

**AGREEMENT ON THE CONSERVATION OF  
POPULATIONS OF EUROPEAN BATS**  
**Report on implementation of the Agreement in Portugal**  
**- 2014 / 7 MoP -**

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## A. General Information

- ◆ *Name of Party:* Portugal
- ◆ *Date of Report:* 9 June 2014
- ◆ *Period Covered:* June 2010 to April 2014
- ◆ *Competent Authority for Mainland Portugal:* Instituto da Conservação da Natureza e das Florestas – ICNF (former Instituto da Conservação da Natureza e das Florestas - ICNB)
- ◆ *Competent Authority for Azores Archipelago:* Direcção Regional do Ambiente da Secretaria Regional dos Recursos Naturais
- ◆ *Competent Authority for Madeira Archipelago:* Direcção Regional de Florestas e Conservação da Natureza
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- ◆ *Contributors Madeira Archipelago:* Sérgio Teixeira, José Jesus, Tamira Freitas, Danilo Russo, David Teixeira (It is with deep sadness that the Madeira Bat research group and Madeira EUROBATS Focal Point wish to inform that our colleague and bat researcher David Teixeira, passed away on 22<sup>nd</sup> of June of 2011, with 32 years of age. Considering his efforts to bat conservation in Madeira and his contribution to the present report, it is our view that we should pay a tribute our dear friend and

colleague), Ricardo Antunes and Ana Rainho

## **B. Status of Bats within the Territory of the Party**

### **1. Summary details of Resident Species**

The revision of the Portuguese Red Data Book, using the new criteria of IUCN, was published in 2005 (Cabral MJ (coord.), Almeida J, Almeida PR, Dellinger T, Ferrand de Almeida N, Oliveira ME, Palmeirim JM, Queiroz AI, Rogado L & Santos-Reis M (eds). 2005. *Livro Vermelho dos Vertebrados de Portugal*. Instituto da Conservação da Natureza. Lisboa). *Pipistrellus nathusii* was not evaluated because its presence in mainland was reported in 1910 but there are no recent observations for this species. Genetic data suggest that *Plecotus auritus* may be replaced by *Plecotus begognae*, but this species is not yet accepted by the scientific community.

#### **Mainland Portugal**

25 species are currently known in mainland (Table 1).

After the publication of the Portuguese Red Data Book, the presence of *Eptesicus isabellinus* and *Myotis escaleraei* (replacing *M. nattereri*) was confirmed in mainland; it is still uncertain if *M. nattereri* is also present.

#### **Azores Archipelago**

According to the Portuguese Red Data Book, two species are currently known for Azores (Table 2): *Nyctalus azoreum* (endemic to Azores) and *Pipistrellus maderensis* (endemic to Macaronesia). A reference is made to old observations of *Myotis myotis*, but its actual occurrence is not confirmed.

#### **Madeira Archipelago**

In Madeira archipelago, Madeira pipistrelle *Pipistrellus maderensis*, Savi's pipistrelle *Hypsugo savii*, Madeira's Leisler's bat *Nyctalus leisleri verrucosus*, Grey long-eared bat *Plecotus austriacus* and the European free-tailed bat *Tadarida teniotis* were listed based on nineteenth century work, essentially developed by Dobson and Bowdich. In 2000 and 2001, the GEBM – “Grupo de Estudo da Biodiversidade Madeirense” (Madeira's Biodiversity Study Group) composed by Sérgio Teixeira, David Teixeira, Ricardo Antunes and Tamira Freitas, funded by Associação Juvenil de Ciência (AJC), collected data comprising search for roost, inquiries to population, bat recordings using Het/TE ultrasound detectors and captured specimens morphology using mist-nets and sweep nets, which confirmed the presence of *Pipistrellus maderensis*, *Nyctalus leisleri verrucosus* and *Plecotus austriacus*. In relation to the other two species reported to Madeira based in XIX century literature, it's our conviction that in the case of the *Tadarida teniotis*, was referred to Madeira due to

locality mislabelling. However, considering that a labelled specimen captured in 1872 exists in the BMNH, this species was included in the Portuguese Red Data Book as NE, whereas *Hypsugo savii* was removed from recorded species list, since no specimens are known and its record was most probably due to misidentification. In 2002 the GEBM group shared all collected data and cooperated with ICNB on the evaluation of Madeira archipelago bat species, included in the revision of the Portuguese Red Data Book using the new IUCN criteria, which confirmed the findings of the GEBM in 2000 and 2001. Based on echolocation data, S. Teixeira presented its thesis defending the presence of two pipistrelle species and two long-eared bats in Madeira Island. The research work was carried out since by Sérgio Teixeira, David Teixeira and Tamira Freitas, but without success on capturing any of these unknown species. In 2008 José Jesus (University of Madeira) and Danilo Russo (University of Naples, Italy) joined the bat research group, allowing increasing sampling effort, data analysis and extend data to molecular work. The substantially superior sampling effort, revealed the presence of an additional pipistrelle species, with echolocation characteristics of *Pipistrellus kuhli*. The recordings were sent to bat echolocation specialist Danilo Russo, which confirmed that the echolocation calls belonged to Kuhl's pipistrelles.

During field work in the summer of 2004, Sérgio Teixeira recorded and observed a *Myotis* like bat leaving its roost. However, although echolocation was *Myotis* like, the low intensity of the recording hindered any possibilities of acoustic identification. Later attempts to capture the individual at roost exit with mist nets failed, although the bat hit the net, but didn't get entangled and escaped. This allowed taking a better look at the individual at its large wingspan and its distinctiveness from previous recorded species. In August of 2005, Sérgio Teixeira and David Teixeira had visual contact with a large winged specimen. In 2010, several echolocation recordings and observations of a *Myotis* sp bat were made. Although this individual wasn't captured, it displayed echolocation call characteristics and feeding behaviour of *Myotis myotis*. It is important to note that two skulls of this species found in the Azorean archipelago (located farther away from the mainland Europe than Madeira archipelago) were identified by Palmeirim in 1979. However until morphological and molecular confirmation, we will consider *Myotis* sp. In conclusion, based on old records and recent data collection using ultrasound recordings, morphology and ethology, 6 species are currently listed in Madeira archipelago (Table 3).

No further evaluations have been carried out since the last report (Agreement on the Conservation of Populations of European Bats - Report on implementation of the Agreement in Portugal - 2013 / 18 Advisory Committee Meeting). Hence we maintain the status for every species listed previously.

## 2. Status and Trends

### Mainland Portugal

Table 1 shows the status and the population trends of the species known in mainland. Apparent population trends of species with status other than Least Concern are referred in the Portuguese Red Data Book. Recently, a report on the analysis of the monitoring data collected between 1988 and 2012 (ICNF 2014; reference under point 12) includes the trends of cave-dwelling species calculated with TRIM.

Table 1 - Status of the species known in mainland and apparent population trends of species with status other than Least Concern (data published in the Portuguese Red Data Book (Cabral et al. 2005). Population trends of cave-dwelling species calculated with TRIM (ICNF 2014). \*: Portuguese Red Data Book refers to *M. nattereri*, the presence of *M. escalerae* was confirmed after 2005. \*\*: not evaluated because its presence was confirmed after 2005.

Species	Status	Apparent Trend	Trend (1988-2012)
<i>Rhinolophus ferrumequinum</i>	Vulnerable		Stable
<i>Rhinolophus hipposideros</i>	Vulnerable		Uncertain
<i>Rhinolophus Euryale</i>	Critically Endangered		Uncertain
<i>Rhinolophus mehelyi</i>	Critically Endangered		Uncertain
<i>Myotis mystacinus</i>	Data Deficient	Unknown	
<i>Myotis emarginatus</i>	Data Deficient	Indeterminate	
<i>Myotis escalerae</i> *	Vulnerable	Seems to be increasing	
<i>Myotis bechsteinii</i>	Endangered	Unknown	
<i>Myotis myotis</i>	Vulnerable		Stable
<i>Myotis blythii</i>	Critically Endangered		Significant moderate decline ( $p < 0.05$ ) *
<i>Myotis daubentonii</i>	Least Concern		
<i>Pipistrellus pipistrellus</i>	Least Concern		
<i>Pipistrellus kuhli</i>	Least Concern		
<i>Pipistrellus pygmaeus</i>	Least Concern		
<i>Hypsugo savii</i>	Data Deficient	Unknown	
<i>Nyctalus leisleri</i>	Data Deficient	Unknown	
<i>Nyctalus noctula</i>	Data Deficient	Unknown	
<i>Nyctalus lasiopterus</i>	Data Deficient	Unknown	
<i>Eptesicus serotinus</i>	Least Concern		
<i>Eptesicus isabellinus</i> **			
<i>Barbastella barbastella</i>	Data Deficient	Unknown	
<i>Plecotus auritus</i>	Data Deficient	Unknown	
<i>Plecotus austriacus</i>	Least Concern		
<i>Miniopterus schreibersii</i>	Vulnerable		Stable
<i>Tadarida teniotis</i>	Data Deficient	Unknown	

### Azores Archipelago

Table 2 shows the status and the apparent population trends of the species known in Azores archipelago.

Table 2 - Status and apparent population trends of the species known in Azores archipelago (data published in the Portuguese Red Data Book.\*: not evaluated because its current presence is not confirmed).

Species	Status	Apparent Trend
<i>Nyctalus azoreum</i>	Critically Endangered	Unknown
<i>Pipistrellus maderensis</i>	Critically Endangered	Unknown
<i>Myotis myotis</i> *	Not Evaluated	

### Madeira Archipelago

Table 3 shows the status and the apparent population trends of the species known in Madeira archipelago.

Table 3 - Status and apparent population trends of the species known in Madeira archipelago (data published in the Portuguese Red Data Book.\*: no records since 1872; \*\*: not evaluated because its presence was confirmed after 2005).

Species	Status	Apparent Trend
<i>Myotis</i> sp** ( <i>Myotis myotis</i> ?)	Not Evaluated	
<i>Nyctalus leisleri verrucosus</i>	Critically Endangered	Declining
<i>Pipistrellus kuhli</i> **	Not Evaluated	Unknown
<i>Pipistrellus maderensis</i>	Critically Endangered	Declining
<i>Plecotus austriacus</i>	Critically Endangered	Declining
<i>Tadarida teniotis</i> *	Not Evaluated	Unknown

## 3. Habitats and Roost Sites

### Mainland Portugal

In mainland there are many identified roosts (caves, mines, buildings, cliffs, bridges and a few trees). Using the updated criteria for the identification of roosts of national importance (ICNF 2013; reference under point 12), 76 roosts were identified. Currently, three roosts are important all year round, 43 are important hibernacula, 40 are important maternities and six are important satellite (occupied during the maternity season by relevant numbers of males and non-breeding females).

### Azores Archipelago

In Azores archipelago roosts detected were located on houses, rocks and trees. For hunting, bats use different habitats often exploring insect's concentrations around street lights.

## **Madeira Archipelago**

Most of known roosts are located in anthropogenic structures such as pierced grey brick walls, stone walls, barns, storages and roofs. A few natural structures are used by bats as roosts, which comprise mainly hollow trees and tree barks. In relation to the previous report, no new roosts have been identified, except for an abandoned pipistrelle roost on Porto Santo Island, located in an empty building.

The main habitats used by bats in Madeira archipelago differ between species and between islands in the case of *Pipistrellus maderensis*, which is the only bat species found on the Island of Porto Santo. Madeira pipistrelles are the species that shows wider ecological adaptability. These bats can be found foraging in almost every habitat type, from urban areas, rural, forests and sloped mountain heathlands. However it shows some preference to public lights, riparian habitats and rural areas in Madeira Island and pine woods in Porto Santo Island, which are the only available forests in the island.

In the case of *Nyctalus leisleri verrucosus*, collected data since 2000 showed that preferential foraging habitats are mountainous areas mainly covered by macaronesian heathlands, sea cliffs independently of vegetation cover and forested areas, especially macaronesian laurel forests, mixed exotic forests and chestnut orchards. This species forages opportunistically in sparsely urbanised rural areas.

As to *Plecotus austriacus* habitat preferences, due to its low intensity echolocation, available data is much scarce than *P. maderensis* and *N. leisleri verrucosus*. In Madeira Island, long-eared bats prefer mixed farmland and forest areas, laurel forests and also sparse urban areas.

Regarding *Pipistrellus kuhli*, even though only in 2008 its presence was confirmed in Madeira, it has been recorded both in the south and northern sides of the island. All records occurred in forested and rural areas with associated public illumination, thus these can be considered preferential habitats for this rare species.

In regard of *Myotis* sp, most probably *Myotis myotis*, has been observed foraging and recorded in forested areas or forest/meadow ecotone, both in the North and South of Madeira Island. Thus we can consider that this species uses the same habitats as mainland populations, having preference for forested areas.

In relation to the European free-tailed bat *Tadarida teniotis*, as aforementioned, was recorded for the last time in 1872, hence no data exists about its habitat preferences in Madeira Island.

In relation to roosts identified in Madeira archipelago, all known roosts are located in Madeira Island and none in Porto Santo Island, although extensive roosts prospection carried out by Sérgio Teixeira, David Teixeira, José Jesus and António Brehm in the University of Madeira's Porto Santo bat expedition in 2004. In Madeira Island up to 11

roosts are identified (Table 4), mostly located in anthropogenic structures as stone walls, barns and other buildings. Unfortunately, all major roosts are now abandoned or destroyed. No new roosts have been found or reported to bat researchers. However we should stress that this result is mostly due to the fact that presently bat researchers in Madeira Archipelago have other jobs and bat work is only done occasionally. Although attempts were made by the bat researchers to get funding to at least devise a conservation plan and start educational initiatives and population information, all efforts were unsuccessful. Hence the lack of at least one researcher dedicated to bats, working along with local authorities, hinders all possibilities of data collection, knowledge about bat population trends and roosts identification and protection in the archipelago. All collected data was gathered by personal efforts, both time and financial, by all volunteer researchers. Without a change in this matter, conservation of Madeiran bat populations will inevitably get to halt. Additionally, all known roosts and feeding areas should be protected.

The new LIFE project on which bats were for the first time included might shed a light about the habitats and roosts of bats both on Desertas Islands and the eastern end of Madeira Island.

Table 4 – Identified roosts in Madeira archipelago and their current status.

Roost	Species	First count (n)	Location	Status	Observations about roost status
FxP3	<i>N. leisleri verrucosus</i> <i>P. maderensis</i>	42 12	Funchal	Destroyed	Breeding roost. Bats roosted inside the roof and crevices of expansion joints. Reconstruction work carried out covered with cement all entry points.
Sérgio 1	<i>N. leisleri verrucosus</i>	56	Funchal	Destroyed	Breeding roost. Reconstruction work covered with cement roost entry.
Tamy 1	<i>P. maderensis</i> <i>Myotis</i> sp	48 1	Funchal	Abandoned	Breeding roost. Disturbance caused by wall painting and lights installation at roost entrance in 2008. Strongly affected by huge forest fire 2010.
Sérgio 2	<i>P. austriacus</i>	8	Funchal	Abandoned	Strongly affected by huge forest fire 2010.
David 1	<i>P. austriacus</i>	40	Santana	Abandoned	Breeding roost. Roost unchanged and friendly owner. Bats stopped roosting in 2005.
David 2	<i>P. maderensis</i>	14	Porto Moniz	In use	Small old structure, with pierced grey bricks. Bats roost inside.
GEBM 1	<i>P. austriacus</i>	aprox 50	Funchal	Destroyed	Reported by inquiry. Reconstruction work carried out in the building. Workers stated that bats fled.
GEBM 2	<i>P. maderensis</i>	n.a.	Santa Cruz	Unknown	Small wall made with grey bricks. Bats roost inside pierced bricks.
Farraia	<i>P. maderensis</i>	30	Santana	In use	Roost inside grey brick wall. Roost unchanged. Owner is bat friendly.
Ana 1	<i>P. maderensis</i>	1	Santana	Destroyed	Found in pierced grey bricks by Ana Rainho during Red Book field work. Brick piercings covered with cement in 2004.
Janela	<i>P. maderensis</i>	n.a.	Porto Moniz	Destroyed	Big roost in grey brick wall inside laurel forest. Large amounts of <i>P. maderensis</i>



					droppings indicate long use. Inquiries to local workers revealed that the roost was destroyed with lighted gasoline cloths placed at roost entrance. Reported that several animals were killed.
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#### 4. Threats

##### **Mainland Portugal**

Major threats occurring in mainland Portugal are:

##### Disturbance

In the last years there has been an increase in the number of people involved in outdoor activities and signs of recent presence of visitors inside caves are frequently found. Disturbance is particularly malefic during hibernation and maternity seasons.

##### Roost destruction

Currently this problem seems to be rare in underground roosts, but there are certainly problems regarding building demolition (including inappropriate timing of works) and woodland management and tree work.

##### Loss of feeding areas

Due to anthropogenic pressures, the habitat composition has greatly changed in many regions of Portugal in the last decades. Most of these changes are due to negatively affect bat species, particularly the threatened ones. Impacts are not yet quantified for most situations, but it is already known the negative impact resulting from the destruction of many kilometres of riparian vegetation, cut and flooded during the construction of numerous large dams all over the country. Similarly, agro-forestry intensification is due to affect many species, namely through the use of dense swards that impede access to food, the degradation of water quality, the destruction of riparian vegetation or the use of alien species for forestry production. The lack of knowledge and the lack of specific bat friendly landscape management measures make feeding habitat loss even a greater threat to bats.

##### Pesticides

Although not yet quantified, the overall use of agricultural chemicals, namely of broad-spectrum pesticides, is known to reduce food abundance to bats, which are also subject to poisoning by these chemicals, through the ingestion of contaminated food and water.

