). Another 210 records of dead animals were gathered during the method study which preceded the research.

In the period between 2003 and 2005 the Serra da Estrela Information Centre (CISE) collected additional data and information on drowned animals and collected records of the number of dead animals per species. Table 10 presents the outcome of this most recent survey. Remarkable species on the list are *Myotis emarginatus*, *Plecotus auritus*, *Cinclus cinclus*, *Monticola saxatilis*, *Emberiza hortulana*, *Iberolacerta monticola* and *Vipera latastei*. Neither study included any insects drowned in the canals.

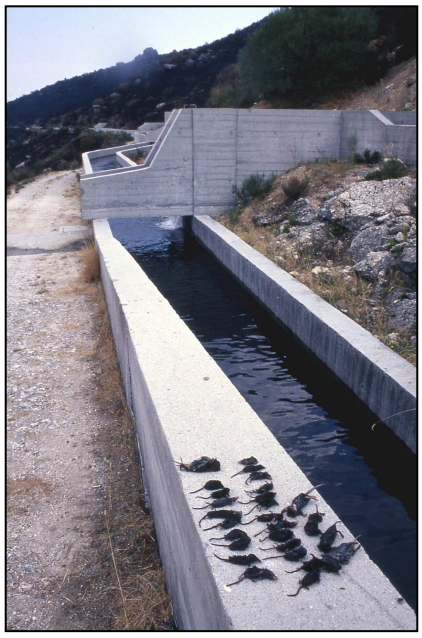


Photo: José Conde

Several mice drowned in the canals.

Species	03-08-2003	25-07-2004	08-10-2004	13-10-2004	25-11-2004	25-01-2005	13-04-2005	TOTAL
AMPHIBIANS								
Salamandra salamandra				1				1
Triturus marmoratus				10				10
Bufo bufo				171				171
Alytes obstetricans		1		27				28
Hyla arborea				1				1
Rana Perezi			1	1				2
REPTILES								
Lacerta schereiberi		1						1
Natrix maura				1				1
Natrix natrix			1					1
BIRDS								
Milvus migrans		2						2
Saxicola torquata		1						1
Prunella modularis	2							2
Emberiza cia		3						3
Birds not identified		3						3
MAMMALS								
Sorex minutus / Sorex granarius	21							21
Crossidura russula	1	1		5				7
Talpa occidentalis		1						1
Oryctolagus cunicula		5	4			2		11
Arvicola sapidus		2	2					4
Microtus agrestis	3	8	3	15				29
Miccrotus lusitanicus		4						4
Microtus sp.			2					2
Apodemus sylvaticus		8	5	16			1	30
Eliomys quercinus	1							1
Vulpes vulpes			1					1
Sus scrofa		1						1
Micro-mammals not identified		5				1		6
OTHER								
Animals not identified						1		1
TOTAL	**28**	**46**	**19**	**248**	**0**	**4**	**1**	**346**

Table 10. Drowned animals found in Lagoacho canal by CISE.

9.4 POSSIBLE SOLUTIONS

It is possible to diminish the negative impact of the canals on ecology and biodiversity. With respect to the problems mentioned in paragraph 2 of this chapter, the following solutions are possible (they all need further elaboration):

1. Diminishing the barrier effect of the canals:
   - The canals could be covered, so that the number of possible passages for fauna is increased.
   - The canals could be raised on poles for certain lengths to enable animals to pass underneath the canals. This also minimizes the disturbance of small streams crossing the canals.
   - The number of underpasses could be increased by constructing more ducts/culverts under the canals.

2. Preventing animals from falling into the canals and drowning:
   - A more extensive part of the canals could be covered with concrete slabs. There is already ample experience with this method, since 2,170 meters have already been covered this way.
   - The design of the canals could be modified to enable animals that fall in to get out again. The canals could be widened on both sides at regular distances and the sides could be made less steep with a "ladder" profile.
   - The flow speed of the water could be diminished through the construction of a storage reservoir to create buffer capacity directly above the pipeline. This way, the amount of water transported through the canals could be maintained at a more constant level.

3. Restoring the natural hydrology of the streams downhill from the canals:
   - Streams should not flow directly into the canals, but instead pass under or over them (for example by the use of culverts or concrete covers respectively).

Photo: Hans Bekker

One of the water canal tracks that is already covered.

10 REFERENCES

- Almeida, N.F. de et. al., 2001: *Anfíbios e Répteis de Portugal,* Fapas, Porto.
- Arnold, N. & D. Ovenden, 2002: *Field Guide Reptiles & Amphibians of Britain and Europe,* Collins Publishers, New York.
- Aulagnier, S., P. Haffner, A.J. Mitchell-Jones, F. Moutou and J. Zima (2009): *Mammals of Europe, North Africa and the Middle East,* A&C Black Publishers, London, 2009.
- Baker A.S. & Craven J.C., 2003: *Checklist of the mites (Arachnida: Acari) associated with bats (Mammalia: Chiroptera) in the British Isles.* Systematic & Applied Acarology Special Publications 14: 1-20.
- Braz, L., H. Gonçalves, P. Barros & P. Travassos (2009): *First record of Bechstein's Bat (Myotis bechsteinii Kuhl, 1817) at north of Portugal and new specie for the Site of Comunitary Importance Alvão-Marão.* Galemys 21 (1) pp 71-75.
- Carvalho, H. & J. Diamantino, 1996: *Estudo do impacto dos canais de adução dos empreendimentos hidroeléctricos sobre a fauna de vertebrados terrestres na área do Parque Natural da Serra da Estrela,* Relatório Técnico, PNSE.
- Dietz, C. & O. von Helversen, 2004: *Illustrated identification key to the bats of Europe,* version 1.0, Tuebingen/Erlangen.
- Dietz, C., O. von Helversen & D. Nill, 2007: *Handbuch der Fledermäuse Europas und Nordwestafrikas, Biologie, Kenzeichen, Gefarddung,* Franckh-Kosmos Verlags GmbH & Co KG, Stuttgart.
- Dijkstra, K.D. & R. Lewington, 2006: *Field Guide to the dragonflies in Britain and Europe*, British Wildlife Publishing, Gillingham.
- Ibanez, C., J.K. Garcia-Mudarra, M. Ruedi, B. Stadelmann & J. Juste, 2006: *The Iberian contribution to cryptic diversity in European bats*. Arcta Chiropterologica 8: 277-297.
- Jansen, J., 2002: *Geobotanical guide of the Serra da Estrela,* Parque natural da Serra da Estrela, Manteigas.
- Jonsson, L., 1993. *Vogels van Europa, Noord-Afrika en het Midden-Oosten,* Tirion, Baarn.
- Lesparre, D. & E. Crespa, 2008: *A herpetofauna do parque natural da Serra da Estrela*, CISE – Munícipio de Seia, Seia.
- Lučan, R.K., 2006 : *Relationships between the parasitic mite Spinturnix andegavinus (Acari: Spinturnicidae) and its bat host, Myotis daubentonii (Chiroptera: Vespertilionidae): seasonal, sex- and age- related variation in infestion and possible impact of the parasite on the host condition and roosting behaviour.* Folia Parasitiologica 53: 147-152.
- MacDonald, D. & P. Barrett, 1995: *Collins Field Guide Mammals of Britain & Europe,* HarperCollins Publishers, London.
- Mitchell-Jones, A.J. et al., 1999: *The atlas of European mammals,* Societas Europaea Mammalogica, London.

– Nöllert, A. & Chr. Nöllert, 1992: *Die Amphibien Europas*, Franckh-Kosmos Verlag, Stuttgart.

– Niethammer, J. & F. Krapp, 1978-2005: *Handbuch der Säugetiere Europas,* Part 1-6, Aula Verlag, Wiebelsheim.

– Rodrigues, L., 2009: *Agreement on the conservation of populations of European bats. Report on implementation of the Agreement in Portugal; 14th AC Meeting*. Instituto da Conservação da Natureza e da Biodiversidade, Portugal.

– Schober, W. & E. Grimmberger, 2001. *Gids van de vleermuizen van Europa, Azoren en de Canarische Eilanden,* Tirion, Baarn.

– Svensson, L. & P.J. Grant, 2003: *ANWB Vogelgids van Europa*, Tirion Uitgevers BV, Baarn

– Tolman, T. & R. Lewington, 1999. *De Nieuwe Vlindergids (450 soorten dagvlinders van Europa en Noordwest-Afrika),* Tirion, Baarn.

– Willemsen, J. en E. Thomassen (ed.) (2009): *Mammal survey Munții Pădurea Craiului (Transylvania – Romania),* Veldwerkgroep van de Zoogdiervereniging, Arhnem.

APPENDICES

APPENDIX 1.
LIST OF SCIENTIFIC, ENGLISH, DUTCH AND PORTUGUESE NAMES

Scientific name	English name	Dutch name	Portuguese name
Erinaceus europaeus	Western hedgehog	Egel	Ourico-cacheiro
Sorex granarius	Spanish shrew	Iberische bosspitsmuis	Musaranho-de-dentes-vermelhos
Neomys anomalus	Miller's water shrew	Millers waterspitsmuis	Musaranho-de agua
Crocidura russula	Greater white-toothed shrew	Huisspitsmuis	Musaranho-de dentes-brancos
Crocidura suaveolens	Lesser white-toothed shrew	Tuinsspitsmuis	M.-pequeno-de dentes-brancos
Galemys pyrenaicus	Pyrenean desman	Pyreneese desman	Toupeira-de-agua
Talpa occidentalis	Iberian mole	Iberische blinde mol	Toupeira/T de Cabrera
Rhinolophus euryale	Mediterranean horseshoe bat	Paarse hoefijzerneus	Morcego-de-ferradura-mediterranico
Rhinolophus ferrumequinum	Greater horseshoe bat	Grote hoefijzerneus	Morcego-de-ferradura-grande
Rhinolophus hipposideros	Lesser horseshoe bat	Kleine hoefijzerneus	Morcego-de-ferradura-pequeno
Myotis bechsteinii	Bechstein's bat	Bechsteins vleermuis	Morcego-de-Bechstein
Myotis blythii	Lesser mouse-eared bat	Kleine vale vleermuis	Morcego-rato-pequeno
Myotis daubentonii	Daubenton's bat	Watervleermuis	Morcego-de-agua
Myotis emarginatus	Geoffroy's bat	Ingekorven vleermuis	Morcego-lanudo
Myotis myotis	Greater mouse-eared bat	Vale vleermuis	Morcego-rato-grande
Myotis nattereri	Natterer's bat	Franjestaart	Morcego-de-franja
Pipistrellus pygmaeus	Soprano pipistrelle	Kleine dwergvleermuis	Morcego-pygmeus
Pipistrellus kuhlii	Kuhl's pipistrelle	Kuhls dwergvleermuis	Morcego-de-Kuhl
Pipistrellus pipistrellus	Common pipistrelle	Dwergvleermuis	Morcego-anao
Hypsugo savii	Savi's pipistrelle	Savi's dwergvleermuis	Morcego de Savii
Nyctalus leisleri	Leisler's bat	Bosvleermuis	Morcego-arboricola-pequeno
Eptesicus serotinus	Serotine	Laatvlieger	Morcego-hortelao
Barbastella barbastellus	Barbastelle	Mopsvleermuis	Morcego-negro
Plecotus auritus	Brown long-eared bat	Grootoorvleermuis	Morcego-orelhudo-castanho
Plecotus austriacus	Grey long-eared bat	Grijze grootoorvleermuis	Morcego-orelhudo-cinzento
Tadarida teniotis	European free-tailed bat	Bulvleermuis	Morcego-rabudo
Oryctolagus cuniculus	Rabbit	Konijn	Coelho-bravo
Sciurus vulgaris	Red squirrel	Eekhoorn	Esquilo-vermelho
Arvicola sapidus	Southern water vole	Zuidelijke woelrat	Rato-de agua
Microtus agrestis	Field vole	Aardmuis	Rato-do-campo-de-rabo-curto
Microtus lusitanicus	Lusitanian pine vole	Baskische woelmuis	Rato-cego
Apodemus sylvaticus	Wood mouse	Bosmuis	Rato-do-campo
Rattus rattus	Black rat	Zwarte rat	Ratazana-preta
Mus musculus domesticus	Western house mouse	Huismuis	Rato-caseiro
Mus spretus	Algerian mouse	Algerijnse muis	Rato-das-hortas
Vulpes vulpes	Red fox	Vos	Raposa
Martes foina	Beech or Stone marten	Steenmarter	Fuinha
Lutra lutra	Otter	Otter	Lontra
Genetta genetta	Common genet	Genetkat	Geneta
Sus scrofa	Wild boar	Wild zwijn	Javali

APPENDIX 2. PARTICIPANTS

Photo: Jan Buys

1 Rollin Verlinde
2 Francisco Amorim
3 Filipe Martins
4 Raymond Haselager
5 Maris Kuningas
6 Ivo Santos
7 Cláudio Álvaro
8 Hans Bekker
9 Eric Thomassen
10 Arien Bekker-Holtland
11 Jeroen Willemsen
12 Odile Schmidt
13 Pedro Alves
14 Clara Ferreira
15 Rui Rafael
16 Jasja Dekker
17 Rob Koelman
18 Kees Mostert
19 Gonçalo Marcolino
20 Jan Wondergem
21 José Conde
22 Bart Noort
23 Jan Boshamer
24 Hélia Gonçalves
25 Paulo Barros
26 Anneleen van Nijlen
27 João Gaiola
28 Walter Heijder
29 Jan Piet Bekker
30 Jan Buys

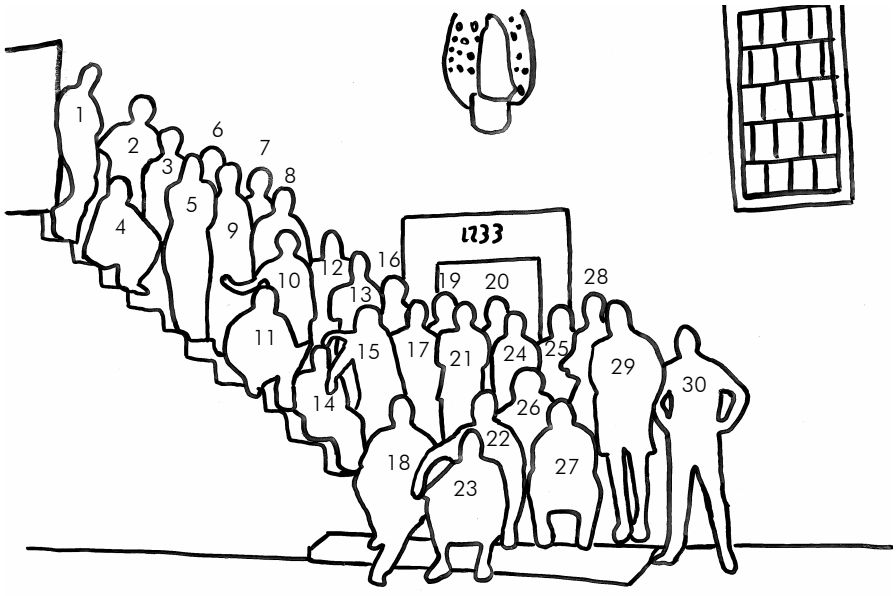


Illustration: Jeroen Willemsen

APPENDIX 3. PERMIT

ICNB
Instituto da Conservação da Natureza e da Biodiversidade, I.P.

Ministério do Ambiente, do Ordenamento do Território e do Desenvolvimento Regional

Rua de Santa Marta, 55
1150-294 Lisboa
Telefone: 213507900

LICENÇA Nº 246 / 2009 / CAPT

LICENÇA PARA CAPTURA, MANUSEAMENTO E MARCAÇÃO DE EXEMPLARES DA FAUNA SELVAGEM NO TERRITÓRIO DE PORTUGAL CONTINENTAL AO ABRIGO DO DECRETO-LEI N.º140/99 DE 24 DE ABRIL, COM A NOVA REDACÇÃO DADA PELO DECRETO-LEI Nº 49/2005 DE 24 DE FEVEREIRO E DO DECRETO-LEI N.º 316/89, DE 22 DE SETEMBRO.

TITULAR DA LICENÇA: Odille Schmidt

IDENTIFICAÇÃO: NVJ3JLCF1 **Arquivo de Identificação:** Hillegom/Holanda

ESPÉCIES EM CAUSA: Quirópteros e micromamíferos

FINALIDADE E PROPÓSITOS: Inventariação de mamíferos no Parque Natural da Serra da Estrela. Marcação com tinta da unha de um polegar (quirópteros) e corte de uma porção de pêlo do dorso (micromamíferos)

N.º DE ESPÉCIMES: sem limite

AMOSTRAS A RECOLHER: tecidos da membrana alar (quirópteros)

PERÍODO DE DURAÇÃO: de Julho a 31 de Agosto de 2009

FREGUESIAS E CONCELHOS: Concelhos de Seia (freguesias de Loriga, S. Romão, Lapa dos Dinheiros, Sabugueiro, Seia, Alvoco da Serra, Vide e Cabeça), Covilhã (freguesia de Cortes do Meio) e Manteigas (freguesia de São Pedro)

MÉTODOS DE CAPTURA A UTILIZAR: Quirópteros: redes *japonesas*; Mamíferos: armadilhas tipo *Longworth*. Também serão utilizadas câmaras fotográficas

COLABORADORES: Raymond Haselager, Cláudio Álvaro (BI N.º 13372927), Ivo Santos (BI N.º 13353336), Marcolino Gonçalo (BI N.º 13383644), João Gambôa (BI N.º 13388390), Clara Ferreira (BI N.º 13544671) e Patrícia Dias (BI N.º 13247254), Walter Heijder (NR2LP09K9), Cornelis Noort (NJ1188888), Gerardus Bekker (N74470072), Rollin Verlinde (IDBEL590811004), Jasja Dekker (NU1PB4L14), Jan Wondergem (NJ6200037), Rob Koelman (NJ6347790), Cornelis Mostert (NYDPJB4J4), Maris Kuningas, João Gaiola (BI N.º 12539430), José Conde (CC N.º 8968971ZZ5) e Filipe Martins (BI N.º 12221530)

- Findo o período de duração desta licença, o titular deve devolver a mesma ao ICNB, acompanhada do respectivo relatório das acções efectuadas.
- A presente licença não inibe do cumprimento de qualquer outra legislação aplicável à acção em curso.

Lisboa, 27 de Julho de 2009

P' O PRESIDENTE

(TITO ROSA)

INSTITUTO DA CONSERVAÇÃO DA NATUREZA E DA BIODIVERSIDADE, IP * Ministério do Ambiente, do Ordenamento do Território e do Desenvolvimento Regional
VICE-PRESIDENTE

APPENDIX 4. MIST NET CATCHES

Mist nets were placed at the following locations (easting and northing in UTM European 1950, zone 29T):

Loc.	Location name	Date	Easting	Northing	Alt. (m)	First bat	Last bat	# Bats
1	Sazes da Beira - Viveiros Florestais	28-07-2009	609278	4467000	985	22h07m	01h06m	11
2	Ponta Canica	29-07-2009	610685	4471528	687	21h10m	23h22m	4
3	Carvalha	30-07-2009	608596	4466962	773	22h40m	22h40m	1
4	Faragao de Igreja	31-07-2009	610680	4467085	1264	22h15m	22h15m	1
5	Vasco Esteves de Cima	01-08-2009	609666	4458605	740	-	-	0
6	Malhão	31-07-2009	611480	4462101	856	21h45m	00h40m	17
7	Sazes da Beira - Viveiros Florestais	02-08-2009	609278	4467000	985	21h15m	22h18m	4
8	Colmeias	03-08-2009	607964	4465030	829	21h35m	23h20m	7
9	Lapa dos Dinheiros	03-08-2009	610663	4470701	920	22h11m	00h10m	9
10	Senhora do Desterro	04-08-2009	611411	4472937	838	21h48m	01h45m	17
11	Sazes da Beira - Mine entrance	05-08-2009	607852	4467906	693	21h10m	23h50m	17