##### Traffic injuries

Since 2009 to 2014, a total of 733 bat casualties of at least 14 species, including *R. mehelyi*, *R. ferrumequinum*, *R. hipposideros*, *P. kuhli*, *P. pipistrellus*, *P. pygmaeus*, *P. austriacus*, *E. serotinus*, *M. daubentonii*, *M. bechsteinii*, *M. escalerae*, *M. schreibersii*, *N. leisleri* and *B. barbastellus* were found roadkills in the South (António Mira, com. pess.; Medinas *et. al.* 2012 (reference under point 12). Results showed that bats are more vulnerable during specific life-history periods, as lactation, mating and migration to

swarming and autumn roosts. Road stretches crossing or in vicinity of high-quality habitats for bats, including dense Mediterranean woodland ("montado") areas, water bodies yielded a significantly higher number of casualties.

Between June and December 2012, a total of 34 bat casualties of at least 6 species (15 *R. ferrumequinum*, 3 *R. hipposideros*, 2 *P. kuhlii*, 6 *P. pipistrellus*, 2 *P. pygmaeus*, 8 *P. auritus/austriacus*) were found dead in roads in the North (NOCTULA com. pess.).

#### Wind-turbines

Since 2001, 870 carcasses of at least 11 species were found (*P. pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *H. savii*, *N. leisleri*, *N. noctula*, *N. lasiopterus*, *T. teniotis*, *M. daubentonii*, *E. isabellinus*, *M. schreibersii*; description under point 15 - Resolutions on Wind Turbines and Bat Populations) but it is not possible to evaluate its impact on populations. *P. pipistrellus* and *N. leisleri* are the most affected species.

### **Azores Archipelago**

Major threats occurring in Azores archipelago include:

#### Geographical isolation

Geographic isolation is one of the major threats, turning bats more susceptible to natural disasters and other threats (namely, disturbance of colonies, changing and destruction of roosts, and destruction of feeding habitats).

#### Pesticides and other pollutants

Although not yet quantified, the overall use of agricultural chemicals, namely of broad-spectrum pesticides, is known to reduce food abundance to bats, which are also subject to poisoning by these chemicals, through the ingestion of contaminated food and water.

#### Poor knowledge

Poor knowledge about biology and ecology of this isolated species raises serious limitations to the establishment of conservation and management measures.

### **Madeira Archipelago**

The main threats to bats in Madeira archipelago are transversal to other European populations. However, considering the frequency of massive forest and suburban fires occurred in 2013, this might have been the main driver of population decrease. Several feeding areas were visited multiple times after the fires. There weren't any contacts with bats. Thus, it seems clear that the fires have affected local populations. The major threats that occur in Madeira archipelago are:

#### Disturbance

Disturbance is still a major factor affecting bat populations in Madeira, especially due to the lack of environmental education initiatives towards the general public, but chiefly to natural

park and forestry rangers who deal frequently with wild species or towards inhabitants of the rural areas, where most known roosts are located. Additionally the increase of outdoor activities practitioners, urban growth are also disturbance factors to consider. The disturbance factors are numerous and hard to control.

#### Roost destruction

Roost destruction is predominantly a result of indirect anthropogenic action such as building rehabilitation or reconstruction. The impacts caused on bat populations by the destruction of roosts could be severely reduced by the regulation of building rehabilitation and destruction and also by the instruction of construction companies and contractors how to deal with bat roosts during construction or rehabilitation work. Alternative roosts should be provided by mutual work between the competent authorities and construction companies.

#### Loss of feeding areas

Similarly to past years, during 2012, several severe forest fires destroyed large areas of woodland and scrubland, affecting deeply the wildlife and also bat feeding areas. The extent of area affected is difficult to ascertain.

As observed during the previous year, the number of untrained and subsistence farmers have increased dramatically in result of unemployment growth. Many feeding areas are located on abandoned farmland. These areas have been reused for farming activities, causing changes in the landscape and habitat composition. Inversely, an increase of organic farming areas results in the increase of suitable feeding areas and the functional connectivity of contiguous biotopes.

#### Pesticides

Although several cases of bat poisoning as a result of agrochemicals use have been recorded in Madeira Island, a positive factor was the recent implementation of strict rules on the use of phytopharmaceuticals by farmers, both in kind and quantity, as well as method of use. This regulation might lead to the decrease of insect secondary poisoning of wild bats by the consumption of intoxicated food sources.

#### Wind-turbines

The implementation of wind-farms continues to increase mainly in the mountainous areas of the central mountain massif. Although the central mountainous area is mostly used by Madeiran leisler's bats, several species have been observed using the central mountains to commute between the island's northern and southern areas. The increase in density of the wind-turbines may, at some extent, affect the bat's commuting paths.

### **5. Data Collection, analysis, interpretation and dissemination**

#### **Mainland Portugal**

Data collection, analysis, interpretation and dissemination are done by "ICNF", Universities

(“Universidade de Lisboa”, “Universidade do Porto”, “Universidade de Trás-os-Montes e Alto Douro”, “Universidade de Aveiro” and “Universidade de Évora”), speleologists (from several Speleologists Associations belonging to “Federação Portuguesa de Espeleologia”, namely “Associação dos Espeleólogos de Sintra”, “Núcleo de Espeleologia da Costa Azul”, “Grupo Protecção Sicó”, “Grupo de Espeleologia e Montanhismo”, “Centro de Estudos e Actividades Especiais”, “Alto Relevo – Clube de Montanhismo”, “Núcleo de Espeleologia de Leiria”, “Espeleo Clube de Torres Vedras”, “Núcleo de Espeleologia de Alcobaça”, “Núcleo de Espeleologia da Associação Académica da Universidade de Aveiro” and “Geonauta”) who are doing roost monitoring, and technicians who are developing roost and habitat local monitoring of projects subjected to environmental impact assessment (particularly wind farms and dams).

There is a database (“SIPNAT: Sistema de Informação do Património Natural”; <http://www.icnf.pt/portal/naturaclas/patrinatur/sipnat>) which includes information on occurrence and characterization of vertebrate species and areas included in Natura 2000 network.

There is a plan (“Plano Sectorial da Rede Natura 2000”; <http://www.icnf.pt/portal/naturaclas/rn2000/plan-set>) which comprehends cartography and conservation and management measures of SCI’s. The plan includes information on natural values included in the annex II of Habitats Directive and data on the species present in the SCI’s (covering species included in annexes II and IV).

The first National Report of Habitats Directive (2001-2006) on the conservation status of the relevant habitat types and species prepared in the framework is available at <http://www.icnf.pt/portal/naturaclas/rn2000/dir-ave-habit/Rel-Nac-Dir-habit>. The second report (2007-2012) is available at <http://www.icnf.pt/portal/naturaclas/rn2000/dir-ave-habit/rel-nac/rel-nac-07-12>.

### ***Azores Archipelago***

Data collection, analysis, interpretation and dissemination are done by “Universidade dos Açores” (the Azores University, in English) under developed projects, including scientific expeditions, in which some studies are conducted to confirm species presence and to extend its distribution knowledge. Data are available for species that occur in Azores archipelago, including their distribution, in the Azorean Biodiversity Portal (<http://www.azoresbioportal.angra.uac.pt/>).

There are Management Plans for the 23 SCI’s (classified as Special Areas of Conservation by the Regulatory Decree No. 5/2009/A, of June 3<sup>rd</sup> 2009; this Decree was revoked by the Regional Legislative Decree No. 15/2012/A, of April 2<sup>nd</sup> 2012, which establishes the legal framework for nature conservation and biodiversity), and the 15 SPA’s classified in Azores archipelago. These plans comprehend SCI’s and SPA’s environmental characteristics, measures to ensure effective management, preservation and conservation of its natural

values.

There is the Sectorial Plan of Natura 2000 Network (“Plano Sectorial da Rede Natura 2000”, published by Regional Legislative Decree No. 20/2006/A, June 6<sup>th</sup> 2006, amended by the Declaration of Rectification No. 48-A/2006, 7<sup>th</sup> August 2006, and by the Regional Legislative Decree N. 7/2007/A, of 10<sup>th</sup> April 2007; <http://www.azores.gov.pt/gra/sram-natureza>), applicable to all SCI’s and SPA’s in order to safeguard natural habitats and wild fauna and flora that occur in Azores archipelago.)

Since March 2012, the Regional Directorate for the Environment started a regional monitoring project “Bat Census of the Azores”, which is an ongoing project. No data report has yet been published.

### ***Madeira Archipelago***

Data collection is now mostly restricted to the “Madeira Island Bat Monitoring Scheme” made by “Madeira Fauna & Flora” Ecotourism Company. Additionally data collection, analysis, interpretation and dissemination has been carried out voluntarily by Sérgio Teixeira. Presently the dissemination is made by Madeira Fauna & Flora through bat watching tours and also by organizing yearly “The International Bat Night”.

All collected bat records were inserted in the Madeira Biodiversity database BIOBASE, under the responsibility of Direcção Regional das Florestas (Regional Forestry Directorate). The management and update of BIOBASE is being carried out by Madeira Fauna & Flora. This company has programmed educational bat watching nights for families and schools and as acquired equipment such as videoscopes to prospect roosts and hence increase the knowledge about roost selection on the archipelago. Yearly, Madeira Fauna & Flora biologists will attempt to gather data to compile and submit a report to European bat conservation organizations and local authorities, including to local EUROBATS focal point. Data collected by several volunteers in 2013 is now being analysed by Madeira Fauna & Flora.

## **C. Measures Taken to Implement Article III of the Agreement**

### ***6. Legal measures taken to protect bats, including enforcement actions***

Portuguese law protects all bat species since 1967. They are also covered by international legislation that was transferred to national legislation, such as Bern Convention, Bonn Convention, and Habitats Directive.

### ***Mainland Portugal***

A few incidents involving bats were reported to the police.

### ***Azores Archipelago***

National legislation is applied.

The Regional legal framework of nature conservation and biodiversity was published by the Regional Legislative Decree No. 15/2012/A, of April 2<sup>nd</sup>. This document transposes the Birds and Habitats Directives and various International Conventions and Regulations to regional law. In addition to transpose the mentioned Directives, this Decree is the key instrument for the conservation of nature and is the main vehicle for the implementation of the Biodiversity targets for 2020, as it seeks to contribute towards ensuring biodiversity through the conservation or restoration of natural and wild flora and fauna habitats to a favourable state of conservation, protection, management and control of wild species, as well as regulation of their exploitation, taking into account the ecological, economic, social, cultural and scientific requirements as well as local and regional circumstances.

### ***Madeira Archipelago***

At Regional level, there isn't any specific legislation to protect bats and their roosts. Additionally, the fact that the small and highly fragmented bat populations of Macaronesian archipelagos weren't listed in the Habitats Directive Annex I, has been deleterious to their conservation, especially in Madeira archipelago, where the only two Islands inhabited, provide ecological conditions to bats to survive, chiefly the presence of water.

During the last year, no specific measures have been introduced.

## ***7. Sites identified and protected which are important to the conservation of bats***

### ***Mainland Portugal***

The survey of the underground roosts is already quite complete, and many overground roosts were discovered during the field work done for the preparation of the Atlas of Portuguese bats (mainland).

Around half of the identified important roosts are included in the current list of Portuguese SCI's.

The list of important underground roosts was sent in to the relevant IWG and were included in the "List of Internationally Important Underground Sites for bats in Europe" published by EUROBATS; the information was updated in 2014.

### ***Azores Archipelago***

The Regional Network of Protected Areas of the Azores was reformulated according to the IUCN criteria, leading to the creation of 9 Natural Island Parks and 1 Azores Marine Park by the Regional Legislative Decree No. 15/2007/A, of 25<sup>th</sup> June 2007. This Decree was

revoked by the Regional Legislative Decree No. 15/2012/A, of April 2nd 2012, which establishes the legal framework for nature conservation and biodiversity.

This law maintains the same spirit and legislative context. The network of protected areas embodies the classification adopted by the International Union for Conservation of Nature (IUCN) and aims the protection and maintenance of biological diversity and integrity of the geological values and natural and cultural resources and values associated with them. It addresses the fundamental nature conservation network, which consists of a group of areas oriented for the conservation of the most representative components of the natural heritage and biodiversity, and aims to promote an integrated and comprehensive view of heritage and natural resources and the values subject by law or international commitment to the special legal status of protection and management, without leading to an additional supplement to the existing regime. It integrates the Natura 2000 network areas, the protected areas or regional significance, the ecological reserve and the regional agricultural reserve. With this regime the Regional Protected Areas Network integrates three types of management units: Island Natural Park (PNI); Azores Marine Park (PMA) and protected areas of local importance.

The 9 Natural Island Parks are the basic management unit of the Regional Network of Protected Areas in Azores archipelago, involving all the local management services of the protected areas at the island level. This structure allows territory management for the conservation of biological and geological diversity as well to the sustainable use of natural resources (<http://www.azores.gov.pt/Gra/sram-natureza/menus/secundario/Áreas+Protegidas/> and <http://parquesnaturais.azores.gov.pt/>).

The 9 Natural Island Parks include all the most important terrestrial habitats, from coastal to mountain areas, comprising many of the different habitats that are essential to bats.

### ***Madeira Archipelago***

Although several important feeding areas or roosts were identified in Madeira Island outside protected areas boundaries none is protected. In the management plans of Madeira's Natura 2000 SCI's, there isn't any reference to bat populations, roosts or feeding areas present within the area. Although the large extent of Madeira Natural Park and Natura 2000 sites might provide some degree of protection, the lack of monitoring and the deleterious effects of forest fires in these areas, decrease the available areas that should be protected. There isn't any active policy about the identification and protection of bat important areas.

## **8. Consideration given to habitats which are important to bats**

### **Mainland Portugal**

In Mainland Portugal the landscape is not managed specifically to protect bat-feeding habitats. However, since many of the main important known roosts are inside SCI's, some planning/management and regulatory rules protect directly or indirectly feeding habitats (as well as roosts). Under the implementation of environmental impact assessment regulation there is also compensation and minimization measures, as well as monitoring, specifically for bats feeding habitats (and also roosts).

### **Azores Archipelago**

In Azores the landscape is not managed specifically to protect bat-feeding habitats. However, Natural Island Parks are equipped with management and action tools for conservation of the most representative components of the natural heritage and biodiversity, and occupy a significant proportion of the land territory (around 24%), including various habitats that are essential for bat species.

The control of alien invasive flora species in sensitive areas with natural vegetation and its restoration are measures that directly and indirectly influence the availability of habitats to bats. In this context, we stress the *Regional Plan for Eradication and Control of Invasive flora species in sensitive areas – PRECEFIAS*, approved by the Resolution 110/2004 of July 29<sup>th</sup>, as well as the LIFE Project “Laurissilva Sustentável”.

### **Madeira Archipelago**

As verified on previous years, no specific consideration is made towards important bat habitats and there aren't any management measures on the move. Although some research work has been carried out to ascertain which habitats are important to Madeira bat populations, no specific management measures are made to preserve important feeding areas or habitats. Although about 60% of the total Island area is protected, most roosts and main known feeding areas are located in rural or sparsely urbanized areas. Nevertheless, considering the orography of the island and area covered by protected habitats such as macaronesian heathlands and laurel forests, the regulatory rules that manage these areas, provide protection indirectly to feeding habitats and roosts. Equally to mainland territory, monitoring, compensation and minimization measures are compulsory under the implementation of environmental impact assessment regulation, specifically for areas that constitute feeding habitats and hold roosts. However, regarding the scenario in the last years, the companies responsible for monitoring and compensation programmes should be enforced to submit to local EUROBATS focal point, a detailed report with all data related to the monitoring of bats in the environmental impact assessment.



## **9. Activities carried out to promote the awareness of the importance of the conservation of bats**

### **Mainland Portugal**

#### Bat Night and activities to public

**14<sup>th</sup> Bat Night (2010)** was celebrated in five occasions: in Coimbra on 12 June by “Museu da Ciência da Universidade de Coimbra”, in Pombal on 17 July by “Grupo Protecção Sicó”, in Redinha on 28 August by “Grupo Protecção Sicó”, in Porto on 28 August by “Museu de História Natural da Faculdade de Ciências da Universidade do Porto”, and in Alte on 29 August by “Almargem”. Events were conducted by Pedro Casaleiro, Hugo Rebelo, Luísa Rodrigues, Luzia Sousa, Pedro Alves and Tiago Marques; more than 800 participants (general public and speleologists) took part in several activities (talks, games, scientific demonstrations, adornment construction, and walks with bat detectors after dusk).

During 2010, Luzia Sousa from “Museu de História Natural da Faculdade de Ciências da Universidade do Porto” organized one family session (80 participants), seven sessions for general public (148 participants) and one activity for children (40 participants). Some sessions were organized with other entities (“Câmara Municipal do Porto”, “Centro de Educação Ambiental dos Jardins do Palácio de Cristal” and “Biblioteca Pública Almeida Garrett”). Luísa Rodrigues from “ICNB” presented two environmental education lectures to general public (150 participants) and gave two talks about bat conservation in schools (100 participants). “Almargem” (with the collaboration of Tiago Marques) organized one talk and a walk with bat detectors after dusk (15 participants).