Location	Species	Time	Age	Sexe	Under arm length (mm)	Weight (gr)	Parasites	Remarks
Sazes da Beira	*Pipistrellus pipistrellus*	22:07	Adult	m	30,2	4,0	-	
Sazes da Beira	*Nyctalus leisleri*	23:00	Adult	m	42,2	15,5	-	
Sazes da Beira	*Myotis emarginatus*	23:30	Adult	m	32,7	7,5	-	
Sazes da Beira	*Myotis bechsteinii*	23:40	Adult	m	42,0	7,0	-	
Sazes da Beira	*Plecotus auritus*	23:40	Adult	m	39,1	9,0	-	
Sazes da Beira	*Pipistrellus pipistrellus*	23:43	Adult	m	29,4	4,0	-	
Sazes da Beira	*Plecotus auritus*	0:18	Adult	m	36,3	9,0	-	
Sazes da Beira	*Plecotus auritus*	0:24	Adult	m	38,3	10,0	-	
Sazes da Beira	*Plecotus auritus*	0:43	Adult	m	38,4	9,0	-	
Sazes da Beira	*Myotis emarginatus*	0:55	Adult	m	40,4	8,5	-	
Sazes da Beira	*Pipistrellus pipistrellus*	1:06	Adult	m	30,9	6,0	-	

Location	Species	Time	Age	Sexe	Under arm length (mm)	Weight (gr)	Parasites	Remarks
Ponta Canica	*Nyctalus leisleri*	21:10	Adult	m	42,9	10,0	212	
Ponta Canica	*Myotis daubentonii*	21:15	Adult	m	36,0	5,5	-	
Ponta Canica	*Myotis daubentonii*	23:22	Adult	m	35,0	7,0	-	
Ponta Canica	*Myotis daubentonii*	23:22	Juvenile	m	34,5	6,0	216	
Carvalha	*Pipistrellus kuhlii*	22:40	Adult	m	32,7	6,1	-	
Faragao de Igreja	*Caprimulgus europaeus*	21:15	Adult					Bird (nighthawk)
Faragao de Igreja	*Myotis myotis*	22:15	Adult	f	62,7	30,0	217	
Malhão	*Eptesicus serotinus*	21:45	Adult	f	54,3	24,0	002	
Malhão	*Eptesicus serotinus*	21:50	Adult	f	53,6	23,0	-	
Malhão	*Hypsugo savii*	21:55	Adult	f	34,4	9,0	005	
Malhão	*Eptesicus serotinus*	22:00	Adult	f	51,2	21,0	-	
Malhão	*Eptesicus serotinus*	22:10	Adult	f	54,3	24,0	008	
Malhão	*Eptesicus serotinus*	22:15	Adult	f	52,1	24,0	010	
Malhão	*Eptesicus serotinus*	22:30	Adult	f	53,0	20,0	012	
Malhão	*Hypsugo savii*	22:40	Adult	f	35,3	9,0	014	
Malhão	*Eptesicus serotinus*	22:45	Adult	f	55,3	25,0	017	Lactating, old (worn teeth)
Malhão	*Eptesicus serotinus*	23:05	Adult	f	53,7	25,0	018	Suckling, worn teeth
Malhão	*Eptesicus serotinus*	23:12	Adult	f	55,3	29,5	020	Suckling
Malhão	*Eptesicus serotinus*	23:35	Adult	f	52,0	28,0	022	Lactating
Malhão	*Eptesicus serotinus*	23:40	Adult	f	53,3	32,0	024	
Malhão	*Eptesicus serotinus*	23:50	Adult	f	51,9	32,0	-	Lactating
Malhão	*Eptesicus serotinus*	0:00	Adult	f	51,9	25,0	026	Lactating
Malhão	*Eptesicus serotinus*	0:30	Adult	f	56,5	29,0	-	Lactating
Malhão	*Eptesicus serotinus*	0:40	Adult	f	52,8	29,0	-	Lactating
Sazes da Beira	*Pipistrellus pipistrellus*	21:15	Adult	f	30,0	4,0	-	
Sazes da Beira	Escaped	21:47	-	-	-	-	-	
Sazes da Beira	*Eptesicus serotinus*	22:00	Adult	f	55,3	30,0	220	

Location	Species	Time	Age	Sexe	Under arm length (mm)	Weight (gr)	Parasites	Remarks
Sazes da Beira	*Barbastella barbastellus*	22:18	Adult	m	40,0	9,0	223	
Colmeias	*Hypsugo savii*	21:35	Adult	f	25,3	6,5	072	
Colmeias	*Eptesicus serotinus*	21:50	Adult	f	51,4	22,3	074	Lactating
Colmeias	*Eptesicus serotinus*	22:00	Adult	f	53,1	26,0	076	Lactating
Colmeias	*Eptesicus serotinus*	22:00	Adult	f	52,8	26,5	078	Lactating
Colmeias	*Eptesicus serotinus*	23:00	Adult	f	35,3	31,0	080	Lactating
Colmeias	*Hypsugo savii*	23:00	Adult	f	36,2	8,5	082	Lactating
Colmeias	*Hypsugo savii*	23:20	Adult	f	36,9	8,5	084	Lactating
Lapa dos Dinheiros	*Eptesicus serotinus*	22:11	Adult	f	51,5	30,0	-	Pregnant
Lapa dos Dinheiros	*Myotis nattereri*	22:20	Adult	m	38,3	7,0	-	
Lapa dos Dinheiros	*Eptesicus serotinus*	22:50	Adult	m	54,0	29,0	-	
Lapa dos Dinheiros	*Nyctalus leisleri*	22:50	Adult	m	42,0	15,0	-	
Lapa dos Dinheiros	*Nyctalus leisleri*	23:10	Adult	m	46,0	16,0	-	
Lapa dos Dinheiros	*Eptesicus serotinus*	23:55	Adult	f	54,2	24,0	-	
Lapa dos Dinheiros	*Pipistrellus pygmaeus*	23:55	Adult	m	29,5	5,0	-	
Lapa dos Dinheiros	*Eptesicus serotinus*	0:05	Adult	f	53,7	31.5	-	
Lapa dos Dinheiros	*Eptesicus serotinus*	0:10	Adult	f	53,2	-	-	Re-catch
Senhora do Desterro	*Pipistrellus pipistrellus*	21:48	Adult	f	32,0	5,0	-	Lactating
Senhora do Desterro	*Myotis daubentonii*	21:48	Adult	m	41,3	8,0	234	
Senhora do Desterro	*Myotis daubentonii*	22:05	Adult	m	34,9	7,5	-	
Senhora do Desterro	*Myotis daubentonii*	22:10	Adult	f	36.6	7,0	-	
Senhora do Desterro	*Myotis daubentonii*	22:23	Adult	f	34.8	7,0	-	
Senhora do Desterro	*Myotis daubentonii*	22:20	Adult	f	35,7	8,0	239	
Senhora do Desterro	*Myotis daubentonii*	22:35	Adult	m	35,3	7,0	-	
Senhora do Desterro	*Myotis daubentonii*	22:45	Juvenile	f	36,0	7,0	242	
Senhora do Desterro	*Myotis daubentonii*	22:46	Adult	f	36,3	7,5	244	
Senhora do Desterro	*Myotis daubentonii*	22:52	Adult	f	36,5	6,5	249	Lactating
Senhora do Desterro	*Myotis daubentonii*	22:52	Adult	f	36,7	8,0	248	Lactating

Location	Species	Time	Age	Sexe	Under arm length (mm)	Weight (gr)	Parasites	Remarks
Senhora do Desterro	*Myotis daubentonii*	23:05	Juvenile	m	36,1	7,5	-	
Senhora do Desterro	*Myotis daubentonii*	23:16	Juvenile	m	35,8	7,0	251	
Senhora do Desterro	*Myotis daubentonii*	23:36	Juvenile	f	35,9	6,0	253	
Senhora do Desterro	*Myotis daubentonii*	0:00	Juvenile	m	34,8	6,0	255	
Senhora do Desterro	*Barbastella barbastellus*	0:45	Adult	f	40,9	10,5	-	
Senhora do Desterro	*Plecotus austriacus*	1:45	Adult	m	40,0	10,0	-	
Sazes da Beira	*Myotis myotis*	21:10	Adult	m	63,9	26,5	141	Flying out -> in
Sazes da Beira	*Plecotus austriacus*	21:15	Adult	m	39,9	7,9	-	
Sazes da Beira	*Myotis nattereri*	21:34	Adult	m	39,0	7,0	144	Flying in -> out
Sazes da Beira	*Myotis nattereri*	21:34	Adult	m	40,1	7,0	146	Flying in -> out
Sazes da Beira	*Myotis nattereri*	21:39	Adult	m	39,3	6,0	148	
Sazes da Beira	*Myotis myotis*	21:45	Adult	m	60,8	28,8	-	
Sazes da Beira	*Myotis nattereri*	21:53	Adult	m	38,9	7,0	151	
Sazes da Beira	*Myotis nattereri*	22:02	Adult	m	39,9	7,0	153	
Sazes da Beira	*Myotis nattereri*	22:02	Adult	m	37,4	6,0	155	
Sazes da Beira	*Myotis nattereri*	22:02	Adult	m	40,2	7,5	157	
Sazes da Beira	*Myotis nattereri*	22:02	Adult	m	39,4	7,0	159	
Sazes da Beira	*Myotis nattereri*	22:05	Adult	m	38,8	6,0	161	
Sazes da Beira	*Myotis nattereri*	22:12	Adult	m	38,6	6,0	163	
Sazes da Beira	*Myotis nattereri*	22:25	Adult	m	37,4	5,0	165	Flying out -> in
Sazes da Beira	*Myotis myotis*	22:37	Adult	f	65,3	29,0	167	Flying in -> out
Sazes da Beira	*Myotis myotis*	22:55	Adult	m	62,1	27,0	-	Flying in -> out
Sazes da Beira	*Myotis nattereri*	23:50	Adult	m	37,6	5,5	170	Flying in -> out

APPENDIX 5. LIVE TRAP CATCHES

Live traps were placed at the following locations (easting and northing in UTM European 1950, zone 29T):

Location name	Date start	Date stop	Easting	Northing	Alt. (m)	Traps	Type of trap	Catches
Ribeiro das Tapadas 1	28-7-2009	1-8-2009	611667	4465819	850	20	Longworth	18
Ribeiro das Tapadas 2	28-7-2009	1-8-2009	611631	4465811	852	20	Longworth	7
Ribeiro das Tapadas 3	28-7-2009	1-8-2009	611665	4465750	847	10	Longworth	13
Ribeira da Nave 1	28-7-2009	31-07-09	612428	4465192	883	30	Longworth	0
Ribeira da Nave 2	28-7-2009	31-07-09	612483	4465226	905	10	Longworth	1
Ribeira da Nave 3	28-7-2009	31-07-09	612488	4465204	883	10	Longworth	2
Covão	29-7-2009	1-8-2009	614790	4461499	955	50	Longworth	5
Malhadais do Cavalo 1	1-8-2009	05-08-09	615903	4470186	1577	10	Longworth	0
Malhadais do Cavalo 2	1-8-2009	05-08-09	615957	4470198	1583	20	Longworth	0
Malhadais do Cavalo 3	1-8-2009	05-08-09	615903	4470186	1577	9	Longworth	0
Malhadais do Cavalo 4	1-8-2009	05-08-09	615909	4470172	1577	10	Longworth	0
Malhadais do Cavalo 5	2-8-2009	05-08-09	615903	4470186	1577	5	Pitfall	0
Covão do Boeiro 1	1-8-2009	05-08-09	617210	4465995	1767	50	Longworth	4
Covão do Boeiro 2	1-8-2009	05-08-09	616917	4466143	1722	10	Pitfall	0
Senhora do Desterro 1	3-8-2009	05-08-09	611566	4472803	1103	16	Longworth	8
Senhora do Desterro 2	3-8-2009	05-08-09	611463	4472967	985	16	Longworth	3
Lapa dos Dinheiros	3-8-2009	05-08-09	610337	4471246	739	12	Treetrap	0

A map of the locations is part of chapter 4 of the report.

Full details on the results can be found on the next pages.

Location	Trap	Date	Check	Species	Age	Sexe	Remarks
Ribeiro das Tapadas 1	761	29-07-09	Morning	*Apodemus sylvaticus*		M	
Ribeiro das Tapadas 1	770	29-07-09	Morning	*Neomys anomalus*			Dead
Ribeiro das Tapadas 1	761	29-07-09	Evening	*Apodemus sylvaticus*		F	
Ribeiro das Tapadas 1	757	30-07-09	Morning	*Apodemus sylvaticus*	Juvenile	M	
Ribeiro das Tapadas 1	761	30-07-09	Morning	*Apodemus sylvaticus*	Adult	F	Pregnant
Ribeiro das Tapadas 1	767	30-07-09	Morning	*Apodemus sylvaticus*	Adult	M	Sexually active
Ribeiro das Tapadas 1	761	30-07-09	Evening	*Apodemus sylvaticus*	Adult	?	
Ribeiro das Tapadas 1	767	30-07-09	Evening	*Apodemus sylvaticus*	Adult	M	
Ribeiro das Tapadas 1	754	31-07-09	Morning	*Neomys anomalus*	Adult		Dead
Ribeiro das Tapadas 1	759	31-07-09	Morning	*Apodemus sylvaticus*	Adult	M	
Ribeiro das Tapadas 1	761	31-07-09	Morning	*Apodemus sylvaticus*	Adult	M	
Ribeiro das Tapadas 1	764	31-07-09	Morning	*Apodemus sylvaticus*	Adult	F	
Ribeiro das Tapadas 1	753	01-08-09	Morning	*Neomys anomalus*	Adult		
Ribeiro das Tapadas 1	756	01-08-09	Morning	*Apodemus sylvaticus*	Adult		
Ribeiro das Tapadas 1	762	01-08-09	Morning	*Neomys anomalus*	Adult		
Ribeiro das Tapadas 1	763	01-08-09	Morning	*Apodemus sylvaticus*	Adult		
Ribeiro das Tapadas 1	764	01-08-09	Morning	*Apodemus sylvaticus*	Adult		
Ribeiro das Tapadas 1	770	01-08-09	Morning	*Apodemus sylvaticus*	Adult		
Ribeiro das Tapadas 2	785	29-07-09	Evening	*Apodemus sylvaticus*		?	
Ribeiro das Tapadas 2	780	30-07-09	Morning	*Neomys anomalus*	Adult	M	
Ribeiro das Tapadas 2	788	30-07-09	Morning	*Mus spretus*	Adult	M	
Ribeiro das Tapadas 2	784	30-07-09	Evening	*Mus spretus*	Adult	F	
Ribeiro das Tapadas 2	783	31-07-09	Morning	*Apodemus sylvaticus*	Subadult	F	
Ribeiro das Tapadas 2	784	31-07-09	Evening	*Crocidura russula*			
Ribeiro das Tapadas 2	784	01-08-09	Morning	*Crocidura russula / suaveolens*	Adult		Dead
Ribeiro das Tapadas 3	793	29-07-09	Morning	*Apodemus sylvaticus*			
Ribeiro das Tapadas 3	792	29-07-09	Evening	*Apodemus sylvaticus*		M	
Ribeiro das Tapadas 3	793	29-07-09	Evening	*Crocidura suaveolens*		?	
Ribeiro das Tapadas 3	797	30-07-09	Morning	*Mus spretus*	Adult	M	
Ribeiro das Tapadas 3	798	30-07-09	Morning	*Neomys anomalus*	Adult	F	
Ribeiro das Tapadas 3	791	31-07-09	Morning	*Apodemus sylvaticus*	Adult	M	

Location	Trap	Date	Check	Species	Age	Sexe	Remarks
Ribeiro das Tapadas 3	796	31-07-09	Morning	*Crocidura russula / suaveolens*	Adult	M	
Ribeiro das Tapadas 3	797	31-07-09	Morning	*Apodemus sylvaticus*	Adult	M	
Ribeiro das Tapadas 3	798	31-07-09	Morning	(Slug)			
Ribeiro das Tapadas 3	793	31-07-09	Evening	*Mus spretus*	Adult	M	Dead
Ribeiro das Tapadas 3	792	01-08-09	Morning	*Apodemus sylvaticus*	Adult		
Ribeiro das Tapadas 3	793	01-08-09	Morning	*Crocidura russula / suaveolens*	Adult		
Ribeiro das Tapadas 3	798	01-08-09	Morning	*Neomys anomalus*	Adult		
Ribeira da Nave 2	231	31-07-09	Morning	*Crocidura russula / suaveolens*			
Ribeira da Nave 3	245	29-07-09	Morning	*Crocidura suaveolens*			
Ribeira da Nave 3	250	30-07-09	Evening	*Crocidura russula / suaveolens*	Adult		
Covão	396	30-07-09	Morning	*Crocidura russula / suaveolens*	Juvenile		
Covão	361	30-07-09	Evening	*Lacerta schreiberi*		F	
Covão	383	31-07-09	Morning	*Crocidura russula / suaveolens*	Adult	F	Lactating
Covão	362	31-07-09	Evening	*Crocidura russula*			
Covão	374	01-08-09	Morning	*Crocidura russula / suaveolens*			
Covão do Boeiro 1	209	02-08-09	Morning	*Apodemus sylvaticus*	Adult	M	
Covão do Boeiro 1	203	02-08-09	Evening	*Apodemus sylvaticus*		F	
Covão do Boeiro 1	216	04-08-09	Morning	*Apodemus sylvaticus*	Adult		
Covão do Boeiro 1	219	04-08-09	Morning	*Podarcis hispanica*			
Senhora do Desterro 1	388	04-08-09	Morning	*Apodemus sylvaticus*			
Senhora do Desterro 1	392	04-08-09	Morning	*Apodemus sylvaticus*			
Senhora do Desterro 1	393	04-08-09	Morning	*Apodemus sylvaticus*			
Senhora do Desterro 1	388	04-08-09	Evening	*Apodemus sylvaticus*			
Senhora do Desterro 1	392	04-08-09	Evening	*Apodemus sylvaticus*			
Senhora do Desterro 1	393	04-08-09	Evening	*Apodemus sylvaticus*			
Senhora do Desterro 1	393	05-08-09	Morning	*Apodemus sylvaticus*			
Senhora do Desterro 1	399	05-08-09	Morning	*Mus spretus*			
Senhora do Desterro 2	352	01-08-09	Morning	*Mus spretus*			
Senhora do Desterro 2	358	03-08-09	Evening	*Lacerta schreiberi*		M	
Senhora do Desterro 2	358	05-08-09	Morning	*Sorex granarius*			

APPENDIX 6. BAT PARASITES

Parasites were collected from the bats that were caught in mist nets. The parasites were kept in 75% alcohol in small Eppendorf cups and were sent to Dr. Jan Kristufik of the Zoological Institute of the *Slovak Academy of Sciences* in Bratislava, who kindly established the species of the parasites.

Please note:
N = Nymph
PN = Protonymph

FAMILY MACRONYSSIDAE

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
078	*Steatonyssus spinosus*	1♀	*Eptesicus serotinus*	♀	Colmeias
216	*Steatonyssus periblepharus*	2PN	*Myotis daubentonii*	♂	Ponta Canica
223	*Steatonyssus periblepharus*	2PN	*Barbastella barbastellus*	♂	Viveiros Florestais_Sazes da Beira
223	*Steatonyssus spinosus*	1PN	*Barbastella barbastellus*	♂	Viveiros Florestais_Sazes da Beira
223	*Macronyssus sp.*	1PN	*Barbastella barbastellus*	♂	Viveiros Florestais_Sazes da Beira
242	*Steatonyssus periblepharus*	1PN	*Myotis daubentonii*	♀	Sra do Desterro

FAMILY ISCHNOPSYLLIDAE

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
146	*Ischnopsyllus hispanicus*	1♂	*Myotis nattereri*	♂	Sazes da Beira

FAMILY IXODIDAE

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
008	*Argas (Carios) vespertilionis*	2 larvae	*Eptesicus serotinus*	♀	Malhão

FAMILY NYCTERIBIIDAE

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
217	*Nycteribia latreillii*	1♂	*Myotis myotis*	♀	Faragao de Igreja

FAMILY TROMBICULIDAE

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
084	*Willmannium carus ?*	1 larvae	*Hypsugo savii*	♀	Colmeias