**15<sup>th</sup> Bat Night (2011)** was celebrated during 2011 in several occasions: in Porto on 7-8 May by “Fundação Serralves”, in Braga on 20 May by “Grupo de peticionários pela salvaguarda das Sete Fontes”, in Alcanena on 21 and 22 May, 2, 3, 9, 10, 16, 17, 23, 24, 30 and 31 July, 6, 7, 13, 14, 20, 21, 27 and 28 August by “Carsoscópio”, in Aveiro on 21 June by FAPAS (with collaboration of “ICNB”, “Câmara Municipal Aveiro”, “Junta Freguesia S. Jacinto” and “Museu História Natural Faculdade Ciências Universidade Porto”), in Montemor-o-Novo on 22 June by “Câmara Municipal Montemor-o-Novo”, in Santarém on 7 July by “Câmara Municipal Santarém” and “Plecotus”, in Ermesinde on 29 July by “LIPOR” and “CIBIO – Universidade Porto”, in Mafra on 19 and 20 August by “Federação Portuguesa Espeleologia”, “Associação Espeleólogos Sintra”, “Grupo Espeleologia Montanhismo”, “Tapada Nacional Mafra” and “Palácio Nacional Mafra”, in Sintra on 21 August, 18 September and 1 October by “Federação Portuguesa Espeleologia”, “Associação Espeleólogos Sintra”, “Grupo Espeleologia Montanhismo” and “Fundação CulturSintra”, in Pombal on 20 August by “Grupo Protecção Sicó” and “Câmara Municipal Pombal”, in Faro on 26 August by “Almargem”, “Centro de Ciência Viva do Algarve” and

“Câmara Municipal Faro”, in Penela on 27 August by “GoOutdoor”, “Plecotus” and “Câmara Municipal Penela”, in Alcobaça on 27 August by “A Rocha”, “Plecotus” and “Câmara Municipal Alcobaça”, in Gondomar on 10 September by “LIPOR”, “CIBIO - Universidade Porto” and “FAPAS”, in Caldas da Rainha on 17 September by “Grupo Protecção Sicó”, and in Vaqueiros – Santarém on 6 October by “Câmara Municipal de Santarém”, “Junta de Freguesia de Vaqueiros” and “Plecotus”. These events were conducted by Bruno Silva, Francisco Amorim, Gabriel Mendes, Helena Santos, Hugo Rebelo, Maria João Silva, Lucília Guedes, Luzia Sousa, Pedro Alves, Sílvia Barreiro, Tiago Marques, Virgínia Duro; more than 1500 participants took part in several activities (talks, games, and walks with bat detectors after dusk).

Other activities done in 2011 are presented under “Year of the Bat and other activities”.

**16<sup>th</sup> Bat Night (2012)** was celebrated together with the second year of the “Year of the Bat” campaign, and are presented under “Year of the Bat and other activities”.

**17<sup>th</sup> Bat Night (2013)** was celebrated in 26 October 2013. 120 persons participated in walks with bat detectors after dusk with Hugo Rebelo, Pedro Alves, Bárbara Monteiro and Gabriel Mendes (organized by CIR-Centro de Investigação da Regaleira CiBio, AES and Plecotus). Most activities done in 2013 were linked to the “Year of the Bat campaign” and are presented under “Year of the Bat and other activities”.

In the framework of “Academia de Verão” (Summer Academy) in 2013, an initiative of the University of Aveiro that enables schoolchildren (10-18 years) to participate in several academy programs including the development of scientific activities, an activity for the dissemination and awareness of bat conservation was carried out. This activity promoted by the Biology and Electronics departments, included: an outdoor lecture, bat observation through a thermal camera, and walks with bat detectors within the University campus. The activity was conducted by Maria João Ramos Pereira, José Vieira, Carlos Faneca, Filipa Peste and Ricardo Correia and attended by 75 participants.

During 2014, some activities were organized (Table 5).

*Table 5 – Events organized in 2014.*

Date	Local	Participants	Monitor	Organization	Support
4 Apr 14	Mata Nacional do Buçaco	91	M Matos	Fund. Mata do Bussaco	Univ. Aveiro
12 Apr 14	Alviela	26	MJ Silva	CCV Alviela	ICNF
12 Apr 14	Estarreja	40	E Mendes	ObservaRia (CM Estarreja)	ICNF, Univ. Aveiro
13 Apr 14	Soure	20	JM Oliveira	ADPCNS	
23 Apr 14	Alviela	20	MJ Silva	CCV Alviela	ICNF
26 Apr 14	Alviela	28	MJ Silva	CCV Alviela	ICNF

### Year of the Bat and other activities

The Portuguese “Year of the Bat” campaign was launched in March 2012 by the Secretary of State of Environment.

To support the campaign, “ICNB” prepared a very informative website (<http://www.wix.com/anodomorcego/icnb>), which includes general information on Portuguese bats, many activities for children, histories, many activities for teachers including three *PowerPoint* presentations with support texts for different ages, divulgation of events, information on bats and forests (including a Portuguese version of the EUROBATS forestry leaflet), divulgation materials (including Portuguese versions of EUROBATS YOB resources), scientific and technical reports, information on the Atlas of Portuguese bats (mainland), a FAQ section, and the possibility for asking questions. In February 2013 the website was already visited by more than 17402 persons and dozens of questions were answered. The website was regularly updated.

Regular bulletins (with news, summaries of some activities and announcement of events) were prepared ([http://anodomorcego.wix.com/icnb/noticias-eventos#!\\_\\_docs/newsletter](http://anodomorcego.wix.com/icnb/noticias-eventos#!__docs/newsletter)).

A facebook profile was created (“Morcegos de Portugal”). This profile proved a fundamental tool to publicise the events that were organised during the campaign 2011-2012 Year of the Bat. A large number of people from distinct parts of the country follow the publications on this profile, making it also a useful vector for educational and scientific contents about bats. The feedback on the posts is overall very positive, and the sharing rate is high, increasing this way the number of people we are reaching through this social network. The profile was closed by the end of the campaign.

During 2011 more than 30 persons and entities organized many dozens of activities, attended by more than 2500 participants (Figure 1). Activities included talks in schools and Universities, ateliers in schools, talks for general public, talks in National Conferences, walks with bat detectors, exhibitions, workshops on morphological and acoustic identification of bats, and divulgation papers in magazines and newspapers (Ana Alves, Ana Rainho, Bruno Silva, Bruno Simões, Carmen Silva, Cristina Vieira, Francisco Amorim, Frederico Oliveira, Fundação Mata do Buçaco, Gabriel Mendes, Helena Santos, Henrique Alves, Henrique Pereira, Hugo Rebelo, Joaquim Reis, Jorge Palmeirim, Luísa Rodrigues, Luis Roma, Luzia Sousa, Manuela Marcelino, Maria João Ramos Pereira, Maria João Silva, Mário Carmo, Milene Matos, Paulo Barros, Pedro Alves, Pedro Rocha, Rosário Pinheiro, Sílvia Barreiro, Tiago Marques, Verónica Paiva). These activities were supported by several entities, including associations (“ACAPO” - an association that supports blind people), schools or similars (“Agrupamento Escolas Alcanena”, “ATL Quinta Fonteira”, “ATL Satisfaz Bastante”, “Colégio dos Plátanos”, “Escola EB/JI Ericeira”, “EB1/JI nº1 Serra

Minas”, “EB1-2 Alto Moinhos”, “EB 2.3 Baguim do Monte”, “EB 2.3 Galiza”, “EB 2.3 Paranhos”, “Escola Matilde Rosa Araújo”, “Escola S. Marcos”, “Escolinha Tia Ló”, “ES Gama Barros”, “ES José Saramago”, “ES Escola Secundária Rocha Peixoto”, “JI Pedro de Santarém”), environmental NGO and infrastructures managed by it (“Amigos do Caster”, “Associação de Espeleólogos de Sintra”, “CEAI”, “CERVAS-Ass Aldeia”, “CN de Escutas”, “FAPAS”, “LPN”, “Quercus”, “RIAS”), municipalities (“Câmara Municipal Lisboa”, “Câmara Municipal Montemor-o-Novo”, “Câmara Municipal Ourém”, “Câmara Municipal Porto”, “Câmara Municipal Póvoa Varzim”, “Câmara Municipal Redondo”, “Câmara Municipal de Santarém”, “Câmara Municipal Seia” and “CISE”, “Câmara Municipal Vimioso”, “Junta de Freguesia de Vaqueiros”), infrastructures and projects that promote scientific culture (“Carsoscópio”, “Centro Ciência Viva de Bragança”, “Centro Ciência Viva de Lagos”, “Ciência Viva no verão”), universities including museums managed by it (“CBA-Universidade Lisboa”, “CESAM-Universidade Aveiro”, “CIBIO-Universidade Porto”, “Universidade Trás-os-Montes Alto Douro”, “Museu de História Natural da Faculdade de Ciências da Universidade do Porto”), National authority for nature conservation (“ICNB”) and protected areas managed by it (“Parque Natural do Alvão”, “Parque Natural da Ria Formosa”, “Parque Natural das Serras de Aire e Candeeiros”, “Parque Natural de Sintra-Cascais”, “Parque Natural do Vale do Guadiana”), zoos and similars (“Monte Selvagem”, “Parque Biológico de Gaia”), companies (“Natuga”, “Go-Outdoor”, “Plecotus”), other governmental bodies (“Secretaria de Estado do Ambiente”, “Direção Regional de Cultura do Norte”), and “Mosteiro de Tibães”, “CulturSintra”, “Ermidas”, “NEPA”, “Parques de Sintra - Monte da Lua”, “Poça, Pocinha, Poceirão”, “Quinta da Escola”, “Quinta Pero Vicente”, “Federação Portuguesa Espeleologia”, “Fundação A LORD”, “Grupo Espeleologia Montanhismo”, “CICA-GM”.

During 2012 and 2013 more than 40 persons and entities organized many dozens of activities, attended by more than 12000 participants (Table 6 and Figure 2). Activities included talks in schools and Universities, ateliers in schools, talks for general public, talks in National Conferences, walks with bat detectors, exhibitions, workshops on morphological and acoustic identification of bats, visit to Museum’s bat collection’s, and divulgation papers in magazines and newspapers.

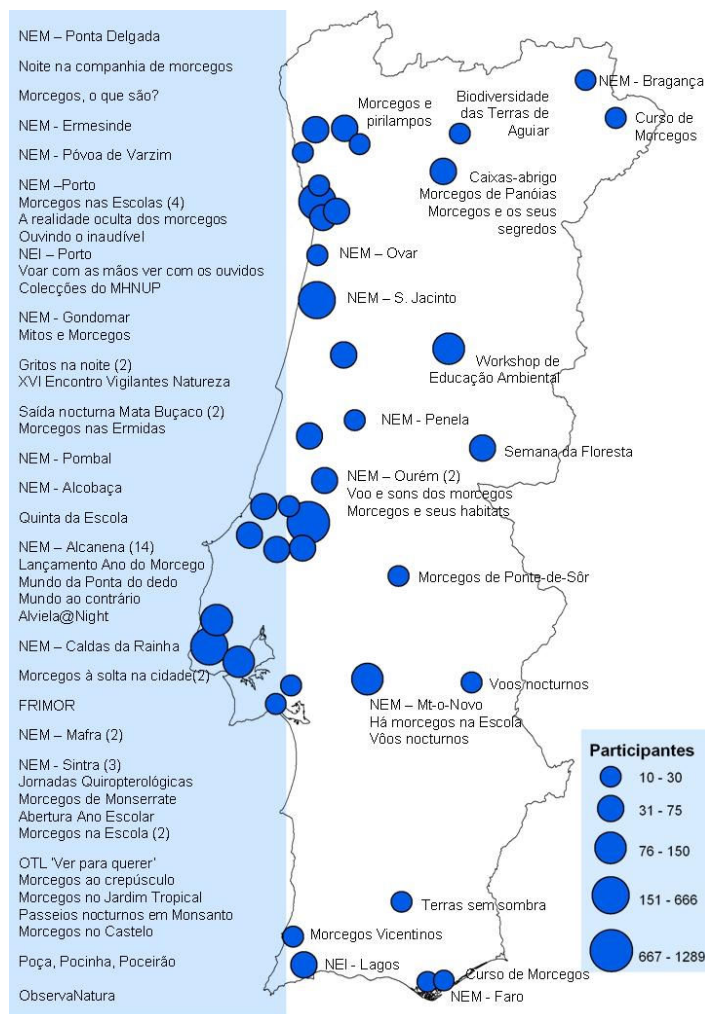


Figure 1 – Events organized in 2011 (map prepared by Ana Rainho).

Table 6 – Events organized in 2012 and 2013.

Date	Local	Participants	Monitor	Organization	Support
Nov 11-Mar 12	Vila Real	834	H Pereira A Rosa	PNAI-ICNF	
Jan-Jun 12	Sabugal	100	L Saloio	RNSM, ICNF	
Jan-Jun 12	Bragança	100	C Régua	PNM, ICNF	
25 Feb 12	Vila de Rei	80	S Barreiro B Silva	Plecotus	
Feb 12	Pernes	20	S Barreiro B Silva	Esc E.B.2/3 D Manuel I, Eco-Escolas, Plecotus	
6 Mar 12	Aveiro	25	M Matos	Esc Sec Mário Sacramento	
16 Mar 12	Alcácer do Sal	50	T Marques	EB Bernardim Ribeiro, Eco- Escolas	
19 Mar 12	Vila Real	100	C Silva	Esc. Sec./3 Camilo Castelo Branco e LEA/UTAD	
24 Mar 12	Porto	10	L Sousa	UP Porto	
31 Mar 12	Bragança	20		CCV Bragança	
29 Mar 12	Almada	30	P Miguel	CM Almada, ICNF	
Mar-Apr, Sep 12	Porto	4298	L Sousa	MHNUP	
Mar-Oct 12	several	275	L Sousa	Several	
Mar-Dec 12	Buçaco	100	M Matos	MN Buçaco	
22 Apr 12	Leiria	150	A Rainho, F Amorim	FAPAS, ICNF, CIBIO	CM Leiria

Apr-May 12	Lisboa	150	Several	ICNF	
Apr-Sep 12	Mondim de Basto	660	M Anjos	PNAI-ICNF	
1 May 12	Lagos	20	M Carmo	A Rocha	
2 May 12	Ovar	210	M Carmo	Agrupamento Escolas Ovar	
4 May 12	Paranhos	70	L Sousa	EB2,3 Paranhos	
5 May 12	Porto	10	L Sousa	Aneis do Porto	
6 May 12	Alcochete	50		CM Alcochete	
15 May 12	Amadora	20	M Carmo	Jl Venteira	
19 May 12	Porto	250		Serralves	
25 May 12	Vila Franca do Lima	40	F Hintze, V Duro	CMIA Viana do Castelo, SPVS	
25 May 12	Sintra	20	G Mendes	AES, Fund. CulturSintra	
25 May 12	Guia	20	P Alves	GPS, Clube Ambiente / Agrupamento Escolas Guia	Plecotus
25 May 12	Baguim do Monte	20	L Sousa	EB2,3 Baguim do Monte	
May 12	Almada	100	P Miguel	CI Mata dos Medos, ICNF	
May-Jun 12	Mondim de Basto	100	H Pereira	PNAI, ICNF	
May-Jul 12	Feijó	100	P Miguel	PPAFCC, CM Almada	
1 Jun 12	Buçaco	30	M Matos	Fund. Mata do Bussaco	
2 Jun 12	Vale Gonçalves	20	M Carmo	LPN	
5 Jun 12	Caminha	60	L Sousa	Escola Sidónio Pais	
9 Jun 12	Vila Real	50	P Barros	ACANUC, Paulo Barros	LEA
20 Jun 12	Sintra	150	G Mendes	Colégio Vasco da Gama	
29 Jun 12	Portel	30	M Carmo	CM Portel, ADA, Cremilde	
29 Jun 12	Lisboa	15	M Matos	Universidade de Lisboa	
30 Jun 12	Porto	15	L Sousa	Ciência 2.0, UP	
Jun-Sep 12	Alviela	210	MJ Silva	CCV Alviela, CV no Verão	ICNF
6 Jul 12	Arrouquela	30	S Barreiro	Associação H2O	Plecotus
8 Jul 12	Ovar	8	N Pinto	SPVS, Otília Tavares, Associação Amigos do Cáster	
13 Jul 12	Tibães	30		Quercus	
14 Jul 12	Duas Igrejas	30	F Amorim	Aldeia	
15 Jul 12	Buçaco	10	M Matos	Fund. Mata do Bussaco	
18 Jul 12	Lisboa	40	G Mendes	Centro Educativo Navarro Paiva	
21 Jul 12	Costa Caparica	20	M Carmo	Grupo Flamingo	ICNF, CIBIO
21 Jul 12	Coimbra	30	M Matos	Museu Ciência Univ Coimbra	
27 Jul 12	Buçaco	25	M Matos	Fund. Mata do Bussaco	
28 Jul 12	Lousal	100	M Carmo	CCV Lousal	
30 Jul 12	Vila do Conde	25	L Sousa	CMIA Vila do Conde	
Jul-Sep 12	Lisboa	100	MJ Pereira	Natuga, Ass. Amigos do Castelo	
Jul-Sep 12	Porto	300	H Santos	FAPAS, CV no verão	
4 Aug 12	Tomar	30	MJ Pereira	Quercus	SEC/DGPC /Conv. Cristo
4 Aug 12	Montejunto	30	P Alves S Barreiro	Plecotus, CM Cadaval	GPS
4 Aug 12	Lousal	100	M Carmo	CCV Lousal	
18 Aug 12	Lousal	25	S Barreiro B Silva	CCV Lousal	Plecotus
18-19 Aug 12	Palhais	25	M Carmo	CM Barreiro	
25 Aug 12	Redinha	50	P Alves	GPS	Plecotus, CM Pombal
25 Aug 12	Arouca	18	C Silva	Associação Geopark de Arouca, LEA/UTAD	
Aug 12	Lagos	300		Zoo de Lagos	
Aug 12	Porto	300		FAPAS, CV verão	
Aug 12	Alviela	100	MJ Silva	CCV Alviela	ICNF
Aug-Sep 12	Porto	100		CIBIO, CV no verão	
1 Sep 12	Portimão	20		CM Portimão	
1 Sep 12	Loulé	20	M Carmo	Almargem	
2 Sep 12	Buçaco	5	M Matos	Fund. Mata do Bussaco	