FAMILY SPINTURNICIDAE

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
002	*Spinturnix kolenatii*	2♀♀	*Eptesicus serotinus*	♀	Malhão
005	*Spinturnix nobleti*	4♀♀	*Hypsugo savii*	♀	Malhão
010	*Spinturnix kolenatii*	1♂ 1♀ 1N	*Eptesicus serotinus*	♀	Malhão
012	*Spinturnix kolenatii*	1♀	*Eptesicus serotinus*	♀	Malhão
014	*Spinturnix nobleti*	2 ♂♂	*Hypsugo savii*	♀	Malhão
017	*Spinturnix kolenatii*	4♂♂	*Eptesicus serotinus*	♀	Malhão
020	*Spinturnix kolenatii*	5♂♂ 2♀♀ 3Ns	*Eptesicus serotinus*	♀	Malhão
022	*Spinturnix kolenatii*	2♂♂ 1♀ 1N	*Eptesicus serotinus*	♀	Malhão
026	*Spinturnix kolenatii*	2♂♂ 6♀♀ 3Ns	*Eptesicus serotinus*	♀	Malhão
072	*Spinturnix nobleti*	1♂ 1♀	*Hypsugo savii*	♀	Colmeias
074	*Spinturnix kolenatii*	1♂ 3♀♀ 3Ns	*Eptesicus serotinus*	♀	Colmeias
076	*Spinturnix kolenatii*	2 ♂♂	*Eptesicus serotinus*	♀	Colmeias
078	*Spinturnix kolenatii*	1♀	*Eptesicus serotinus*	♀	Colmeias
080	*Spinturnix kolenatii*	1♂ 1N	*Eptesicus serotinus*	♀	Colmeias
082	*Spinturnix nobleti*	1♂ 1♀	*Hypsugo savii*	♀	Colmeias
141	*Spinturnix myoti*	2 ♂♂	*Myotis myotis*	♂	Sazes da Beira
144	*Spinturnix myoti*	2♀♀	*Myotis nattereri*	♂	Sazes da Beira
146	*Spinturnix myoti*	2♂♂ 2♀♀ 1N	*Myotis nattereri*	♂	Sazes da Beira
148	*Spinturnix myoti*	2♂♂ 1♀	*Myotis nattereri*	♂	Sazes da Beira
151	*Spinturnix myoti*	1♂	*Myotis nattereri*	♂	Sazes da Beira
153	*Spinturnix myoti*	2♂♂ 2♀♀	*Myotis nattereri*	♂	Sazes da Beira
155	*Spinturnix myoti*	3♀♀ 1N	*Myotis nattereri*	♂	Sazes da Beira
157	*Spinturnix myoti*	2♂♂ 1♀	*Myotis nattereri*	♂	Sazes da Beira
159	*Spinturnix myoti*	1♂ 1♀ 2Ns	*Myotis nattereri*	♂	Sazes da Beira
161	*Spinturnix myoti*	1♂	*Myotis nattereri*	♂	Sazes da Beira
163	*Spinturnix myoti*	2♂♂ 3Ns	*Myotis nattereri*	♂	Sazes da Beira
165	*Spinturnix myoti*	2♂♂ 3♀♀	*Myotis nattereri*	♂	Sazes da Beira
167	*Spinturnix myoti*	4♂♂ 4♀♀	*Myotis myotis*	♀	Sazes da Beira
170	*Spinturnix myoti*	1♂ 2Ns	*Myotis nattereri*	♂	Sazes da Beira
217	*Spinturnix myoti*	4♀♀	*Myotis myotis*	♀	Faragao de Igreja
220	*Spinturnix kolenatii*	2 ♂♂	*Eptesicus serotinus*	♀	Viveiros Florestais_Sazes da Beira
234	*Spinturnix andegavinus*	1♂ 3Ns	*Myotis daubentonii*	♂	Sra do Desterro

Sample	Parasite	Number and gender	Bat species	Bat gender	Location mist net
239	*Spinturnix andegavinus*	2 ♂♂	*Myotis daubentonii*	♀	Sra do Desterro
244	*Spinturnix andegavinus*	1♂ 1♀	*Myotis daubentonii*	♀	Sra do Desterro
248	*Spinturnix andegavinus*	1♂	*Myotis daubentonii*	♀	Sra do Desterro
251	*Spinturnix andegavinus*	1♀	*Myotis daubentonii*	♂	Sra do Desterro
253	*Spinturnix andegavinus*	1♀	*Myotis daubentonii*	♀	Sra do Desterro
255	*Spinturnix andegavinus*	1♂	*Myotis daubentonii*	♂	Sra do Desterro

APPENDIX 7. INTERNATIONAL LEGAL & CONSERVATION STATUS

(after Mitchell-Jones e.a. 1999)

Scientific name	Habitats Directive	Bern	Bonn	CITES I, II & EC 338/97	IUCN
Erinaceus europaeus		III			
Sorex granarius		III			
Neomys anomalus		III			
Crocidura russula		III			
Crocidura suaveolens		III			
Galemys pyrenaicus	II/IV	II			VU
Talpa occidentalis					
Rhinolophus euryale	II/IV	II	II		VU
Rhinolophus ferrumequinum	II/IV	II	II		LR-cd
Rhinolophus hipposideros	II/IV	II	II		VU
Myotis bechsteinii	III/IV	II	II		VU
Myotis blythii	III/IV	II	II		
Myotis daubentonii	IV	II	II		
Myotis emarginatus	II/IV	II	II		VU
Myotis myotis	II/IV	II	II		LR-nt
Myotis nattereri	IV	II	II		
Pipistrellus pygmaeus	IV	II	II		
Pipistrellus kuhlii	IV	II	II		
Pipistrellus pipistrellus	IV	III	II		
Hypsugo savii	IV	II	II		
Nyctalus leisleri	IV	II	II		LR-nt
Eptesicus serotinus	IV	II	II		
Barbastella barbastellus	II/IV	II	II		VU
Plecotus auritus	IV	II	II		
Plecotus austriacus	IV	II	II		
Tadarida teniotis	IV	II	II		
Oryctolagus cuniculus					
Sciurus vulgaris		III			LR-nt
Arvicola sapidus					LR-nt
Microtus agrestis					
Microtus lusitanicus					
Apodemus sylvaticus					
Rattus rattus					
Mus msuculus domesticus					
Mus spretus					
Vulpes vulpes					
Martes foina		III			
Lutra lutra	II/IV	II		I	
Genetta genetta	V	III			
Sus scrofa					

HABITATS DIRECTIVE:
Council Directive (92/43/AEEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora, as amended afterthe accession of Austria, Sweden and Finland.
http://www.ecnc.nl/doc/europe/legislat/habidire.html
- Annex II: Animal and plant species of Community interest whose conservation requires the designation of special areas of conservation;
- Annex III: Animal and plant species of Community interest in need of strict protection;
- Annex IV: Animal and plant species of Community interest whose taking in the wild and exploitation may be subject to management measures.

BERN:
Convention on the Conservation of Natural habitats and of Wild Fauna and Flora. Annexes as amended by the Conference of the Parties in 1997. URL *http://www.ecnc.nl/doc/europe/legislat/bernconv.html*
- Appendix II: Strictly protected species;
- Appendix III: Protected species.

BONN:
Convention on the Conservation of Migratory Species of Wild Animals. Annexes as amended by the Standing Committee in 1997. *http://www.wcmc.org.uk/CMS/*
- Appendix I: Endangered migratory species.
- Appendix II: Migratory species to be subjected to agreements.
  The following agreements have been concluded under Appendix II:
  - Agreement on the Conservation of Seals in the Wadden Sea.
  - Agreement on the Conservation of Bats in Europe.
  - Agreement on the Conservation of Ceteceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area.
  - Agreement on the Conservation of Seals in the Wadden Sea.
  - Agreement on the Conservation of Small Ceteceans of the Baltic and North Seas.

CITES:
Convention on International Trade in Endangered Species of Wild Fauna and Flora, Annexes as amended by the Conference of the Parties in 1997. *http://www.wcmc.org.uk/CITES/ENGLISH/APPENDIC.htm*
- Appendix I contains species that the Parties have deemed to be threatened with extinction and which are, or may be, affected by trade/
- Appendix II contains species that, although not necessary threatened, could become so if their trade is not properly controlled. Appendix II also contains some species that look so similar to species already listed that their trade is monitored and regulated in order to make control easier.
- (Appendix III does not mention European states).

EC 338/97:
Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein. *http://europa.eu.int/eur-lex/en/lif/dat/en_397R0939.html*
- Annex A: species which are listed in Appendix I of CITES for which EC Member States have not entered a reservation or which are considered by the EC to be threatened by international trade.
- Annex B: species which are listed in Appendix II of CITES or are in Appendix I but subject to reservation by Member States or which are considered by the EC to require their international trade to be controlled.

IUCN:
19961UCN Red List of Threatened Animals (Baillie & Groombridge, 1996).
http://www.wcmc.org.uk/species/animals/index.html. Compiled for Europe (excluding the categories "Lower Risk near threatened" and "Lower Risk – conservation dependent") in the European Red Data Book (WCMC, in press). CR: Critically endangered; EN: Endangered; VU: Vulnerable; LR-nt: Lower Risk-near threatened; LR-cd: Lower Risk-conservation dependent; dd: data deficient.