2 Sep 12	Macedo de Cavaleiros	20	SB Ribeiro	PPAA, CV no verão	
8 Sep 12	Cascais	10	M Carmo	CM Cascais, CIAPS	
14 Sep 12	Ovar	12	N Pinto	SPVS, Otilia Tavares, Associação Amigos do Cáster	
14 Sep 12	Ermesinde	20		Lipor de Baguim do Monte	
20 Sep 12	Braga	15	F Hintze, V Duro	Minho University, SPVS	
4 Oct 12	S Brás Alportel	180	M Carmo	CM S Brás Alportel	
4 Oct 12	Viso	65	L Sousa	EB2,3 Viso	
5-6 Oct 12	Candal	15	M Matos	Living Place, Trilhos de Xisto, Casa Cimeira	
6 Oct 12	Lagos	20	M Carmo	Zoo de Lagos	
12 Oct 12	Panóias	22	C Silva	DRCN, LEA/UTAD, PNAI	
14 Oct 12	Serpa	8	M Carmo	Agrupamento Escolas Serpa	
18 Oct 12	Montijo	20		Casa do Ambiente, Montijo	
31 Oct 12	Aveiro	12	N Pinto	Jael Palhas, SPVS	
Oct 12	Penamacor	70		RNSM, ICNF	
Oct-Dec 12	Vila Real	432	H Pereira A Rosa	CII PN Alvão, ICNF	
Oct-Dec 12	Lisboa	30	B Pinto	MNHN, GEM, ICNF	
1 Nov 12	Fátima	50		Grutas da Moeda	
10 Nov 12	Ajuda	20	M Carmo	ISA	
11 Nov 12	Freixo do Meio	20	M Carmo	Herdade do Freixo do Meio	
15 Nov 12	Sintra	50	G Mendes L Rodrigues	CM Sintra, PNSC	
19 Nov 12	Braga	20	F Hintze, V Duro	Colégio João Paulo II	
20 Nov 12	Braga	22	N Garrido, V Duro	Colégio João Paulo II	
23 Nov 12	Condeixa-a-Nova	130	N Pinto	SPVS, Sónia Cotrim, EB nº1 Condeixa-a-Nova	
Nov-Dec 12	Sintra	50	M Marcelino	PNSC, CMS, ICNF	
21 Feb 13	Matosinhos	20	M Matos	Centro de Monitorização e Interpretação Ambiental de Matosinhos	
23 Feb 13	Tibães	6		SPVS	
11-12 May 13	Porto		H Rebelo, HSantos	Serralves	
18 May 13	Porto	30	L Sousa	Dia Internacional dos Museus/ MHNUP	
22 May 13	S. Brás de Alportel	20	Mário Carmo	Câmara Municipal de S. Brás de Alportel	
15 Jun 13	Porto	35	L Sousa	ANEIS/CMP	MHNUP
22 Jun 13	Sintra	70	G.Mendes	CIR-Centro de Investigação da Regaleira	Casa do Fauno
20 July 13	Lousal	15	Mário Carmo	Centro Ciência Viva do Lousal	
26 Jul 13	Mata Nacional do Buçaco	30	M Matos	Fund. Mata do Bussaco e Univ. Aveiro	
27 July 13	Lousal	15	Mário Carmo	Centro Ciência Viva do Lousal	
28 July 13	Lagos	30	Mário Carmo	Zoo de Lagos	
30 Jul 13	Mata Nacional do Buçaco	27	M Matos	Fund. Mata do Bussaco e Univ. Aveiro	
3 Aug 13	Barreiro	25	Mário Carmo	Câmara Municipal do Barreiro	
4 Aug 13	Lagos	25	Mário Carmo	Centro Ciência Viva de Lagos	
17 Aug 13	Pombal	40	P Alves	GPS	Plecotus, CM Pombal

23 Aug 13	Porto	43	L Sousa	Centro de Educação Ambiental da Quinta do Covelo - CMP/MHNUP	
25 Aug 13	Lagos	25	Mário Carmo	Centro Ciência Viva de Lagos	
31 Aug 13	Caldas da Rainha	50	P Alves	GPS	Plecotus, Museu do Hospital e das Caldas, Aroma do Campo
6 Sep 13	Porto	30	L Sousa	Biblioteca Pública Municipal - CMP	MHNUP
7 Sept 13	Castro Verde	25	Mário Carmo	LPN (inserido no CCViva)	
20 Sep 13	Mealhada	12	M Matos	Living Place	
25 Sep 13	Porto	37	L Sousa	Noite dos Investigadores	MHNUP
6 Oct 13	Porto			Serralves	
27 Oct 13	Sintra	40	G Mendes	CIR-Centro de Investigação da Regaleira	AES
26 Oct 13	Porto	45	L Sousa	Reitoria da UP	MHNUP
31 Oct 13	Aveiro	15	N Pinto	Ana Jervis Cunha, Bernardo Conde - Quinta Ecológica da Moita	Santa Casa da Misericórdia de Aveiro, ASPEA, SPVS
1 Nov 13	Porto	15	L Sousa	Jael Palhas - Universidade do Porto	MHNUP

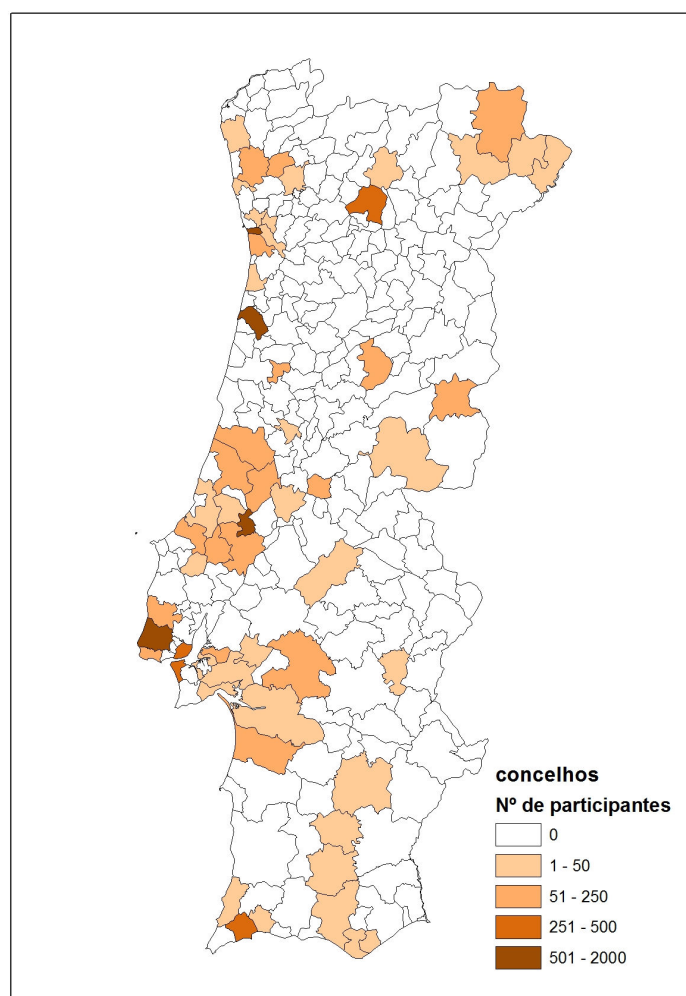


Figure 2 – Events organized per county in 2012 (map prepared by Ana Rainho).

Many schools studied bats and organized activities, such as talks, contests and exhibitions



(examples in [http://www.wix.com/anodomorcego/icnb/morcega-te#!\\_\\_morcega-te/escola11](http://www.wix.com/anodomorcego/icnb/morcega-te#!__morcega-te/escola11) and [http://anodomorcego.wix.com/icnb/noticias-eventos#!\\_\\_morcega-te/escola12](http://anodomorcego.wix.com/icnb/noticias-eventos#!__morcega-te/escola12)).

“ICNB” published an agenda for 2011 dedicated to the Year of Bat. It included texts regarding general information (importance, threats, and conservation measures) and brief descriptions about all species known in mainland.

The Alviela Ciência Viva Center (“Carsoscópio”) published an agenda in 2012 dedicated to The Year of the Bat. This project was a result of a partnership between “Carsoscópio” and the local Alcanena Elementary and Kindergarten Schools, with the main purpose of creating an illustrated agenda, which counted with the contribution of 767 pre-schoolers and elementary school students. The agenda was launched in January 2012 and includes photos, drawings, stories and various notes on the 12 species of bats that inhabit the Alviela caves.

Four big exhibitions with materials prepared by schools were organized (PN Alvão, PN Sintra-Cascais, PPAF Costa da Caparica and RN Serra Malcata).

“Almargem” published the leaflet “Morcegos do Algarve” ([http://media.wix.com/ugd/579fed\\_93f57e633580f1a48df59b861ded96ef.pdf?dn=MorcegosPublic.pdf](http://media.wix.com/ugd/579fed_93f57e633580f1a48df59b861ded96ef.pdf?dn=MorcegosPublic.pdf)).

“ICNB - Parque Natural Sintra-Cascais” produced the poster “Os morcegos do PNSC” ([http://media.wix.com/ugd/579fed\\_f7f8e287ab39f27a596979db8e3568e4.pdf?dn=morcegosPNSC\\_2011\\_cartaz.pdf](http://media.wix.com/ugd/579fed_f7f8e287ab39f27a596979db8e3568e4.pdf?dn=morcegosPNSC_2011_cartaz.pdf)).

One book for children was published (Dias & Matos; reference under point 12). This book was born from the idea of presenting the Forest of Bussaco to children of preschool and basic education levels of education, within the scope of environmental education and co-responsabilization for the protection and sustainable use of natural resources. It combines aspects of the imaginary with real historical facts and identifies species of flora and fauna considered of high conservation value.

A flyer regarding fauna of Mata Nacional do Buçaco was published (<http://www.fmb.pt/bright/images/galeria/ff.pdf>) within the Life + BRIGHT Project. This flyer indicates the most valuable species of the fauna of Bussaco Forest, in terms of conservation.

A private company, Natuga, led by biologists, offers touristic walks with bat detectors in a partnership with the São Jorge Castle in Lisboa. In 2011, 2012, and 2013 walks were done every Saturday throughout the summer (June-September) with an average number of participants of 15, and totalling around 700 participants in the three years. Additionally, in 2011 Natuga made a partnership with Parques Sintra- Monte da Lua for similar touristic walks. In only three occasions (June, July and August) there were almost 100 participants. Natuga was also present at ObservaNatura, a fair dedicated to birdwatching and ecotourism where it promoted a similar walk for the visitants of the fair in October 2011.

Six courses on morphological and acoustic identification for the general public were organized by Mário Carmo in 2011, 2012 and 2013 (in total, around 90 participants).

Workshops on morphological identification for speleologists were organized by Gabriel Mendes in 2011, 2012, 2013 and 2014 (in total, 200 participants).

In January 2011, the event “I Jornadas Quiropterianas” was organized by “Fundação Curtursintra/Quinta da Regaleira”, “Federação Portuguesa de Espeleologia”, “Associação dos Espeleólogos de Sintra” and “Grupo de Espeleologia e Montanhismo”. The event was dedicated to monitoring and included several talks and discussions, and it was attended by around 50 participants.

In October 2013, the event “II Jornadas Quiropterianas” was organized by “Centro de Investigação da Regaleira – CIR”. The event included the presentation of several academic and public awareness works, mostly by MSc and PhD students, and it was attended by more than 100 participants; it was also available online.

The Municipality of Sintra and the Sintra-Cascais Natural Park promoted an illustration contest about bats ' Bring bats to daylight", directed to all the schools in the municipality. Twenty schools participated with a total of 105 illustrations. The exhibition was held in Vila Alda, in Sintra.

The *photographic exhibition “Portuguese Bats”* was presented in the National Museum of Natural History and Science (Lisbon) between 29 October 2012 and 31 March 2013. It’s main goals were to show part of the Portuguese bat diversity, as well as some of the methods used to study them. The exhibition included some photos of bats in flight made by two professional photographers that graciously contributed with photos, and other images about research methods that were done by amateur photographers during fieldwork in Portugal. The target audience of the exhibition were teenagers and families, which are the usual visitors of the museum.

The University of Évora, in association with the Municipality of Évora, with the Faculty of Science of the University of Lisbon, with the Biodiversity chair at the University of Évora and the Portuguese National Museum of Natural History, organized the *exhibition “Bats of Portugal (mainland and islands)”* illustrated by Lúcia Antunes. The opening was on the 28th of February, at 6 pm, at Évora’s Dom Manuel Palace and the exhibition will be open to the public until March 31. This exhibit aims to present the 27 bat species found in the Portuguese territory through scientific illustrations that will compose the book A Guide to Bats of Portugal (mainland and islands) - Morphology and ethology of the Chiroptera in National Territory. These illustrations, joining scientifically accurate information with aesthetically appealing drawings, are an accessible and more captivating means of transmitting knowledge seeking to create greater empathy with the bats. It is the aim of the exhibition to not only create a greater familiarization with this group of mammals but also to reveal their environmental importance and role as indicators of biodiversity. In doing so, it will hopefully contribute to the reversion of the endangered status in which nine of the

twenty-seven species present in Portugal are presently. In addition to the exhibition's catalogue launch, the opening ceremony included a series of lectures on topics relevant to the subject of bats. The exhibition was later shown at the Portuguese Association for the Environment from May 23 to June 14 2013, in Lisbon's National Costume Museum from May 31 to October 25 2013, and at Quinta da Regaleira from October 26 to December 1 2013 (with the support of the "Fundação CulturSintra" and the "Centro de Investigação da Regaleira - (CIR)").

Two documentaries about bats were produced by Universidade Aberta in collaboration with "ICNF" (<http://www.adrive.com/public/Zcd72T/UnivAberta1.mpg> and <http://www.adrive.com/public/nAQqkK/UnivAberta2.mpg>).

A big exhibition to celebrate the closure of the campaign was organized in Lisbon's National Costume Museum by "ICNF", supported by "Câmara Municipal de Lisboa". The exhibition included many materials prepared by schools, didactic materials of the former exhibition of "Carsoscópio", some illustrations of the exhibition "Bats of Portugal (mainland and islands)", documentaries, games, and the recreation of a cave. The exhibition was inaugurated in May 2013 by a representative of the Secretary of State of Forests and Rural Development and by Andreas Streit. The exhibition was opened for 5 months; during that period the Museum was visited by 10000 persons. Several talks were organized at Sunday's morning.

An exhibition called "The bats and their secrets" was organized in the Interpretative Center of Monsanto Park, supported by "Câmara Municipal de Lisboa" and "ICNF" to pass on information to the public about the way bats live and their needs to prevent the decline and extinction of the species. The exhibition included many materials prepared by schools, didactic materials of the former exhibition of "Carsoscópio", documentaries and the recreation of a cave. The exhibition was opened for 4 months inaugurated in February 2014 with free entrance. During that period it was visited by 6000 persons, the majority were children from schools.

A blog about Portuguese Wildlife fauna was created (<http://umdiadecampo.blogspot.com/>). It intends to be a space of divulgation (biology, ecology, distribution and status conservation) and public opinion. The blog hopes divulgate and give an important contribution to the knowledge of the Portuguese wildlife heritage, with a particular interest in bats.

A new research Centre (Centro de Investigação da Regaleira – CIR, referred under point 12) created a website (<http://bats.regaleira.pt>) which aims to highlight the importance of the conservation and environmental information related to bats and the studies that are being developed at the centre in partnership with several Portuguese universities.

A time-table regarding the seasons when caves should not be visited due the presence of important bat colonies is presented in the website of "Federação Portuguesa de Espeleologia" (<http://www.fpe-espeleo.org/index.php/quiropteros>).

## **Azores Archipelago**

The start of the project “Bat Census of the Azores” coincided with the Year of the Bat. This project has a strong monitoring objective, but also an important environmental awareness component. Since it started in March 2012, several environmental awareness sessions were made. In 2012 these sessions took place in São Miguel, Terceira, Graciosa and Santa Maria islands. A total of 70 participants became more knowledgeable of the importance of bats and which species can be found in the Azores Archipelago.

As part of the *Regional Plan for the Environmental Education and Awareness of the Azores*, published in September 2011 by the Regional Secretariat for the Environment and Sea Affairs, a new education tool was launched in September 2012 – the Azores Biodiversity Kit (“Kit da Biodiversidade dos Açores”, in Portuguese). This tool includes several resources: a child story, in which one of the two main characters is named “Nicolau”, inspired in the name of the endemic Azorean bat *Nyctalus azoreum*. This story has in the end a picture of a bat to be coloured; A poster of the Endemic Species of the Azores”, which photographs of all the main endemic species of fauna and flora, and in which the Azorean Bat is included. This Biodiversity kit was offered to all primary schools of the archipelago, in a total of 158 primary schools, 740 professors and 12.672 students. The Government’s environmental educational services of each of the 9 Islands (integrated in the Island Natural Parks since their creation) were responsible of distributing and promoting this Kit. These educational services named “Ecotecas” have been created since 1999 and nowadays it exists the Regional Network of Ecotecas, with one in every island of the archipelago. Their services is to promote and organize environmental awareness and education activities to all segments of the population, and especially to schools. Their work is to implement the Regional Plan for the Environmental Education and Awareness of the Azores. Specifically regarding the subject of Azorean Bats, which are included in the Endemic Fauna and protected species projects, several school lectures, talks for general public, walks with bat detectors, workshops at regional teachers meetings, have been organized since 2012, with continuity till nowadays, it is an ongoing project.

Moreover, the project of Furnas Landscape Restoration Project, being implemented in São Miguel Island, offered bat shelters to each of the partners engaged in this project. Together with the bat shelter offered, it was given a brochure about the Azorean Bat, being the only endemic mammal species of the Azores. The first Report of the Regional Plan for the Environmental Education and Awareness of the Azores, predicted for 2014/2015, is expected to have the specific statistics.

### **Madeira Archipelago**

Between June 2010 and February 2012, several activities have been carried out in Madeira to promote awareness and importance of conservation, mainly:

- Bat lecture at University of Madeira to Biology students by Danilo Russo in 2008; Bat lecture at the Environmental week of the Ecocertified Hotel dos Prazeres by Sérgio Teixeira in 2010;
- Bat night included within the Researchers' Night 2011 organized by Centro de Ciência Viva of Porto Moniz, lectured by Sérgio Teixeira;
- Publication of the book "Vertebrados terrestres autóctones dos Arquipélagos da Madeira e Selvagens. Répteis e mamíferos. Biodiversidade Madeirense: Avaliação e Conservação", published by Direcção Regional do Ambiente (Regional Environmental Directorate).
- Additionally several articles about bats were published in regional and national magazines and newspapers as well as close contact awareness and demystification with farmers and general population during field work carried out voluntarily by Sérgio Teixeira, David Teixeira, José Jesus and Tamira Freitas.

Between March 2012 and February 2013, several activities have been carried out:

- Porto Santo Island Municipality in association with Porto Santo Verde dedicated its VII Environmental Symposium to Bats, under the theme "À descoberta do morcego do Porto Santo"
- Under the program Ecoescolas (Ecoschools), the "Escola Básica do 1º Ciclo do Porto Santo" School displayed the movie "O Morcego – A extinção é para sempre" on the symposium. The movie was made by its students and supported by the teacher Rosa Afonso.
- Lecture at the VII Environmental Symposium of Porto Santo Island by Sérgio Teixeira.
- On the 30th of December, under the EUROBATS International Bat Night event, the ecotourism company Madeira Fauna & Flora organized an open Bat watching night to the closing of the International Year of Bat on Madeira Archipelago.

Between March 2013 and April 2014 the only events were the bat watching nights and open International bat nights carried out by Madeira Fauna & Flora company.

### **10. Responsible bodies, in accordance with Article III.5 of the Agreement, nominated for the provision of advice on bat conservation and management**

Responsible bodies are:

*Mainland Portugal:* "ICNF" (Despacho nº 14536/2010, 26<sup>th</sup> August 2010)

*Azores Archipelago:* Direcção Regional do Ambiente da Secretaria Regional dos Recursos

Naturais (Verbal note of the Portuguese Embassy in Berlin, April 2014)

*Madeira Archipelago*: Direcção Regional de Florestas e Conservação da Natureza (Verbal note of the Portuguese Embassy in Berlin, April 2014)

### **11. Additional action undertaken to safeguard populations of bats**

#### ***Mainland Portugal***

No recent developments in this area. In accordance with Portuguese law the entrances of inactive mine galleries should be closed for security reasons. There has been an effort that methods compatible with the continuation of their use by bats (recommended by EUROBATS Publication Series nº 2) are adopted. Galleries colonized by important bat colonies are being closed by fences, galleries used by some bats are being closed by bat friendly gates with doors (to allow monitoring) and galleries not used by bats are being closed by walls with large respiration holes (this will allow a future colonization but not their monitoring). Vertical shafts are being protected with grilles.

#### ***Azores Archipelago***

No additional actions were undertaken to protect bat populations in Azores archipelago.

#### ***Madeira Archipelago***

No additional actions were undertaken to protect bat populations in Madeira archipelago.

### **12. Recent and ongoing programmes (including research and policy initiatives) relating to the conservation and management of bats**

*Guide to Bats of Portugal (mainland and islands) - Morphology and ethology of the Chiroptera in National Territory.* Final Project of a Master's degree in Scientific Illustration developed by Lúcia Antunes (Antunes 2013) is a fully illustrated publication/guide regarding bats in Portugal. Apart from focusing on the morphological representation of all species present in the Portuguese mainland and islands, it will also feature illustrations of graphical identification keys, feeding habits, reproduction, habitats, representations of echolocation, et cetera. Tasks include drawing scientifically accurate illustrations and infographics, developing the layout and pagination of the guide and the treatment and insertion of illustrations into specific layouts. Scientific information will be accompanied by illustrations appealing to readers from a wide universe, alerting to the hazards that affect bats and creating familiarity with this special group of animals. Joining the celebration of the Year of the Bat 2011-2012, this guide is primarily a physical object that will also be applied and adapted to digital mediums like a website and apps for tablets and smartphones providing a whole new level of accessibility to information about bats. The Guide is currently being

written.

### ***Mainland Portugal***

*Alviela Ciência Viva Science Centre (“Carsoscópio”).* The Centre is located in the proximities of one of the country's most important maternity roosts (Alcanena I) and holds an interactive exhibit totally dedicated to bats – The Quiroptário (<http://www.alviela.cienciaviva.pt/home/>). The building and the exhibition have been requalified, in order to improve the conditions. At April 4th, 2013, the Alviela Ciência Viva Science Centre reopened to the public with the Quiroptário requalified with new graphics, updated information and more interactive exhibits. This interactive exhibition shows in an attractive and unique way the importance of these animals in ecosystems and also the need of their conservation, by giving to the nearly 17000 annual visitors an opportunity to actively participate in acquiring knowledge by exploiting interactive - exhibits. The requalification was done by Câmara Municipal Alcanena, Agência Ciência Viva, “ICNF” and Instituto Politécnico Leiria. On February the 18th, 2014 the Alviela Ciência Viva Science Centre competed in the Communications category for the Natura 2000 Award, a distinction the European Commission created to “award the best efforts undergone in Europe to preserve nature”. This award aims in divulging the Natura 2000 network and showing its importance in preserving Europe’s biodiversity. The Centro Ciência Viva do Alviela was one of the four finalists in the Communications category, with the campaign “Knowing and preserving the 12 bat species of Alviela’s cave – Portugal”, that included the Bat Cave Observatory, the interactive exhibit Quiroptário and the activity “Noite dos Morcegos”. This Ciência Viva science Centre also includes a Cave Bat Observatory composed by 4 infrared cameras placed in the inside of the cave which allows users to follow live, 24 hours per day the bat colony that uses this cave as a maternity roost (referred under point 9). This observatory aims to support scientific research and is devoted to the appreciation and awareness for the conservation of Chiroptera, it allows to observe in a natural shelter, 12 bats species, and develop behavioral studies to determine the seasonal occupation of the roost, determine when the births occur and the period that goes from the birth to the weaning and first flights of the pups, describe roosting behaviour and the interaction among species that use the roost.

*Website “Morcegos na Web”.* The website which includes online images collected in the maternity roost Alcanena I by infrared cameras in currently being remodelled.

*Lousal Ciência Viva Centre.* The Centre (<http://www.lousal.cienciaviva.pt/home/>) was built near an abandoned mine which includes a gallery colonized by a maternity colony. The exhibition includes an interactive module on bats, containing short documentaries, 2D games and quizzes. Its main objective is to introduce several aspects of bat biology and ecology to the

general public, and particularly to school communities, and to encourage an understanding of these animals, and their important role in nature. Funded by “Agência Ciência Viva” and “Fundação Frédéric Velge”.

*Morcegagens - Making economic valuation work for bat conservation and environmental education.* This project is being carried out by Mário Carmo and Lousal Ciência Viva Centre. Using the travel cost method, it will be investigated how much people are willing to pay to get to a site or an activity like “Morcegagens” with biodiversity value. It is based on the assumption that people will spend more to travel to a site they value more highly. The travel cost method has not been used yet to value bats. This can provide plausible estimates of monetary values for recreation in natural environments because it uses actual behavior of visitors as they adjust to changes in the real costs they incur, and actual data on the costs of the visit (for Morcegagens is a free charged visit). In the future, this project aims to expand the comparative form to a location closer to a big city and even by comparison to an activity that has a direct cost ("entry price") for the consumer.

*Monitoring programme of cave-dwelling species.* A monitoring programme of the cave-dwelling species is in progress since 1987, coordinated by “ICNF”. This programme involves the estimation of bat numbers present in the most important wintering and maternity roosts. The surveys are carried out annually in most of the roosts. An analysis of the data is under preparation. Co-funded by “ICNF”, “Faculdade de Ciências de Lisboa”, “Universidade do Porto”, “Universidade de Évora”, “Universidade de Trás-os-Montes e Alto Douro” and “Federação Portuguesa de Espeleologia” (namely, “Associação dos Espeleólogos de Sintra”, “Núcleo de Espeleologia da Costa Azul”, “Grupo Protecção Sicó”, “Grupo de Espeleologia e Montanhismo”, “Centro de Estudos e Actividades Especiais”, “Alto Relevo – Clube de Montanhismo”, “Núcleo de Espeleologia de Leiria”, “Espeleo Clube de Torres Vedras”, “Núcleo de Espeleologia de Alcobaça”, “Núcleo de Espeleologia da Associação Académica da Universidade de Aveiro” and “Geonauta”). Recently, a report on the analysis of the data collected between 1988 and 2012 (ICNF 2014) includes the trends of cave-dwelling species calculated with TRIM and the characterization of the 76 important roosts (seasonal occupation and evolution of the estimates of the most common species).

*Bat exclusion.* Whenever necessary, licenced exclusion activities are accompanied by rangers or accredited professionals. There is a document with general advices on cohabitation with bats and information on bat exclusion (*“Tenho morcegos em casa, o que devo fazer? - Guia de apoio a situações de coabitação e exclusão de morcegos em edifícios”*; <http://www.icnf.pt/portall/naturaclas/patrinatur/resource/docs/Mam/morc/guia-coabit-morc>). There were two situations of exclusion from small natural roosts which need to be destroyed due to the construction of a dam; activities were conducted by technicians who are monitoring the



project.

*Bat houses: Esporão S.A. promotes conservation of bats.* Esporão S.A. consider bats as a strong ally in the biocontrol of pests in crops of vineyards. Therefore, between May and September 2010, it was decided to study the communities of bats using bat detectors. Under the Biodiversity Conservation Plan in 2010, developed as a result of accession to the Business & Biodiversity Initiative, several initiatives were implemented, including the placement of bat boxes (20 already installed, 20 planned to be installed in the near future). 40% of the 20 boxes are already occupied (recent counts reveal around 100 *Pipistrellus* spp. (<http://www.esporao.com/en/sustainability/projects/>)).

*Scientific camp in “Reserva Natural Serra da Malcata”.* Between 2 and 6 June 2010, 12 technicians participated in a scientific camp. Mist-netting allowed the confirmation of the presence of 3 of the 6 previously inventoried species, and the identification of 6 new species for the area. Currently, 12 species are inventoried in this Reserve.

*Course on acoustic identification and Anabat Training Course (Level 1, 2 and 3).* Organized on 6-8 June 2011, by Sociedade Portuguesa de Vida Selvagem in collaboration with CBMA – Universidade do Minho.

*“Centro de Investigação da Regaleira - CIR”.* Associated to the alternative roost “Morcegário da Regaleira”, a research centre was created in 2011: “Centro de Investigação da Regaleira – CIR”. The Centre is a platform to support the study of biodiversity in general and bats in particular, and is the result of the evolution of scientific, cultural, technical and logistical between “Fundação Cultursintra”, “Federação Portuguesa de Espeleologia” and “Associação dos Espeleólogos de Sintra”. The Centre is developing research lines in partnership with several universities and other entities of scientific expertise to study of biodiversity in general and bats in particular.

*Monitoring of the alternative roost “Morcegário da Regaleira”.* In spring 2008 a conflict regarding one maternity colony and a Historical Building appeared. The colony had around 150 *R. hipposideros* and use to breed in some rooms that need to be restored during the maternity season. To avoid the colony disturbance a temporary heated roost was created in a building of Quinta da Regaleira, where some bats seldom appeared. The temporary roost was colonized by the colony and the bats breed there already in 2008 as well as in 2009 and 2010. However, since the temporary roost also needs to be restored, it was decided to adapt a bigger room to try to attract bats all over year and a new roost was created in spring 2009 (“Morcegário da Regaleira”). The new roost is occupied all over the year by *R. hipposideros* and the maternity colony is one of the biggest known in the country. Monitoring system includes the register of climatic variables using temperature and relative humidity data loggers and the observation of the room using IR video cameras with remote access and data storage. The project was funded by “Associação dos Espeleólogos de

Sintra” and “Fundação Cultursintra”, and is being conducted by “Centro de Investigação da Regaleira (CIR)”, aiming to: determine the seasonal occupation of alternative roost, determine when the births occur and the period that goes from the birth to the weaning and first flights of the pups, describe roosting behaviour of *R. hipposideros* and its interaction with other species that use the roost, study the influence of climatic conditions on roost occupation, and use all information in order to improve alternative roosts which may need to be created.

Studying of a complex of roosts of *R. euryale* in Sintra. In 2009, speleologists discovered in Sintra Mountain Range a maternity roost of this threatened species with nearly 200 animals. In 2010 bats disappeared from there but a maternity colony was discovered at a near location in 2011. Given Sintra’s Mountain Range importance for this threatened species, this project aims to: determine the seasonal occupation of the roosts, determine the period between the birth and the weaning and first flights of the pups, relate the roost usage with the surrounding environment and landscape variables, and describe roosting behaviour of this species. The project is being conducted by “Centro de Investigação da Regaleira (CIR)”.

Application of trained-dogs as a standard methodology on carcass searches. Between 2007 and 2009 four dogs were trained under a protocol established between ECOSATIVA and the Drugs Detection Speciality of Republican National Guard (GNR), adapting Arnett’s experience published in 2005. The results of the application on 10 wind farms were presented by the end of 2009, and showed significant difference ( $p < 0,5$ ) on detectability, greater the smaller the animal. Very significant differences ( $p < 0,01$ ) between habitats were found: forest and tall shrubland were the habitats where the difference of using dogs instead of human observers was bigger. The detectability of dogs is normally above 90%, and never bellows 50%. Human observers verify much lower detectability, which can be near to 0% in some habitats, as those referred. In the last 3 years this methodology was applied on more than 20 wind farms, resulting on 90 carcasses found on 14 wind farms. Nowadays this methodology is used as a standard on all bat and bird monitoring projects conducted by ECOSATIVA. Since the beginning of 2011 this methodology is also being applied on two high tension electric lines.

Biologist-dog project. This R&D project resulted of a protocol established between Bio3 and the Special Operations Group of the Portuguese Public Security Police (PSP) – K9 Unit, to train handlers (biologists) and detection dogs to form dog-handler teams. After training, to assess the use of dogs for bird and bat carcass searches in real field surveys, the following hypotheses were addressed: (1) dogs are more accurate than humans to detect bird and bat carcasses under different vegetation conditions, and (2) carcass decomposition, weather conditions (temperature and wind speed) and distance to the target affects the

search accuracy and efficiency of the working dog. Results indicated that dogs are more accurate than humans, independently of vegetation density. Furthermore, carcass decomposition condition, distances to the carcass and weather conditions have shown to affect dog's efficiency. Despite significant, the observed effects were reflected in a reduced time scale.

*Optimization of bats mortality rate monitoring on wind farms.* ECOSATIVA is developing an optimized methodology to more accurately assess the real mortality rates on wind farms. The high influence of the correction factors on estimating mortality are a well known bias factor, and are a consequence of low detectability rates and high carcass removal rates by predators. The new methodology is on a test phase, being applied on a small number of wind farms to reinforce the theoretical assumptions and allow further optimization.

*Wildlife Fatality Estimator: from bias correction factor to corrected fatality estimates.* The Wildlife Fatality Estimator is a totally free on-line platform that can be used to estimate bat mortality associated with wind farms or other human infrastructures ([www.wildlifefatalityestimator.com](http://www.wildlifefatalityestimator.com)). It was created by Bio3 in partnership with Regina Bispo and aims to help users to properly apply the state-of-the-art methodologies and save time in the data analysis. The platform is still under development, yet with 2 of the 3 application modules ("Carcass Persistence", "Search Efficiency" and "Fatality Estimation") already fully operational.

*Wind & Biodiversity: integrated solutions for managing biodiversity in wind farms.* This project aims to develop integrated solutions for managing biodiversity in wind farms. Between 2011 and 2015 a set of technologies, methodologies and know-how will be developed in order to help reconciling wind farms with biodiversity, in particular with birds and bats. The project's goals are to: 1) understand bird and bat communities' behaviour and dynamics, 2) understand the causes and accurately quantify bird and bat mortality, 3) develop equipments and technology to mitigate or eliminate bird and bat fatalities, and 4) develop, adapt and validate compensation measures to implement in wind farms with high mortality impacts. The project is led by Bio3, a private company, in partnership with the University of Aveiro, which participates mainly with two research units - the Associated Laboratory CESAM (Centre for Environment and Marine Studies) and IEETA (Institute of Electronics and Telematics Engineering of Aveiro). Co-funded by European Regional Development Fund (ERDF) and the National Strategic Reference Framework (QREN).