APPENDIX 8. RECORDINGS OF OTHER TAXONOMIC GROUPS

BIRDS

Scientific name	English name	Dutch name	Portuguese name
Accipiter gentilis	Northern Goshawk	Havik	Açor
Accipiter nisus	Eurasian Sparrow-hawk	Sperwer	Gavião
Actitis hypoleucos	Common Sandpiper	Oeverloper	Maçarico-das-rochas
Ardea cinerea	Grey Heron	Blauwe reiger	Garça-real
Aegithalos caudatus	Long-tailed Tit	Staartmees	Chapim-rabilongo
Alauda arvensis	Sky Lark	Veldleeuwerik	Laverca
Alcedo atthis	Common Kingfisher	IJsvogel	Guarda-rios
Alectoris rufa	Red-legged Partidge	Rode patrijs	Perdiz-comum
Anthus campestris	Tawny Pipit	Duinpieper	Petinha-dos-campos
Anthus spinoletta	Water Pipit	Waterpieper	Petinha-ribeirinha
Apus apus	Common Swift	Gierzwaluw	Andorinhão-preto
Apus pallidus	Palid Swift	Vale gierzwaluw	Andorinhão-pálido
Athene noctua	Little Owl	Steenuil	Mocho-galego
Buteo buteo	Common Buzzard	Buizerd	Águia-de-asa-redonda
Caprimulgus europaeus	European Nightjar	Nachtzwaluw	Noitibó
Carduelis cannabina	Linnet	Kneu	Pintarroxo
Carduelis carduelis	Goldfinch	Putter	Pintassilgo
Carduelis chloris	Greenfinch	Groenling	Verdilhão
Certhia brachydactyla	Short-toed Treeceeper	Boomkruiper	Trepadeira-comum
Ciconia ciconia	White Stork	Ooievaar	Cegonha-branca
Cinclus cinclus	Dipper	Waterspreeuw	Melro-d'água
Circaetus gallicus	Short-toed Eagle	Slangenarend	Águia-cobreira
Circus pygargus	Montagu's Harrier	Grauwe kiekendief	Tartaranhão-caçador
Coccothraustes coccothraustes	Hawfinch	Appelvink	Bico-grossudo
Columba livia	Rock dove	Rotsduif	Pombo-da-rocha
Columba oenas	Wood Pigeon	Houtduif	Pombo-bravo
Corvus corax	Common Raven	Raaf	Corvo
Corvus corone	Carrion Crow	Zwarte kraai	Gralha-preta
Corvus monedula	Eurasian Jackdaw	Kauw	Gralha-de-nuca-cinzenta
Cuculus canorus	Common cuckoo	Koekoek	Cuco
Delichon urbica	House Martin	Huiszwaluw	Andorinha-dos-beirais
Dendrocopos major	Great Spotted Woodpecker	Grote bonte specht	Pica-pau-malhado-grande
Emberiza cia	Rock Bunting	Grijze gors	Cia
Emberiza cirlus	Cirl Bunting	Cirlgors	Escrevedeira-de-garganta-preta
Erithacus rubecula	Europian Robin	Roodborst	Pisco-de-peito-ruivo
Falco peregrinus	Peregrine Falcon	Slechtvalk	Falcão-peregrino
Falco subbuteo	Eurasian Hobby	Boomvalk	Ógea
Falco tinnunculus	Common Kestrel	Torenvalk	Peneireiro-vulgar
Fringilla coelebs	Chaffinch	Vink	Tentilhão
Garrulus glandarius	Eurasian Jay	Vlaamse gaai	Gaio
Hieraaetus pennatus	Booted Eagle	Dwergarend	Águia-calçada
Hirundo daurica	Red-rumped Swallow	Roodstuitzwaluw	Andorinha-dáurica
Hirundo rustica	Eurasian Swallow	Boerenzwaluw	Andorinha-das-chaminés
Jynx torquilla	Wryneck	Draaihals	Torcicolo
Merops apiaster	Europian Bee-eater	Bijeneter	Abelharuco
Miliaria calandra	Corn Bunting	Grauwe gors	Trigueirão
Milvus migrans	Black Kite	Zwarte wouw	Milhafre-preto
Monticola saxatilis	Rock Thrush	Rode rotslijster	Melro-das-rochas
Motacilla alba	White Wagtail	Witte kwikstaart	Alvéola-branca
Motacilla cinerea	Grey Wagtail	Grote gele kwikstaart	Alvéola-cinzenta
Muscicapa striata	Spotted Flycather	Grauwe vliegenvanger	Papa-moscas-cinzento
Oenanthe oenanthe	Northern Wheatear	Tapuit	Chasco-cinzento
Oriolus oriolus	Golden Oriole	Wielewaal	Papa-figos
Otus scops	Eurasian Scops Owl	Dwergooruil	Mocho-d'orelhas
Parus ater	Coal Tit	Zwarte mees	Chapim-preto
Parus caeruleus	Blue Tit	Pimpelmees	Chapim-azul
Parus cristatus	Crested Tit	Kuifmees	Chapim-de-poupa
Parus major	Great Tit	Koolmees	Chapim-real
Passer domesticus	House Sparrow	Huismus	Pardal-comum
Passer montanus	Tree Sparrow	Ringmus	Pardal-montês
Pernis apivorus	Honey Buzzard	Wespendief	Falcão-abelheiro
Petronia petronia	Rock Sparrow	Rotsmus	Pardal-francês
Phoenicurus ochruros	Black Redstart	Zwarte roodstaart	Rabirruivo-preto
Phoenicurus phoenicurus	Common Redstart	Gekraagde roodstaart	Rabirruivo-de-testa-branca
Phylloscopus bonelli	Bonelli's Warbler	Westelijke Bergfluiter	Felosa-de-bonelli

Phylloscopus collybita	Common Chiffchaf	Tjiftjaf	Felosa-comum
Phylloscopus trochilus	Willow Warbler	Fitis	Felosa-musical
Pica pica	Magpie	Ekster	Pega
Picus viridis	European Green Woodpecker	Groene specht	Peto-verde
Prunella modularis	Dunnock	Heggemus	Ferreirinha
Ptyonoprogne rupestris	Crag Martin	Rotszwaluw	Andorinha-das-rochas
Pyrrhocorax pyrrhocorax	Red-billed Chough	Alpenkraai	Gralha-de-bico-vermelho
Riparia riparia	Sand Martin	Oeverzwaluw	Andorinha-das-barreiras
Saxicola torquata	Common stonechat	Afrikaanse roodborsttapuit	Cartaxo-comum
Serinus serinus	European Serin	Europese kanarie	Chamariz
Sitta europaea	Europian Nuthatch	Boomklever	Trepadeira-azul
Streptopelia decaocto	Eurasian Collared Dove	Turkse tortel	Rola-turca
Streptopelia turtur	Europian Turtle Dove	Zomertortel	Rola
Strix aluco	Tawny Owl	Bosuil	Coruja-do-mato
Sturnus unicolor	Spotless Starling	Zwarte spreeuw	Estorninho-preto
Sylvia atricapilla	Blackcap	Zwartkop	Toutinegra-de-barrete-preto
Sylvia borin	Garden Warbler	Tuinfluiter	Felosa-das-figueiras
Sylvia melanocephala	Sardinian Warbler	Kleine zwartkop	Toutinegra-de-cabeça-preta
Sylvia undata	Dartford Warbler	Provencaalse grasmus	Felosa-do-mato
Tringa ochropus	Green Sandpiper	Witgatje	Bique-bique
Troglodytes troglodytes	Wren	Winterkoning	Carriça
Turdus merula	Common Blackbird	Merel	Melro-preto
Turdus philomelos	Song Thrush	Zanglijster	Tordo-músico
Turdus viscivorus	Mistle Trush	Lijster	Tordeia
Tyto alba	Barn Owl	Kerkuil	Coruja-das-torres
Upupa epops	Hoopoe	Hop	Poupa

REPTILES

Scientific name	English name	Dutch name	Portuguese name
Anguis fragilis	Slow worm	Hazelworm	Cobra-de-vidro, Licranço
Chalcides bedriagai	Bedriaga's skink	Spaanse skink	Cobra-de-pernas-de-cinco-dedos
Coronella girondica	Southern smooth snake	Girondische gladde slang	Cobra-lisa-bordelesa
Elaphe scalaris	Ladder snake	Trapslang	Cobra-de-escada
Iberolacerta monticola	Iberian rock lizard	Iberische berghagedis	Lagartixa-da-montanha
Lacerta lepida	Ocellated lizard	Parelhagedis	Sardão
Lacerta schreiberi	Schreiber's green lizard	Spaanse smaragdhagedis	Lagarto-de-água
Malpolon monspessulanus	Montpellier snake	Hagedisslang	Cobra-rateira
Natrix maura	Viperine snake	Adderringslang	Cobra-de-água-viperina
Natrix natrix	Grass snake	Ringslang	Cobra-de-água-de-colar
Podarcis carbonelli	Carbonell's Wall Lizard	Carbonell's muurhagedis	Lagartixa de Carbonell
Podarcis hispanica	Iberian wall lizard	Spaanse muurhagedis	Lagartixa-ibérica
Psammodromus algirus	Large psammodromus	Algerijnse zandloper	Lagartixa-do-mato
Tarentola mauritanica	Moorish gecko	Muurgekko	Osga
Vipera latasti	European viper	Wipneusadder	Vibora-cornuda

AMPHIBIANS

Scientific name	English name	Dutch name	Portuguese name
Alytes obstetricans	Midwife toad	Vroedmeesterpad	Sapo-parteiro-comum
Bufo bufo	Common toad	Gewone pad	Sapo-comum
Chioglossa lusitanica	Golden-striped salamander	Goudstreepsalamander	Salamandra-lusitanica
Hyla arborea	Rela	Boomkikker	Rela
Rana iberica	Iberian frog	Spaanse beekkikker	Rã-ibérica
Rana perezi	Perez's frog	Iberische groene kikker	Rã-verde
Salamandra salamandra	Fire salamander	Vuursalamander	Salamandra-de-pintas-amarelas
Triturus boscai	Bosca's newt	Spaanse watersalamander	Tritão-de-ventre-laranja
Triturus marmoratus	Marbled newt	Marmersalamander	Tritão-marmorado

BUTTERFLIES

Scientific name	English name	Dutch name	Portuguese name
Argynnis pandora	Cardinal	Kardinaalsmantel	-
Argynnis paphia	Silver-washed Fritillary	Keizersmantel	-
Aricia cramera	Southern Brown Argus	Moors bruin blauwtje	Aricia
Brintesia circe	Great Banded Grayling	Witbandzandoog	-
Celastrina argiolus	Holly Blue	Boomblauwtje	-
Coenonympha arcania	Pearly Heath	Tweekleurig hooibeestje	-
Coenonympha dorus	Dusky Heath	Bleek hooibeestje	-