*Agro-forestry management practices of montados and its impact on biodiversity: bats and birds as models.* Montado is an agro-forestry-pastoral system that consists of cork or holm oaks scattered on a matrix of mostly grassland. This grassland is artificially maintained, often with grazing. Montado is one of the most important land cover in Portugal, dominating much of the landscape in the southern half of the country. It is also very important in Spain

and in other Mediterranean regions. Although montado is an economically valuable system, it is also one of the most biodiversity rich ecosystems in Iberia. This makes it one of the best examples of a balance between conservation and development, and a resource that most stakeholders want to preserve. The biodiversity value of montados varies considerably, and this is to a great extent depends of how they are managed. However, little is known about how different management regimes influence their biodiversity. This is a serious limitation at a time when, due to various EU agricultural and environmental instruments, the obligations and opportunities to maximize the nature value of farmland are expanding. The overall aim of this project (which was conducted by Jorge Palmeirim, Ana Rainho, Tiago Marques, Christoph Meyer, Ana Leal and some students) was to contribute to the identification of management practices that promote the biodiversity value of montados, while maintaining their economic importance, using passerine birds and bats as models. Since this influence is often mediated by the availability of food resources, particular attention to insects, was given. The results provided support for the preparation of management guidelines focusing mainly the (a) maintenance and recovery of riparian vegetation in waterlines, as these among other benefits provide some heterogeneity to the montado landscape; (b) maintenance of a mosaic of undercover mixing areas of grasslands with scrub, as this will benefit the different bat species that use montados, resorting to different grazing intensity levels; (c) promotion of the variability of tree density, also improve habitat availability to the different species of bats occurring in the area, some preferring closed and others preferring open habitats. Funded by “Fundação para a Ciência e a Tecnologia”.

*Factors affecting terrestrial vertebrate diversity and activity patterns at the lagoon system of Baixo Vouga and Ria de Aveiro.* This ongoing project aims to study the spatio-temporal dynamics of several vertebrate communities at the lagoon system of Baixo Vouga and Ria de Aveiro, and is being conducted by four MSc students, and is scientifically coordinated by Carlos Fonseca, Maria João Ramos Pereira, Joaquim Ferreira, Eduardo Ferreira, Rita Rocha and Milene Matos. The landscape consists of traditional forms of agriculture, locally called Bocage, mostly characterized by small areas of crop and pasture surrounded by autochthonous tree and shrub hedgerows and freshwater courses – which is unknown elsewhere in the country –, marshlands, reed areas, and by a highly humanized landscape. In fact, the area as a whole forms a buffer zone between several urban and industrial centres. External pressure on this area, including heavy metal pollution from the surrounding industries and changes in water balance resulting from the synergistic action of human intervention, especially in the form of infrastructure development, and climate change increases the complexity of habitat management in this unique area and calls out for the need to understand the regional patterns of biodiversity. The sustainable

management of the Baixo Vouga Lagunar complex wetland system lies in protecting its ecological integrity and biodiversity from the negative impacts associated to the strong human pressure they are under. In the specific case of bats, the aim is to assess spatio-temporal patterns in bat diversity and activity in this complex wetland system and to understand the main factors behind those patterns, including climatic variables, micro-habitat diversity, food availability and sources of human pressure. Funded by Aveiro University and Observatoire Hommes-Millieux - Estarreja, and partially logistically supported by the Municipality of Estarreja.

*Biodiversity, prey-predator dynamics and environmental education at the humanized landscape of BIORIA.* The sustainable management of the unique habitats of the Estarreja region should focus on maintaining the ecological integrity of the area and protecting its biodiversity from the negative impacts associated to the strong human pressure they are under. So, effective conservation efforts should be based on updated and solid information about the natural values of the region. This project was a follow-up of the previous one. Spatial-temporal dynamics of vertebrates are being complemented with the characterization of entomological fauna, which constitutes the base of the trophic chain, and the exotic crustacean *Procambarus clarkii*, with the objective of exploring the predator-prey dynamics and its impact on vertebrate distribution. The evaluation of the potential effect of climatic variation, micro-habitats, food availability and human pressure factors will be continued, to develop effective strategies in terms of management and conservation. The obtained results will be disclosed and presented in actions concerning environmental education in the studied region with the purpose of being involved the highest number of citizens. Funded by Aveiro University and Observatoire Hommes-Millieux - Estarreja, and partially logistically supported by the Municipality of Estarreja.

*Bussaco's Recovery from Invasions Generating Habitat Threats (BRIGHT project).* This project, included in Life + Programme (NAT/P/075), is taking place in Bussaco National Forest and consists of a series of actions aimed at preserving the natural heritage of the Forest - namely, the 'adernal' - an unique habitat in the world – through habitat management and invasive species eradication. The University of Aveiro is in charge of monitoring the results of the projects and assess the impact forestry work on fauna and flora communities. In this context, monitoring of Bussaco bats is ongoing since July 2012. The project also includes a strong component of information and awareness of the general public, corporations, volunteers, schools, etc., comprising regular workshops, lectures, field work, etc. Thus, given the importance that bats have for nature conservation, they are a recurrent theme in many events held within the project ([www.fmb.pt/bright](http://www.fmb.pt/bright)).

*Atlas of Portuguese bats (mainland).* Bats are a frequent target of conservation owing to

both their status and sensitivity to environmental change. The current knowledge on many species distribution in mainland Portugal is nevertheless scarce. This lack of knowledge has obvious consequences on bat conservation and management that often hinge upon information on species presence. The main goal of this project (which was conducted by dozens of volunteers and coordinated by “ICNF”) was thus to overcome this issue, specifically: (a) map the present distribution of the 25 bats species known to occur in mainland Portugal; (b) understand some factors that may hinder bat distribution and richness; (c) populate a database that will make this information to all interested parts; and (d) in conjunction with the campaign 2011-2012 Year of the Bat, to mobilize and stimulate bat professionals into educating the populations regarding the importance of bats in the ecosystems and in their life. To support this project two identification keys were produced (one on calls and another on morphological characters). To train volunteers, nine courses on morphological identification (129 participants) and four courses on acoustic identification (41 participants) were organized. The Atlas was published by the end of 2013 and launched in April 2014 during a ceremony that counted with the presence of a Government representative and many of the volunteers of the project.

*Atlas of the Fauna of the Alentejo Coast.* This ongoing project aims to study the distribution and abundance of all vertebrate species along a 5 km wide per 185 km long stripe from Tróia (center-south Portugal) to Burgau (southwestern Portugal). All the area is being sampled based on a 5 x 5 km grid, comprising 52 squares where different surveying methods are applied, directed to different groups of species. Bats were sampled based on two detection points (10 minutes each) per square, and samplings were made during spring. During summer, autumn and winter bat detection points were also performed, although following a less intensive, broader-scaled sampling scheme. The project is being conducted by the STRIX and supported by CIMAL, a regional inter-municipal association.

*Pilot-project to assess the use and impact of management activities for the promotion of biodiversity on farms in the Portuguese mainland.* This project aims to select management practices that promote biodiversity on farms. In the first phase, which ended in April 2012, the specific objective was to establish base line data for the biodiversity indicator taxonomic groups. Five taxonomic groups were selected as biodiversity indicators: bats, birds, reptiles, amphibians and butterflies. In this phase the study on bats was conducted by Tiago Marques, on 16 farms located throughout the country. The farms selected include the traditional olive grove, two vineyards on terraces (one irrigated and one not irrigated) and a chestnut production in the Douro, corn for silage in Baixo Vouga, cherry at Cova da Beira, rice in the lower Mondego, crops of vegetables and pear in the West, corn in the lezíria of the Tagus river, olives and tomato-intensive industry in the Alentejo, a lowland vineyard in the peninsula of Setúbal, pastures for sheep and cattle in the southern and central Alentejo

and citrus grove in the Algarve. A report with the baseline data was produced and farm specific management actions were included as an advice for farmers to increase biodiversity on their farms. These included the construction of small ponds, putting up bat boxes and the plantation of trees to close gaps along tree lines. The farmers and managers have implemented these actions. In 2012 and 2013 the study of bats was repeated, by Margarida Augusto and Mário Carmo, in order to get data to try to assess the success of the implement actions. Funded by “PRRN – Programa para a Rede Rural Nacional” do “Ministério da Agricultura, Mar, Ambiente e Ordenamento do Território” e pelo “Fundo Europeu Agrícola de Desenvolvimento Rural da União Europeia”.

*Conservation of temporary ponds in the Portuguese southwest coast.* Mediterranean Temporary Ponds (CTM) are seasonal wetland habitats, subjected to extreme and unstable ecological conditions. Due to their uniqueness and scientific value are classified as priority habitat (3170\*) for conservation by Habitats Directive. The coastal plain of southwest Portugal is classified as “SCI Costa Sudoeste” and hosts a large number of temporary ponds, as a consequence of climatic and edaphic characteristics. However, in the last two-decade, modern industrialized agriculture and tourism are causing a steep decline of this habitat in this Natura 2000 site. Traditionally seen as non-productive areas, CTM are nowadays subjected to strong anthropogenic pressures, such as deep soil turning, accelerated drainage, flattening the surface topography or transformation into permanent reservoirs for irrigation. Therefore, it is urgent to act in order to halt this decrease trend and assure their long-term protection. Thus, the main aim of the project is to enhance the CTM conservation status in SW Portugal, with the following objectives: (a) compilation, in a coherent and homogeneous data base, of the biological information available and update cartography, (b) promote the reduction and elimination of known threats, halting the destruction this habitat suffered in the recent past, (c) demonstrate management and restoration techniques that will improve and enhance the conservation status of the CTM, (c) create and establish a seed bank, primarily, as a tool for conservation and restoration actions, and as biodiversity safeguarding, (d) promote locally the dissemination of knowledge about temporary ponds ecology and function, throughout sustainable management practices demonstrations, and (e) contribute to the long-term protection of CTM, engaging landowners, farmers and decision makers, (f) increase public awareness about temporary pond habitat preservation and the value of ecosystem services provided by them. The study on bats is being conducted by Tiago Marques. Funded by LIFE.

*Bat communities: Monitoring bats of Mata da Machada.* In order to get data for a potential proposal for a Local Reserve, Mário Carmo started to study the bats in 2011 in the Mata Nacional da Machada and Sapal do Rio Coina. In 2012 he supervised Cátia Ferreira, who collected the data April and May for a final project of Biology Graduation; the project is now

being finished. In 2014 Mário Carmo resumed the monitoring using bat detectors (sampled monthly) and an automatic sampling station. The project is being carried out with the Câmara Municipal do Barreiro.

*Where to go when it is too hot? Promoting genetic diversity and gene flow in natural populations under predicted climate change.* Climate change (CC) is currently one highly debated topic in the political and scientific agenda. The majority of the studies point towards a future global biodiversity decline due to CC. In response, there has been a growing investment on renewable energies aiming to reduce the emissions of greenhouse gases. However, these infrastructures are acknowledged to also cause severe negative impacts on biodiversity by themselves. This project, conducted by Hugo Rebelo, investigates the potential effects of CC on natural populations and proposes guidelines to hamper potential threats. Specifically, it aims to investigate in a multi-scale approach the effects of CC on population adaptability, connectivity and viability of several Mediterranean bat species, an area particularly sensitive to CC. In parallel it also aims to further develop the methodological approaches in this field of research. This research will mainly focus on two scales: regional (two mountain chains in Iberia) and the Iberian Peninsula. The multi-scale approach will allow understanding species response and local adaptations to climate at different resolutions. Results from this research would identify which populations are potentially more adapted to predicted CC and how to promote the future connectivity and genetic variability of a species. Additionally, these research outputs would identify which locations are optimal for the management of natural populations considering socio-economic costs and which areas have less impact for the development of infrastructures (like renewable energies).

*Finding a new world – Endoscopy of cryptic habitats.* This R&D project was developed by NOCTULA – Modelling and Environment and presented on the International Conference of IAIA 2012; it was awarded and highlighted at the closing ceremony. Although features such as old woodpecker holes, cracks and crevices are usually recognized as potentially important habitats for cryptofauna communities, these small cavities have been almost entirely neglected, being the available cryptofauna studies mostly concentrated on easily accessible environments such as large caves and tunnels. Environmental impact studies often neglected cryptic species justifying technical difficulties associated with their location or arguing that they tend to exhibit low fidelity to individual crevices being the absence of data in many cases responsible for animal roosts destruction during the construction works of several projects. The bat species roosting in small cryptic habitats are an example of a group that has been neglected in Portugal, in spite of some of them currently faces high risk of extinction. During this R&D project, a large number of groups of vertebrates and invertebrates were registered which led NOCTULA to conduct studies in a broader



framework. When compared to other methodologies to study the species that live in small cryptic habitats, endoscopy is relatively easy and quick to apply on the field and the amount of data that can be registered and stored is enormous. Moreover, video documentation saves expensive working time and the analysis can be done any time.

*A new stochastic dynamic tool to improve the accuracy of mortality estimates for bats killed at wind farms.* This work, prepared by the Laboratory of Applied Ecology from CITAB/UTAD (Bastos et al., 2013), aimed to test the applicability of a Stochastic Dynamic Methodology (StDM) to estimate bat fatalities at wind farms. The StDM estimator was based on a sequential modelling procedure, initiated by the construction of a dynamic model that provides realistic scenarios of bat fatalities, from where the respective detections were forecasted. The resulting simulations allowed to generate a database from the simulations of the fatalities time distribution and respective detections performance, considering the related relevant parameters as correction factors for imperfect detection (i.e. carcasses persistence, searcher efficiency, monitoring period, periodicity of searches and number of wind turbines). This information, when submitted to an information-theoretic approach based on Generalized Linear Models, enable to establish the interaction criteria between the obtained parameters, supporting the calculation of the more appropriated algorithm for the StDM estimator. Based on new simulated independent scenarios, the proposed estimator was submitted to a validation procedure, where the performance of the framework showed realism in capturing the dynamic patterns of the studied phenomena: most confrontations between the StDM estimates and the simulated real mortality were validated. When compared with other estimators, which are supported by constant parameters or independent deterministic assumptions, one of the main strengths of the obtained StDM estimator relies on the non-constancy and inter-dependency of the commonly used parameters for bias corrected estimates. Furthermore, the proposed framework can provide algorithms capable of estimating potential real mortality, even in the absence of detected carcasses. In fact, through the simulation of the main parameter's combinations, this approach was designed to capture the pertinent gradients in the model database construction (including the absences of detected mortality), which enable the best adjustment for each particular studied monitoring reality. This approach is therefore proposed as a innovative starting point in estimating real fatalities, namely preventing the failure of other existing estimators facing the absence of detected mortality and the wrong interpretations of the false zeros meaning by the decision-makers.

*Winter Influence on bat activity: a contribution to understand the influence of climate changes on bat phenology.* The principal objective of this PhD (co-tutoring PhD programme between the University of Aveiro and the University of Lisbon), in preparation by Nuno Pinto, is to evaluate the impact of global changes in bat communities. Funded by

“Fundação para a Ciência e a Tecnologia.

*Combining molecular analyses with predictive modelling to study the population history of Iberian cryptic bats: lessons from the past to better predict the future.* The Iberian Peninsula is known as one of the major contributors to Europe’s biodiversity. Moreover, more than 20% of Iberia’s bat species have shown evidence of cryptic diversity. This PhD, in preparation by Helena Santos, mainly focuses on the species cryptic complex, *Plecotus auritus/begognae*, with the aim of investigating which ecological and genetic characteristics influence past, present and future species’ distribution and which mechanisms can promote population’s isolation. An innovative use of species distribution modelling techniques combined with genetic analyses will enable the understanding of how ecological niches contribute to species’ genetic variability and the identification of possible contact zones. Furthermore, by developing models for the past and future climate change scenarios, it will be possible to study population movements through time, determining glacial refugia and post-glacial expansion. Also, the analysis of the factors that promoted these movements will allow the prediction of future species’ reactions to climate change.

*Effects of a large reservoir on the populations of a rupicolous species: a case study with the unknown European free-tailed bat.* The practice of constructing dams is an important strategy for water provisioning for human settlements, yet may impact negatively on biodiversity. A PhD in preparation by Francisco Amorim (CIBIO – University of Porto) will use the Baixo Sabor reservoir as a unique opportunity to conduct a large-scale test of the effects of a dam at the community and species level. In particular, resulting flooding of the cliffs is expected to be especially detrimental to rock-dwelling species. By combining spatial analyses and genetic tools, it will characterise and quantify the consequences of habitat loss and fragmentation due to the aforementioned reservoir on social structure, population size and connectivity. The main aim would be to identify landscape features that promote connectivity and gene flow among known roosts and, therefore, help to maintain population viability and genetic diversity. Results from this project would help guide the development of cost-efficient conservation measures that mitigate the negative impacts of the dam on biodiversity loss. Beside the “Fundação para a Ciência e a Tecnologia” PhD grant, this project is also funded by the same institution through the project LTER/BIA-BEC/0004/2009 and “EDP – Energia de Portugal”.

*Estimating wildlife mortality at wind farms: accounting for carcass removal, imperfect detection and partial coverage.* One of the main concerns in monitoring wind farms is related to the mortality of birds and bats directly caused by collision with the wind farm structures. The methods used to estimate mortality are still not consensual and in many cases there are limitations and considerable estimation errors associated with it. Additionally, in most cases, the field monitoring process is logistically and financially limited.

As such, it becomes urgent to use efficient methods, to reduce the logistical and the financial efforts, without compromising the quality of results. This PhD, prepared by Regina Bispo, was a contribution to the study of methodologies for monitoring wind farms in particular regarding the methods to estimate mortality and optimize the monitoring strategies.