Coenonympha pampilus	Small Heath	Hooibeestje	-
Colias croceus	Clouded Yellow	Oranje luzernevlinder	Borboleta-maravilha
Erynnis tages	Dingy Skipper	Bruin dikkopje	-
Gonepteryx rhamni	Brimstone	Citroenvlinder	Borboleta-limão
Hipparchia alcyone	Rock Grayling	Kleine boswachter	-
Hipparchia fidia	Striped Grayling	Gestreepte heivlinder	Borboleta-zebra
Hipparchia semele	Grayling	Heivlinder	-
Hyponephele lycaon	Dusky Meadow Brown	Grauwe zandoog	Lobito
Iphiclides podalirius/feisthamelii	Scarce Swallowtail	Koningspage	-
Issoria lathonia	Queen	Kleine parelmoervlinder	-
Lampides boeticus	Long-tailed blue	Tijgerblauwtje	Azulinha
Lasiommata maera	Large Wall Brown	Rotsvlinder	-
Leptidea sinapis	Wood White	Boswitje	Branca-de-pontas-escuras
Leptotes pirihous	Lang's Short-tailed Blue	Klein tijgerblauwtje	Cinzentinha
Limenitis reducta	Southern White Admiral	Blauwe ijsvogelvlinder	-
Lycaena alciphron	Purple-shot Copper	Violette vuurvlinder	-
Lycaena phlaeas	Small Copper	Kleine vuurvlinder	-
Lycaena tityrus	Scooty Copper	Bruine vuurvlinder	-
Macroglossum stellatarum	Hummingbird hawk-moth	Kolibrivlinder	Borboleta-colibri
Maniola jurtina	Meadow Brown	Bruine zandoog	-
Melanargia russiae	Esper's Marbled White	Zuidelijk dambordje	-
Melanargia lachesis	Iberian Marbled White	Spaans dambordje	Branca-Ibérica
Melitaea athalia	Heath Fritillary	Bosparelmoervlinder	-
Melitaea deione	Provençal Fritillary	Spaanse parelmoervlinder	-
Melitaea didyma	Spotted Fritillary	Tweekleurige parelmoervlinder	-
Melitaea phoebe	Knapweed Fritillary	Knoopkruidparelmoervlinder	-
Neozephyrus quercus	Purple Hairstreak	Eikenpage	-
Papilio machaon	Swallowtail	Koninginnepage	Borboleta-cauda-de-andorinha
Pararge aegeria	Speckled Wood	Bont zandoogje	-
Pieris brassicae	Large White	Groot koolwitje	Borboleta-grande-da-couve
Pieris napi	Green-veined white	Klein geaderd witje	Branca-com-veios-verdes
Pieris rapae	Small White	Klein koolwitje	Borboleta-pequena-da-couve
Plebeius argus	Silver Studded Blue	Heideblauwtje	-
Polyommatus icarus	Common Blue	Icarusblauwtje	-
Polyommatus thersites	Chapman's Blue	Esparcetteblauwtje	-
Pontia daplidice	Bath White	Resedawitje	Borboleta-branca-e-verde
Pyronia cecilia	Southern Gatekeeper	Zuidelijk oranje zandoog	-
Pyronia tithonus	Gatekeeper	Oranje zandoog	-
Satyrium esculi	False Ilex Hairstreak	Spaanse eikenpage	-
Satyrium spini	Blue-spot Hairstreak	Wegedoornpage	-
Satyrus actaea	Black Satyr	Kleine saterzandoog	-
Satyrus spec	Grote of kleine	Saterzandoog	-
Thymelicus acteon	Lulworth Skipper	Dwergdikkopje	-
Thymelicus sylvestris	Small Skipper	Geelsprietdikkopje	-
Vanessa atalanta	Red Admiral	Atalanta	-
Vanessa cardui	Painted lady	Distelvlinder	Bela-dama

DRAGONFLIES

Scientific name	English name	Dutch name	Portuguese name
Aeshna juncea	Moorland Hawker	Venglazenmaker	-
Aeshnea cyaena	Blue Hawker	Blauwe glazenmaker	-
Aeshnea mixta	Migrant Hawker	Paardenbijter	-
Anax imperator	Blue Emperor	Grote keizerlibel	-
Boyeria irene	Western Spectres	Schemerlibel	-
Calopteryx haemorrhoidalis	Copper Demoiselle	Koperen beekjuffer	-
Calopteryx virgo	Beautiful Demoiselle	Bosbeekjuffer	-
Ceriagrion tenellum	Small Red Damsel	Koraaljuffer	-
Cordulegaster boltonii	Golden-ringed dragonfly	Bronlibel	-
Enallagma cyathigerum	Common blue damselfly	Watersnuffel	-
Enallagma cyathiherum	Common Bluet	Watersnuffel	-
Lestes dryas	Robust Spreadwing	Tangpantserjuffer	-
Lestes virens vestalis	Small Spreadwing	Tengere pantserjuffer	-
Libellula quadrimaculata	Four-spotted chaser	Viervleklibel	-
Onychogomphus forcipatus	Small pincertail	Kleine tanglibelle	-
Onychogomphus uncatus	Large pincertail	Grote tanglibelle	-
Orthetrum cancellatum	Black-tailed Skimmer	Gewone oeverlibel	-
Orthetrum coerulescens	Keeled Skimmer	Beekoeverlibel	-
Platycnemis latipes	White Featherleg	Witte Breedscheenjuffer	-
Pyrrhosoma nymphula	Large Red Damsel	Vuurjuffer	-
Sympetrum fonscolombii	Red-veined Darter	Zwervende heidelibel	-
Sympetrum striolatum	Common Darter	Bruinrode heidelibel	-

OTHER GROUPS

Scientific name	English name	Dutch name	Portuguese name
Mantis religiosa	Praying mantis	Bidsprinkhaan	Louva-a-Deus
Oedipoda caerulescens	Blue-winged Grasshopper	Blauwvleugelsprinkhaan	-
Omocetus viridulus	Common Green grasshopper	Wekkertje	-
Pholidoptera griseoptera	Dark Bush-cricket	Bramensprinkhaan	-

PLANTS

Scientific name	English name	Dutch name	Portuguese name
Acacia dealbata	Silver wattle	-	Mimosa
Acer negundo	Box-elder	Vederesdoorn	Bordo negundo
Acer pseudoplatanus	Sycamore	Gewone esdoorn	Pádreiro
Agrostis castellana	Castillean bent	Tweetoppig struisgras	Saudades
Ailanthus altissima	Tree of heaven	Hemelboom	Ailantho-da-china
Allium sphaerocephalon	Round-headed Leek	-	Alho-bravo
Alnus glutinosa	Alder	Zwarte els	Amieiro
Anarrhinum bellidifolium	Daisy-leaved toadflax	-	-
Angelica major	-	Grote engelwortel	Angélica
Angelica sylvestris	Wild angelica	Gewone engelwortel	Angélica-silvestre
Anthemis arvensis	Corn chamomile	Valse kamille	Margação
Apium nodiflorum	Fool's water-cress	Groot moerasscherm	Rabaça
Armeria sampaioi	Sea Pink	-	-
Arnica montana	Mountain arnica	Valkruid	Arnica
Arrhenatherum elatius	False oat-grass	-	Aveia-de-rosário
Arum italicum	Italian lords and ladies	Italiaanse aronskelk	Jarro-dos-campos
Asphodelus albus	White asphodel	Witte affodil	Arbrótea
Asplenium septentrionale	Forked spleenwort	-	-
Asterolinon linum-stellatum	-	-	-
Betula celtiberica	-	-	Vidoeiro
Briza maxima	Great quaking grass	Groot trilgras	Bole-bole-maior
Bryonia dioica	White bryony	Heggenrank	Norça-branca
Calluna vulgaris	Heather	Struikhei	Torga-ordinária
Campanula herminii	-	-	-
Campanula lusitanica	Bellflower	-	Campainhas
Campanula rapunculus	Rampion	Rapunzelklokje	Rapôncio
Carduus carpetanus	-	-	-
Carex echinata	Star sedge	Sterzegge	-
Carex nigra	-	Zwarte zegge	-
Castanea sativa	Sweet chestnut	Tamme kastanje	Castanheiro
Centaurea sect. Paniculata	-	-	-
Chelidonium majus	Greater celandine	Stinkende gouwe	Erva-andorinha
Chrysosplenium oppositifolium	Opposite-leaved golden saxifrage	Paarbladig goudveil	-
Cirsium palustre	Marsh thistle	Kale jonker	Cardo-palustre
Cirsium vulgare	Spear thistle	Speerdistel	Cardo-roxo
Cistus psilosepalus	-	-	Sanganho
Clinopodium vulgare	Wild basil	Borstelkrans	Clinopódio
Convolvulus arvensis	Field bindweed	Akkerwinde	Corriola
Corynephorus canescens	Grey hair-grass	Buntgras	Erva-pinchoneira
Crataegus monogyna	Hawthorn	Eenstijlige meidoorn	Pilriteiro
Crepis capillaris	Smooth hawksbeard	Klein streepzaad	Almeirão-branco
Cryptogramma crispa	Parsley fern	-	-
Cucumis melo	Melon	Meloen	-
Cymbalaria muralis	Ivy-leaved toadflax	Muurleeuwenbek	-
Cynara cardunculus	Cardoon	Kardoen	Cardo-do-coalho
Cytisus multiflorus	White Spanish broom	-	Giesta-brabca
Cytisus oromediterraneus	-	-	Piorneira-da-estrela
Cytisus scoparius	Broom	Brem	Giesteira-commum
Cytisus striatus	-	-	Giesteiras-das-serras
Dactylis glomerata	-	Kropaar	Panasco-de-folha-estreita
Daucus carota	Wild carot	Wilde peen	Cenoura-brava
Deschampsia flexuosa	-	Bochtige smele	-
Dianthus lusitanus	-	-	Cravinas-bravas
Digitalis purpurea	Foxglove	Vingerhoedskruid	Dedaleira
Digitalis thapsi	-	-	Abeloura-amarelada
Doronicum pubescens	-	-	-
Drosera rotundifolia	Round-leaved sundew	Ronde zonnedauw	Drósera
Dryopteris dilatata	Broad buckler fern	Brede stekelvaren	-
Dryopteris filix-mas	Male fern	Mannetjesvaren	Feto-macho
Echinochloa crus-galli	Cockspur	Europese hanenpoot	Milhã-pé-de-galo