*Spatially explicit models for planning bat foraging habitat conservation in agricultural landscapes.*

Farmland management strategies directed to wildlife conservation are often weighed down by human food safety and other economic issues. In order to reach a balanced management, where both wildlife conservation and economic activities can cope within the same area, robust and trustworthy ecological information is needed. Bats are quite distinctive in the way they use space for foraging because most are colonial central-place foragers, form large multispecies colonies, and although flight enables them to exploit scattered and distant resources, they are strongly associated to the area surrounding the roost and consequently highly vulnerable to land-use changes caused by agricultural practices and policies. The overall goal of this PhD, prepared by Ana Rainho, was to examine the habitat suitability requirements of three colonial bat species of conservation concern in a Mediterranean agro-ecosystem. Specifically, four issues were investigated: (1) how the density of ground vegetation constrains the foraging ability of bats that capture prey on the ground; (2) the importance of distance variables as predictors in the modelling of bat foraging habitats; (3) trade-offs on the foraging behaviour and habitat selection of species sharing a mixed-species colony; and (4) future implications of implementing some landscape management measures, on the foraging habitat suitability of these bat species. Radio-tracking and captivity behavioural data were analysed mainly through resource-selection functions and future scenario analysis to spatially explicitly model and estimate current and future use of habitat. Results identified trade-offs between the habitat preferences of different species and between species preferences and agricultural land-use. Habitat conservation plans directed to multispecies colonies should conciliate information on the foraging behaviour and habitat preferences of all relevant species. The spatially explicit methodology used allowed to delimit areas of land-use preservation and areas of intervention, where agricultural practices and land-cover can be subject to changes while guaranteeing the preservation of the multispecies colony. Funded by “Fundação para a Ciência e a Tecnologia”.

*Opsins and Bats: The Evolution of Mammalian Vision.* Mammals have successfully colonized a vast range of ecological niches and have highly developed sensory capabilities, ranging from a wide olfactory repertoire to echolocation. Vision provides information fundamental for the survival of the almost 5000 mammal species that currently exist. In some mammals, vision is the predominant sense; in other mammals vision has become

degenerated. Studies in mammalian colour vision have linked changes in opsin genes to differences in evolutionary history, ecology, as well as other sensory capabilities. This PhD thesis, prepared by Bruno Simões, aims to explore the functionality and parallel evolution of visual pigments involved in colour vision across mammals and within a particularly diverse order of mammals, the bats. It was hypothesized that the loss of the short-wavelength vision in some bat lineages is linked with the acquisition of high-duty cycle echolocation in the Rhinolophoidea and with the acquisition of cave roosting habits in the Pteropodidae. This hypothesis was tested by gathering a dataset of SWS1 opsin genes across all bat families and most of the pteropodid genera. This dataset also covers most of the ecological and sensorial capabilities found in bats, including other species with high-duty cycle echolocation (not within the Rhinolophoidea) and with thermal-perception (vampire bats). The results dispute the link between the acquisition of high-duty cycle echolocation and the loss of function of the SWS1 opsin gene in bats but suggest that geological events in the evolutionary natural history of bats that drive the loss. The SWS1 opsin appears to UV light sensitive across the extant and ancestral bat lineages. The evolution and the spectral sensitivity of the medium-to-long wavelength colour vision in bats were elucidated. Contrary to the SWS1 opsin gene, the MWS/LWS opsin gene is conserved across bats and tuned to red (555 – 560nm) in most bats. This tuning to a long wavelength may be related with an optimization to a nocturnal life history. Funded by “Fundação para a Ciência e a Tecnologia”.

*Vertebrate Diversity in the Bussaco Mountain and surrounding areas.* Biodiversity is fundamental to ecosystem functioning and, in addition to its intrinsic value, assures essential goods and services to mankind. It is generally accepted that reserves alone will not be able to effectively preserve biodiversity in order to halt the species loss that has occurring, at unprecedented rates. Thus, understanding distributional patterns of species occurrence and richness at regional or landscape scale, even in unreserved territories, is essential to design effective management policies for biodiversity conservation. The main objective of this PhD, prepared by Milene Matos, was to describe and understand patterns of vertebrate species richness, distribution and abundance among the differently human-altered habitats that constitute the study area. Thus, amphibians, birds, bats, small and medium-sized mammals were sampled. The Bussaco Mountain and its surrounding areas are dominated by large extensions of monocultures of *Pinus pinaster* and *Eucalyptus globulus* and agricultural lands. Bussaco National Forest, extremely diverse woodland, also integrates the landscape. It was intended to investigate the effect of current forestry practices and of agriculture intensification on biodiversity, by assessing the importance of each habitat type to Vertebrates in general and to some groups in particular. Among agricultural lands, it is clear that traditional agriculture, with available water sites and its

typical complexity, is of great importance to most of the vertebrate fauna, having presented the highest conservationist value. With respect to forest habitats, the mixed forest consistently presented higher species richness and diversity, proving to be the preferred habitat for the majority of species and the woodland with greatest conservationist interest. From a conservationist point of view, monocultures, especially of exotic species, revealed to be habitats of relatively poor value. Notwithstanding, these general conclusions report to main trends, being that particular *taxa* may present different individual responses, according to specific requirements and life-history traits. The gathered knowledge provides the essential foundation on which to draw conservation guidelines, focusing on the integration of human activities and the maintenance of biodiversity and respective services. Funded by “Fundação para a Ciência e a Tecnologia”.

*Effects of exotic eucalypt plantations on native bats in a Mediterranean landscape.* The transformation of native habitats into forest plantations for industrial purposes frequently has negative consequences for biodiversity. This PhD, carried out by Joana Cruz, from the University of York UK, and CIBIO Portugal, evaluated the impact of eucalypt plantations on native bats in the Mediterranean area, taking Portugal as a case study. They compared the overall bat activity, species richness and *Pipistrellus kuhlii* (the most abundant bat species in the area) activity between eucalypt plantations and native *montado* habitat, and examined the influence of stand, landscape and survey variables within plantations on the response variables. A set of eleven plantation stands, three landscape and two survey variables were employed as predictor variables using a zero-inflated Poisson generalised linear mixed model. Hawking and generalist bats of the genus *Pipistrellus* were the most frequently detected species. Bat activity, species richness and *Pipistrellus kuhlii* activity were higher in native *montado* than in any of the eucalypt stands. Mature eucalypt plantations showed the highest bat activity, while clear-cut areas showed the lowest. Generally, within eucalypt stands, complex high-level vegetation structure, from the ground level up to 3 metres high, and proximity to water points were associated with higher levels of bat and *P. kuhlii* activity, and species richness. The results suggest that in order to promote bat diversity and activity in exotic eucalypt plantations in the Mediterranean region, it is important to provide a high density of water points, maintain plots of mature plantations, and promote understorey clutter. Funded by “Fundação para a Ciência e a Tecnologia”.

*Living on the edge: studying bat colonization of bridges in northern Portugal.* Bridges play a relevant role as roosting opportunities for several bat species in the U.S.A. However, in Europe that role has seldom been studied with only sporadic and scarce information available. In the scope of several environment impact assessments being carried out in Portugal, it was found that some bridges in the north harboured substantial numbers of individuals and bat species. In this context, this MSc, in preparation by Pedro Alves,

proposes to study which factors promote the colonisation of bridges by bats in northern Portugal (mainly at Sabor river watershed). In this area a large dam is being constructed and consequently new bridges are being built to compensate the loss of bridges that are going to be submerged by the reservoir. This provides a unique opportunity to analyse bridges with different ages.

*Factors determining the activity of bats in pine forests.* The different characteristics of pine forests, such as the size and fragmentation of parcels, age and composition of the understorey, are considered limiting factors of the different faunal communities present in natural areas. This MSc, in preparation by Mário Carmo, aims to determine the importance of forest management in the use of space by the bats in the study area. To this end, it was sampled the activity of this faunal community in pine forests and in their edges.

*Behavior and social structures in *Miniopterus schreibersii* and *Rhinolophus hipposideros* in maternity roosts.* The main goal of this MSc, in preparation by Maria João Silva, is the study of the social behaviour and structure of bats in maternity roosts, establishing behavioural patterns that lead to the preservation of bats during a critical season of their annual life cycle. This document is based on imagery collected from The Alviela Bat Observatory (equipment installed in the inside of a cave) and The Quinta de Regaleira Observatory (equipment installed in an abandoned building) between April and September 2010, and 2011.

*Modelling distribution of *Tadarida teniotis* in Northeast of Portugal.* This MSc, in preparation by Virgínia Duro, aims to develop a model of habitat suitability for the bat specie, *Tadarida teniotis*, and to understand what environmental factors contribute to its distribution in the Northwest region of Portugal.

*The effect of landscape dynamics on bat habitat use and community composition in a future reservoir area.* Landscape alteration is considered to be one of the main drivers of current biodiversity crisis. This MSc, in preparation by Inês Jorge, presents a case study where a river valley recognized to be relevant for the biodiversity conservation (in fact, this area is part of Natura 2000 network) is suffering a major alteration in the landscape due to the construction of a large dam – Sabor dam. Within this context, this research aims to understand the effect of landscape dynamics on bat habitat use and community composition. The methodological approach for the thesis will be divided into three separate phases: environmental characterization of the study of the area (Sabor river valley), data collection on bats and correlative analyses between the data of the previous phases. On the first phase, the orography and vegetation of the area will be defined and measured, its boundaries set and studied according to its localization and several environmental correlates. For the following phase, previously collected data on bats (data acquired on over 200 transects made between April and October of 2011 and 2012) will be used and

associated to variables from the previous phase. This data will be analyzed on a GIS program according to the descriptive variables of the landscape previously studied. The last and third phase will consist on the analyses of the environmental variables with bat-passes by species, the total bat-passes and species richness. These analyses will be done using Generalised Linear Mixed Models. From these analyses it is expected to determine what landscape characteristics should be protected in the Sabor valley in order to promote the sustainability of bat populations.

*The importance of trees to bat activity in an agricultural landscape.* In agricultural landscapes, scattered trees, tree lines and tree blocks are a significant fraction of natural habitat available for wildlife. In these landscapes trees are important to insectivorous bats because they can provide roost, feeding habitat and can also constitute landmarks and provide protection during bats commuting routes between roosts and feeding areas. At the same time, insectivorous bats provide a valuable ecosystem service in agricultural landscapes, as they can eat half their weight in insects per night contributing to the control of insect populations in these areas. This MSc, in preparation by Sílvia Barreiro, proposes to study the importance of scattered trees, tree lines and tree blocks for the activity and species richness of bats in an agricultural landscape, and assess their relative conservation value. The study is being carried out in the alluvial plain of Tagus river in Portugal. Variables such as prey availability, percentage of tree cover, distance to water, distance to settlements, and type of crop will be considered.

*Environmental Education: Influence perception and attitudes toward bats.* This MSc, prepared by Veronica Paiva, regarded the problematic poor image of bats, associated to myths and legends, which obstacles their conservation. Environmental education is one possible way to provide information about bats and warn the population about the dangers that they cross, improving environmental awareness. This thesis aimed to assess the impact that the actions of “Carsoscópio” and “Clube Bio-Ecológico Amigos da Vida Selvagem” have on the target-public and what is their contribution on the improvement of the public perception of bats.

*Using Species Distribution Modelling to Predict Bat Fatality Risk at Wind Farms.* This MSc, prepared by Helena Santos, aimed to predict which areas present higher risks to bat fatality when facing the presence of wind farms. In an innovative approach, species distribution modelling was employed with mortality data and the ecological conditions at wind farms located in Portugal. Predictive models were calculated to determine areas of probable mortality and which environmental factors are promoting it. Mortality data of four bat species, *Hypsugo savii*, *Nyctalus leisleri*, *Pipistrellus kuhlii* and *Pipistrellus pipistrellus*, was used. These are the species that have suffered the most fatalities at wind farms in Portugal, totalizing 290 of the 466 fatalities recorded from 2003 to 2010. The mortality risk models calculated showed

good performances, with all respective AUCs being ca. 0.99. Models determined that wind farms sited at humid areas with mild temperatures, closer than 5000 metres of forested areas and 600 metres of steep slopes, showed higher probability of mortality. It was also verified that the areas with high probability of mortality overlapped a considerable range of *N. leisleri*'s potential distribution, suggesting that populations of this species might be at high risk due to wind farm fatalities. Due to the innovative approach of this work, it was considered necessary to ground-truth the models. In a nutshell, by allowing the identification of mortality risk areas prior to wind farm instalment and the determination of which conditions promote such mortality, this study could be paradigmatic for the development of an important preemptive conservation measure for bat populations. This study received a grant from Bat Conservation International.

*Characterization of the fungal flora present in bat guano and survey of species with clinical interest.* Fungal diversity in bat guano has rarely been examined in caves of Europe and even more rarely in caves of Portugal. In this MSc, prepared by Filipa Vale, a total of 17 caves were surveyed and several guano samples were collected. All fungi isolated from these samples were identified according to their morphological features. When this identification was not possible and to confirm the morphological identification, sequencing of the ITS regions was performed. From all inoculated samples a total of 160 isolates were obtained, from which 40 were identified to the species level, 99 to the genus level and 21 remain to identify. The phylum that prevailed was Ascomycota, with a total of 87 species, followed by the Basidiomycota, and Zygomycota. The most preeminent genus among all caves was *Trichosporon*, with a total of 35 species isolated and at the three temperatures of incubation, followed by *Penicillium*. Some species that may be potential human pathogens were isolated, such as *Acremonium* spp., *Exophiala* sp., *Fusarium* sp., *Paecilomyces* spp., *Scedosporium* sp., *Scopulariopsis* spp., *Verticillium* spp, *Geomyces pannorum*, *Geotrichum candidum*, *Sporothrix schenckii* and *Trichophyton concentricum*. Interestingly, it was isolated in just one cave a filamentous fungus that grew at 15°C, identified as *Geomyces* sp. according to the results of the molecular analysis. However, its macro as well as micro-morphology is very similar to the species *Geomyces destructans*.

*Agent-based modeling to simulate the use of space and effects caused by the installation of a wind farm on *Nyctalus leisleri*.* This MSc, prepared by Daniel Ferreira, aimed to develop an Agent-Based Model focused on the circadian landscape usage patterns of a population of the tree dwelling bat *Nyctalus leisleri* and on the possible mortality events associated to a wind farm. The realism of the obtained results was confirmed by comparing the predominance in the selection of foraging areas and the high mobility, evidenced by the results of maximum distance to roosts and home range size. The use of coniferous forests, broadleaf forests and other land cover were the most important factors for increasing the



home range size. We found that high wind speeds lead to a decrease in the number of fatalities due to the limitations they impose to bat activity. Additionally, there was a clear relationship between mortality events and the proximity between roosts and wind turbines. This methodology presents unique features that distinguish it from other classical forms of modelling. The usefulness of agent-based models was evident because they allowed a better understanding of habitat use patterns and individual response to environmental changes.

*Influence of water availability in bats activity and diversity in the Mediterranean landscapes – the importance of distance to ponds in the South of Portugal.* With climatic changes, the water availability becomes a limiting factor for the presence of fauna; further more in dry regions, such as the Mediterranean region, which is characterized by high ambient temperature combined with low relative humidity. This MSc, prepared by Inês Fernandes, aims to determine how the water availability and the distance to water bodies influences the bats activity and diversity, by comparison of a “normal” year (2011) with a year of severe drought (2012), in the study area. The activity of the bat community was sampled in the surroundings of sixteen ponds, during the past two years. As expected, the results in vicinity of water bodies indicate that bats general activity increased from “typical” year (2011) to extremely dry year (2012), and it was significantly higher in the first fifty meters radius from the ponds."

*The influence of habitat structure on insectivorous bat activity within cork oak woodlands.* This MSc, prepared by Cintia Domingos aimed to verify the relation between bat activity and the vegetation structure within *montado*. In order to reach that goal, we compared the richness and activity of bat species in two different habitat types, *montado* with and without a shrubby understory. Abundance of prey and other factors of the habitat and the vegetation structure that may affect the activity of bats were also evaluated. Bat echolocation signals were registered, along with simultaneous insect capture by light traps, in 5 different *montados* of Portugal, in the region of Alentejo. Although not significantly different, the abundance of prey is greater in *montados* with shrubby understory. Total bat activity is higher in areas closer to water with smaller tree density and taller trees. Only *P. pygmaeus* appears to prefer greater tree densities. Shrubby understory seems to be important for total bat activity, as well as for most other groups studied, except for *Myotis* spp., which seems to prefer areas without shrubs. Prey abundance seems to also be important for total bat activity and, in particular, for *P. kuhlii*.

*Factors affecting bat diversity and activity patterns at the lagoon system of Baixo Vouga and Ria de Aveiro.* This MSc, prepared by Eduardo Mendes, aimed to assess spatio-temporal patterns in bat diversity and activity in the Baixo Vouga Lagunar complex wetland system and to understand the main factors behind those patterns, including climatic

variables, micro-habitat diversity, food availability and sources of human pressure. The study was integrated in a larger-scale, long-term monitoring project within the Baixo Vouga Lagunar wetland, aiming to inventory and describe diversity patterns of several vertebrate taxa including bats, amphibians, small nonvolant mammals, carnivores, and birds. The dissertation was integrated in the project *Factors affecting terrestrial vertebrate diversity and activity patterns at the lagoon system of Baixo Vouga and Ria de Aveiro* Funded by Aveiro University and Observatoire Hommes-Millieux - Estarreja, and partially logistically supported by the Municipality of Estarreja.

*Temporal patterns of roost use and food selection by *Rhinolophus hipposideros* (Chiroptera, Rhinolophidae).* This MSc, prepared by Ana Lino, aimed to understand temporal patterns of roost use by *R. hipposideros* and determine if there is food selection. Funded by Aveiro University and partially logistically supported by Centro de Investigação da Regaleira – CIR.