Echinospartum ibericum	-	-	Caldoneira
Echium lusitanicum	-	-	Soajos
Echium plantagineum	Purple viper's bugloss	Weegbreeslangenkruid	Soagem
Erica arborea	Tree heath	Boomhei	Urze-branca
Erica australis	Spanish heath	-	Urze-vermelha
Erica cinerea	Bell heather	Rode dophei	Urze-roxa
Erigeron karvinskianus	Mexican fleabane	Muurfijnstraal	Vitadínia-das-floristas
Erodium cicutarium	Common storksbill	Reigersbek	Bico-de-cegonha
Erophila verna	Common whitlow-grass	Vroegeling	-
Eryngium tenue	-	-	Cardete
Eucalyptus globulus	Blue gum	Blauwe gomboom	Eucalipto-comum
Euphorbia helioscopia	Sun spurge	Kroontjeskruid	Maleiteira
Fagus sylvatica	Beech	Beuk	Faia
Falopia convolvulus	Black bindweed	Zwaluwtong	Corriola-bastarda
Ficus carica	Fig	Vijgenboom	Figueira
Foeniculum vulgare	Fennel	Venkel	Funcho
Fragaria vesca	Wild strawberry	Bosaardbei	Morangueiro
Frangula alnus	Alder buckthorn	-	Amieiro-negro
Fraxinus angustifolia	-	Smalbladige es	Freixo-comum
Fritillaria nervosa	-	-	Fritilária
Galactites tomentosa	Mediterranean Thistle	-	Cardo
Galinsoga parviflora	Galliant soldiers	Kaal knopkruid	Erva-da-moda
Galinsoga quadriradiata	-	Harig knopkruid	-
Galium album	Upright hedge bedstraw	-	Aspérula
Galium aparine	Cleavers	Kleefkruid	Amor-de-hortelão
Galium mollugo	Hedge bedstraw	Glad walstro	Aspérula
Genista anglica	Petty whin	Stekelbrem	Aliaga
Genista cinerascens	-	-	-
Gentiana pneumonanthe	Marsh gentian	Klokjesgentiaan	-
Geranium molle	Dove's foot cranebill	Zachte ooievaarsbek	Bico-de-pomba-menor
Geranium robertianum	Herb robert	Robertskruid	Erva-de-são-roberto
Geum urbanum	Wood avens	Geel nagelkruid	Erva-benta
Glechoma hederacea	Ground ivy	Hondsdraf	Erva-de-são-joão
Halimium lasianthum	-	-	Sargaça
Hedera helix	Ivy	Klimop	Hera
Helichrysum stoechas	-	-	Perpétua-das-areias
Heracleum sphondylium	Hogweed	-	Branca-ursina
Hieracium castellanum	-	-	-
Hispidella hispanica	-	-	-
Holcus lanatus	Yorkshire fog	Gestreepte witbol	Erva-lanar
Hydrocotyle vulgaris	Marsh pennywort	Gewone waternavel	Trevão
Hypericum humifusum	Trailing St John's wort	Liggend hertshooi	Hipericão-rasteiro
Hypericum perforatum s.l.	Perforate St John's wort	Sint-Janskruid	Milfurada
Hypochaeris radicata	Catsear	Gewoon biggekruid	Erva-das-tetas
Ilex aquifolium	Holly	Hulst	Azevinho
Iris pseudacorus	Yellow iris	Gele lis	Lírio-amarelo-dos-pântanos
Jasione montana	Sheepsbit	Zandblauwtje	Baton-azul
Juncus bulbosus	Bulbous rush	Knolrus	Junco-bulboso
Juncus effusus	Soft rush	Pitrus	Junco-solto
Juncus heterophyllus	-	-	Junco-de-folhas-variadas
Juniperus communis	Dwarf juniper	Jeneverbes	Zimbro-rasteiro
Juniperus oxycedrus	Prickly juniper	Stekelige jeneverbes	Cedro-da-folha-fina
Lamium maculatum	Spotted dead-nettle	Gevlekte dovenetel	Chucha-pitos
Lapsana communis	Nipple wort	Akkerkool	Labresto
Lavandula stoechas	Lavender	Franse lavendel	Rosmaninho
Leontodon hispidus	-	Ruige leeuwentand	-
Leontodon taraxacoides	-	-	Leituga-dos-montes
Leucanthemum sylvaticum	-	-	Bem-me-quer
Linaria saxatilis	-	-	-
Lolium perenne	Perennial ryegrass	Engels raaigras	Gazão
Lonicera periclymenum	Honeysuckle	Wilde kamperfoelie	Madressilva
Lotus corniculatus	Common bird's foot-trefoil	Gewone rolklaver	Cornichão
Lotus pedunculatus	Greater bird's foot-trefoil	Moerasrolklaver	Erva-coelheira
Luzula campestris	-	Gewone veldbies	Junco-dos-prados
Luzula forsteri	-	-	-
Lycopus europaeus	Gipsy wort	Wolfspoot	Marroio-de-água
Lythrum salicaria	Purple loosestrife	Grote kattenstaart	Salgueirinha
Malus domestica	Apple	-	Macieira
Malus sylvestris	Crab apple	Appel	Macieira-brava
Malva neglecta	Dwarf mallow	Klein kaasjeskruid	Malva-redonda
Malva sylvestris	Common mallow	Groot kaasjeskruid	Malva-silvestre
Matricaria discoidea	Pineappleweed	Schijfkamille	-
Mentha suaveolens	Apple mint	Witte munt	Mentastro

Menyanthes trifoliata	Bogbean	Waterdrieblad	Fava-de-água
Molinia caerulea	Purple moor-grass	Pijpenstrootje	-
Murbeckiella sousae	-	-	-
Olea europaea	Cultivated olive	Olijfboom	Oliveira
Origanum vulgare	Marjoram	Wilde marjolein	Oregão-vulgar-do-minho
Oxalis corniculata	Procumbent yellow sorrel	Gehoornde klaverzuring	Erva-azeda
Parietaria judaica	Pellitory-of-the-wall	Klein glaskruid	Alfaca-de-cobra
Parietaria lusitanica	-	-	Parietária-portuguesa
Pentaglottis sempervirens	Green alkanet	Overblijvende ossentong	Olho-de-gato
Phragmites australis	Common reed	Riet	Caniço
Pinus nigra ssp laricio	-	Zwarte den	Pinheiro-larício
Pinus sylvestris	Scots pine	Grove den	Pinheiro-silvestre
Plantago bellardi	-	-	Tanchagem
Plantago coronopus	Buck's-horn plantain	Hertshoornweegbree	Diabelha
Plantago lanceolata	Ribwort plantain	Smalle weegbree	Língua-de-ovelha
Plantago major	Greater plantain	Grote weegbree	Tanchagem-maior
Platanus hispanica	London plane	-	Plátano-comum
Poa annua	Annual meadow-grass	Straatgras	Cabelo-do-cão
Polygonum persicaria	Redshank	Perzikkruid	Erva-pessegueira
Polypodium interjectum	Western polypody	Brede eikvaren	Polipódio
Polypodium vulgare	Common polypody	Eikvaren	Polipódio-do-norte
Populus nigra	Black poplar	Zwarte populier	Choupo-negro
Potentilla erecta	Tormentil	Tormentil	Sete-em-rama
Prunella vulgaris	Selfheal	Gewone brunel	Erva-férrea
Prunus domestica	Wild plum	Pruim	Ameixeira
Prunus lusitanica	Portugal laurel	-	Azereiro
Prunus persica	Peach	Perzik	Pessegueiro
Pteridium aquilinum	Bracken	Adelaarsvaren	Feto-ordinário
Pterospartum tridentatum	-	-	Carqueija
Quercus pyrenaica	Pyrenean oak	Pyreneese eik	Carvalho-negral
Quercus robur	Pedunculate oak	Zomereik	Carvalho-roble
Ranunculus omiophyllus	Round-leaved crowfoot	Drijvende waterranonkel	-
Reseda gredensis	-	-	-
Rumex acetosella	Sheep's sorrel	Schapenzuring	Azeda-mansa
Rumex obtusifolius	Broad-leaved dock	Ridderzuring	Labaça-obtusa
Ruscus aculeatus	Butcher's-broom	muizendoorn	Gibarbeira
Sambucus nigra	Elder	Gewone vlier	Sabugueiro-negro
Sanguisorba minor	-	Kleine pimpernel	Pimpinela
Saxifraga spathularis	-	-	-
Scolymus hispanicus	Spanish oyster plant	Gouddistel	Cangarinha
Sedum arenarium	-	-	-
Sedum brevifolium	-	-	Arroz-dos-muros
Sedum maireanum	-	-	-
Senecio jacobaea	Common ragwort	Jacobskruiskruid	Tasna
Senecio pyrenaicus	-	-	Erva-loira-da-serra-da-estrela
Sibthorpia europaea	Cornish moneywort	-	Erva-longa
Silene acutifolia	-	-	-
Silene nutans	Nottingham catchfly	Nachtsilene	-
Silene vulgaris	Bladder campion	Blaassilene	Erva-traqueira
Solanum nigrum	Black nightshade	Zwarte nachtschade	Erva-moira
Sonchus oleraceus	Smooth sow-thistle	Gewone melkdistel	Serralha-macia
Sorbus aucuparia	Rowan	Wilde lijsterbes	Tramazeira
Sparganium angustifolium	Floating bur-reed	Drijvende egelskop	-
Spergularia rubra	Sand spurrey	Rode schijnspurrie	Sapinho-roxo-das-areias
Stachys arvensis	Field woundwort	Akkerandoorn	Rabo-de-raposa
Stipa gigantea	-	-	Baracejo
Teesdalia nudicaulis	Shepherd's cress	Klein tasjeskruid	-
Teucrium salviastrum	-	-	Pólio
Thymus mastichina	-	-	Bela-luz
Torilis arvensis	Spreading hedge-parsley	-	Salsinha
Trifolium arvense	Hare's-foot clover	Hazenpootje	Pé-de-lebre
Trifolium repens	White clover	Witte klaver	Trevo-branco
Trifolium resupinatum	Reversed clove	Perzische klaver	Trevo-de-flores-reviradas
Ulex europaeus	-	Gaspeldoorn	Tojo-arnal-do-litoral
Ulex minor	Dwarf gorse	Kleine gaspeldoorn	Tojo-molar
Umbilicus rupestris	Navelwort	rotsnavelkruid	Umbigo-devénus
Urtica dioica	Common nettle	Grote brandnetel	Urtiga maior
Vaccinium uliginosum	-	-	-
Veratrum album	White false helleborine	Witte nieswortel	Helléboro-branco
Verbascum pulverulentum	Hoary mullein	-	Verbasco-pulverulento
Verbascum sinuatum	-	-	Cachapeiro
Veronica linkiana	-	-	-
Viola palustris	Marsh violet	Moerasviooltje	-

Viola riviniana	Common dog-violet	Bleeksporig bosviooltje	Violetas-bravas
Vitis vinifera	Common vine	Wijnstok	Videira
Wahlenbergia hederacea	Ivy-leaved bellflower	Klimopklokje	Ruínas
Zea mays	Maize	Mais	Milho