*Influence of small dams in Chiroptera activity in northeastern Portugal.* This MSc, prepared by Frederico Oliveira, aims to verify whether the reservoirs of dams influence the species richness, activity and foraging of bats in small streams and to evaluate which factors contribute for that influence.

*Automated acoustic identification of bat species.* Recent improvements in bat survey methods in Portugal, especially automatic recording stations, have led to an analysis problem due to the amount of data obtained. This MSC, prepared by Bruno Silva, proposes a possible solution for this: an automated identification R script based on artificial neural networks and using a reference database of recordings obtained in Portugal. The compiled database already includes 748 recordings from 20 different species, made after hand release of captured bats or outside known roosts. The R script for detection of bat calls in a recording, extraction of the calls from the background noise and measuring the 19 parameters used for classification is implemented. A two stage hierarchical classification bat call scheme was implemented based on logistic regression models and ensembles of artificial neural networks. In the first stage calls are classified in six large groups of species, with correct classification rates close to 100%. In the second stage calls are classified in species (or small groups of species) with classification rates that varied between 50% and 100%. This study received a grant from Bat Conservation International.

*Factors Shaping Bat Occurrence in Urban Green Areas.* Urbanisation is one of mankind's longer-lasting activities. Bat species most sensitive to human activities have suffered population declines due to urbanisation and the resulting loss of habitats. The presence of urban green areas in a city can promote the presence of bats and increase their activity in general. Little is known about the characteristics that an urban green area should have to promote the presence of bat species. This MSc, prepared by Gonçalo Duarte, was

conducted in the municipality of Cascais and addresses three questions: What features of urban green areas promote bat activity? Which urban green areas in Cascais have best conditions for bat occurrence? Which urban green areas should be improved? During 67 nights, between September 2011 and October 2012, 354 points in 15 urban green areas were sampled with bat detectors. A total of 39 variables were used to describe the urban green areas, and their surroundings. The data were statistically analysed using Generalized Linear Mixed Models. The most relevant variables were canopy perimeter, proportion of canopy area in green area, and area covered by low shrubs. Higher bat activity occurs where canopy perimeter is greater, when the relative amount of canopy in a green area is high and where shrub vegetation occurs. Bat activity tends to be null in places where the distance to forest edge is greater than 50m. Four urban green areas stand out by having a high number of predicted bat passes, while in two urban green areas predictions indicate very low levels of bat activity. Results suggest that in order to promote bat activity, urban green areas should be forested, have clearings, extensive edge perimeters and low shrubby vegetation. The majority of urban green areas in the eastern part of the municipality need improvement in order to promote bat presence.

*Monitoring bats in the context of the evaluation of ecological impacts of the Picote Dam power reinforcement works.* This Graduation Thesis, prepared by Luis Ochoa aimed to assess the ecological impacts of power reinforcement works on the colonies of bats using the inside of the Picote dam as a shelter. For the fulfillment of the objectives proposed was realized monthly monitoring of the presence, abundance, identification and classification of statutes of conservation of different bats species that occur in Picote dam during the works period, between 2007 and 2011, and post-construction (2013), to evaluate the need to propose measures of minimization. The main results have not revealed significant differences in species richness of bats throughout the years of monitoring but highlighted the post-construction period (2013) as that in which they were registered higher average abundance values. The galleries 1 and 2 of the dam wall exhibited a significantly higher species richness than the others, probably for presenting the best micro-climatic and ecological conditions for bats and not in response to any perturbation induced by the works. Assuming that, in general the reinforcement works had no significant negative impact on the bats using the interior (galleries) of the dam wall, and episodic impacts outside the wall were minimized after the conclusion of the works, remains only the need to continue to apply the measure already proposed in previous years, in particular turn on the lights of the galleries only when it is strictly necessary, in order to reduce the disturbance of the bats that seek this structure as a shelter.

*Bat communities: potential predators of the Pine Processionary population in the Pine Forest of Leiria.* Final project of a Biology Graduation, developed by Ricardo Silva in May

2012, with Denis Medinas, Manuela Branco and Mário Carmo as project mentors and supervisors. The main goal of this study was to understand which bat species were active during the flight period of an insect called “Pine Processionary Moth” (*T. pityocampa*), more specifically of a population with a phenology shift that occurs in Leiria, Portugal, known as “Summer Population”, and to analyze their predatory potential over this population. The level of activity of bats would be analyzed according to an increase in the number of Pine Processionary Moths, in a specific location, depending on the “attraction rate” caused by different amounts of pheromone diffusers. Since the Pine Processionary is a defoliating pest that causes serious environmental, economic and health issues (in both humans and animals), it would be of great significance to understand how these results could be used in a biological control of the pest. However, due to adverse weather conditions during the monitoring period, such as low temperatures and rain, very few moths were observed, thus making the results unreliable.

*Bats in an organic farming sustainable management.* Although currently its economic value is still little recognized, bats feature a relevant biological and ecological importance in the ecosystems. The aim of this final project of a Biology Graduation, developed by Sílvia Pereira was to verify the sustainability of two areas of the Herdade do Freixo do Meio (municipality of Montemor-o-Novo) in the activity of bats, using the inventory of species present and the verification of the presence or absence of shelters in the region. The site was chosen due not only to the fact that presents a wide variety of shelters (housing forest and cave-dwelling species), but also for its proximity to the SIC Serra de Monfurado. Area 1 showed a very diverse community (*P. kuhlii*, *P. pygmaeus*, *Nyctalus* spp., *Myotis myotis/blythii* and *Eptesicus serotinus/isabellinus*), while in area 2 it were found only *Pipistrellus* ssp. and *Nyctalus* spp. Results show that agro-forest-pastoral activities can influence bats, and it was considered that bats worked as indicators of a sustainable organic farming, as it was observed higher abundance and diversity in the area with higher agricultural production and with most significant conservation values.

*Relationship between climatic factors and the usage of an artificial shelter by Rhinolophus hipposideros (lesser horse-shoe bat).* Final project of a Biology Graduation, developed by Iolanda Guerra, focused on understanding how different climatic conditions existing in the winter period influence the activity of a colony of *R. hipposideros*. The population in question occupies an artificial shelter with induced climate variables on Quinta da Regaleira in Sintra. It was concluded that there is a relationship between how individuals use the shelter and the weather conditions outside. More specifically, it was seen that the increase in the number of individuals in the shelter takes place when the relative humidity increases, the temperature decreases, the precipitation increases and the speed of the wind decreases. In relation to the uniformity of the utilization of the shelter, it was found that the

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The regional Government considered important to study the conservation status of bats in the Azores archipelago, by promoting a Regional Bat Census which started in 2012. Sampling was carried out in 2012, 2013 and will continue in 2014. The census aimed to: confirm the results known from an ICNF study in 2002, to promote an internship course for nature watchers and government environmental technicians, acquire new knowledge about the species, increase the sampling area, evaluate bats population's conditions and identify potential sources of threats, as well as promote environmental awareness with local communities. No official report with confirmed data as yet been published.

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- Trujillo, D. & C. Gonzalez (2011). *Pipistrellus maderensis* (Dobson, 1878) (Chiroptera: Vespertilionidae), una nueva adición a la fauna de las islas Azores (oceanio Atlántico). *VIERAEA* 39: 215-218.

### Madeira Archipelago

There aren't initiatives or programmes. Although an attempt was made by Madeira Fauna & Flora with local authorities to apply a LIFE programme dedicated exclusively to Madeira islands bats, the lack of funds in result of the economic crisis, halted this initiative. However, volunteer work by bat researchers resulted in several publications. Also within the Madeiran Biodiversity book collection (*Biodiversidade Madeirense: Avaliação e Conservação*), the Regional Environment Directorate (DRA) published the 6<sup>th</sup> volume dedicated to vertebrates, including bats.

### Publications

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- Russo D., S. Teixeira, L. Cistrone, J. Jesus, D. Teixeira, T. Freitas, & G. Jones. 2009. Social calls are subject to stabilizing selection in insular bats. *Journal of*

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**13. Consideration being given to the potential effects of pesticides on bats, and their food sources, and efforts to replace timber treatment chemicals which are highly toxic to bats**

**Mainland Portugal**

No recent developments in this area. Pest control agencies were contacted in order to explain that bats cannot be harmed during their operations.

**Azores Archipelago**

No developments in this area.

**Madeira Archipelago**

No considerations have been made.

**D. Functioning of the Agreement**

**14. Co-operation with other Range States**

**Mainland Portugal**

Cooperation with Spain concerning the recapture of banded bats is being carried out.

Luísa Rodrigues cooperated with Bat Conservation Trust, Dutch Mammal Society and Statistics Netherlands on the project “*Streamlining European Biodiversity Indicators (SEBI): Development of a prototype indicator of European bat population trends*”.

Luísa Rodrigues, Nuno Pinto, Tiago Brito, Pedro Alves and Paulo Barros cooperated with Sebastien Puechmaille on the project “Investigations in to the distribution, prevalence and

population structure of *Geomyces destructans* across the Western Palearctic”.

Several Portuguese bat workers attended national and international conferences: *Evolution2010* (USA, 2010: Bruno Simões), *15th International Bat Research Conference* (Czech Republic, 2010: Ana Rainho, Bruno Simões, Christoph Meyer, Denis Medinas, Francisco Amorim, Hugo Rebelo, Jorge Palmeirim, Maria João Ramos Pereira, Mário Carmo, Tiago Marques), *VIII Wind Wildlife Research Meeting* (USA, 2010: Hugo Costa, Miguel Mascarenhas, Regina Bispo, Teresa Marques), *4th Conference on Environmental Assessment* (Portugal, 2010: Alexandre H. Leitão, Filipe Canário, Miguel Repas, Nadine Pires, Paulo Cardoso, Ricardo Tomé), *III Jornadas de la Asociación Española para la Conservación y el Estudio de los Murciélagos SECEMU* (Spain, 2010: Francisco Amorim, Milene Matos, Nuno Pinto, Paulo Barros), *VI Congreso Nacional de Evaluación de Impacto Ambiental* (Spain: Hugo Costa), *Conference on Wind energy and Wildlife impacts* (Norway, 2011: Anabela Paula, Hugo Costa, Joana Bernardino, Miguel Mascarenhas, Regina Bispo), *European Mammal Congress* (France, 2011: Bruno Simões), *Annual Meeting of the Society of Molecular Biology and Evolution* (Japan, 2011: Bruno Simões), *II Encontro Ibérico de Biología Subterránea* (Portugal, 2011: Luísa Rodrigues), *41st Annual Symposium on Bat Research* (Canada, 2011: Francisco Amorim, Helena Santos, Hugo Rebelo), *Wind & Biodiversity Seminar* (Portugal, 2011: Bárbara Monteiro, Joana Bernardino, Hugo Costa, Luísa Rodrigues, Maria João Ramos Pereira, Milene Matos, Teresa Marques), *X Congreso de la SECEM* (Spain, 2011: Maria João Ramos Pereira), *I Congreso Ibérico sobre Energía Eólica y Conservación de la Fauna* (Spain, 2012: Hugo Costa, Luísa Rodrigues, Joana Bernardino, João Paula, Regina Bispo), *Annual Meeting of the Society of Molecular Biology and Evolution* (Ireland, 2012: Bruno Simões), *IENE 2012* (Germany, 2012: Denis Medinas), *International symposium on the importance of bats as bioindicators* (Spain, 2012: Hugo Rebelo), *International Statistical Ecology Conference* (Norway, 2012: Regina Bispo), *London Evolutionary Research Network* (UK, 2012: Bruno Simões), *Polish Wind Energy Association Conference* (Poland, 2012: Joana Bernardino), *Portuguese Conference on Pattern Recognition* (Portugal, 2012: Carlos Faneca, Carlos Bastos, Ricardo Correia, José Vieira), *Workshop on Sampling and Experimental Design with Applications* (Portugal, 2012: Regina Bispo), *5<sup>th</sup> White Nose Syndrome Symposium* (USA, 2012: Hugo Rebelo), *32nd Annual Conference of the International Association For Impact Assessment* (Portugal, 2012: Joana Bernardino), *IV Jornadas de la SECEMU* (Spain, 2012: Milene Matos, Eduardo Mendes, Ana Lino), *IVth International Wildlife Management Congress* (South Africa, 2012: Joana Cruz), *IX Wind Wildlife Research Meeting* (USA, 2012: Joana Bernardino), *Conference on Wind Power and Environmental Impacts* (Sweden, 2013: Filipa Peste, Joana Bernardino, Miguel Mascarenhas), *II Jornadas Quiropterianas* (Portugal, 2013: Milene Matos, Nuno Pinto, Ana Rainho, Luísa Rodrigues,

Jorge Palmeirim, Rita Bastos, Gabriel Mendes, Pedro Alves, Bruno Silva, Maria João Silva, Carsoscópio), *3<sup>rd</sup> International Berlin Bat Meeting: Bats in the Anthropocene* (Germany, 2013: Helena Santos, Pedro Alves, Gonçalo Duarte), *16th International Bat Research Symposium* (Costa Rica, 2013: Hugo Rebelo, Helena Santos, Francisco Amorim, Maria João Pereira), *International Symposium on the Importance of Bats as Bioindicators* (Spain, 2013: Hugo Rebelo), *4<sup>ème</sup> Réseau des Observatoires Hommes-Milieux* (Portugal, 2013: Milene Matos), “*O capital natural como fonte de desenvolvimento económico*” (Portugal, 2013: Milene Matos), *III Sement Event* (Portugal, 2013: Milene Matos, André Aguiar), *ObservaRia* (Portugal, 2013: Milene Matos), *7<sup>o</sup> Congresso Florestal Nacional. Sociedade Portuguesa de Ciência Florestais* (Portugal, 2013: Milene Matos), “*Europa 2020: retórica, discursos, política e prática*” (Portugal, 2013: Milene Matos), *ObservaNatura* (Portugal, 2013: Milene Matos), *XI Congreso de la SECEM* (Spain, 2013: Milene Matos), *WINDaba* (South Africa, 2013: Joana Bernardino, Hugo Costa), *5<sup>o</sup> Congresso Nacional de Avaliação de Impacte* (Portugal, 2014: Joana Bernardino).

Luísa Rodrigues participated in several EUROBATS Intersessional Working Groups: *IWG on Conservation of key underground sites*, *IWG on Monitoring and Indicators*, *IWG on Monitoring of daily and seasonal movements of bats*, *IWG on Autecological studies for priority species*, *IWG on Man-made Purpose-built Bat Roosts*, *IWG on Impact of roads and other traffic infrastructures on bats*, *IWG on Lethal fungal infections*, and *IWG on Wind turbines and bat populations*, convening the last one.

Luísa Rodrigues participated in EUROBATS Publications Series n<sup>o</sup> 1 (*1991-2006 EUROBATS celebrates its 15th anniversary*), n<sup>o</sup> 3 (*Guidelines for consideration of bats in windfarm projects*), n<sup>o</sup> 4 (*Protection of overground roosts for bats, particularly roosts in buildings of cultural heritage importance*) and n<sup>o</sup> 5 (*Guidelines for Surveillance and Monitoring of European Bats*).

Luísa Rodrigues and Ana Rainho participated in EUROBATS Publications Series n<sup>o</sup> 2 (*Protecting and managing underground sites for bats*).

All questionnaire sent by EUROBATS’s IWGs were filled.

### **Azores Archipelago**

No information.

### **Madeira Archipelago**

Sérgio Teixeira and José Jesus cooperate at a personal level with Italy (Università degli Studi di Napoli Federico II) regarding data collection in Madeira Island.

Considering the similarities between macaronesian archipelagos in terms of bat

conservation, conversations with Canary archipelago bat specialists are being made to establish working partnerships.

### **15. Measures taken to implement Resolutions adopted by Meetings of Parties**

#### **Resolution 2.2 - Consistent Monitoring Methodologies and Resolution 5.4 – Monitoring bats across Europe**

##### ***Mainland Portugal***

Since 1987 there has been a programme to monitor cave-dwelling species. Maternity and hibernation underground roosts considered being of National importance and some buildings that harbour important colonies of "cave-dwelling species" such as *R. ferrumequinum* and *R. hipposideros* are monitored, in a total of around 40 places each season. Observations inside the roosts are done, counting the individuals or estimating the area of the colonies (visually and with photographs), using the methods described for *M. myotis/blythii* and *M. schreibersii* in the resolution approved in 2MoP and recommended by EUROBATS Publication Series nº 5. These methods can be successfully applied to *R. euryale*, *R. mehelyi*, *M. myotis*, *M. blythii* and *M. schreibersii*, which are very faithful to their roosts and hang from the ceiling, making the observations very reliable. In the case of *R. ferrumequinum* and *R. hipposideros*, there are more problems since they use many roosts to breed, in small numbers. Even during the winter, when they are expected to use only underground sites, they are not as philopatric as other species. In the case of *M. escaleraei* and *M. emarginatus*, although most maternity colonies are known in underground roosts, since normally they use hidden places (especially *M. escaleraei*), very often they are not observable inside. Often, only the capture of flying juveniles enables the identification of maternity sites.

Roosts inventoried during local monitoring programmes established as minimization measures of projects subjected to environmental impact assessment (particularly wind farms and dams) are monitored by promoters. If any underground roost of National importance is found, it is included in the programme coordinated by "ICNF".

A database including all observations done during the Monitoring Programme was updated. Recently, a report on the analysis of the data collected between 1988 and 2012 (ICNF 2014; reference under point 12) includes the trends of cave-dwelling species calculated with TRIM and the characterization of the 76 important roosts.

##### ***Azores Archipelago***

The regional Government started a monitoring program, the Regional Bat Census, in 2012. No official report with confirmed data as yet been published.

### ***Madeira Archipelago***

Not implemented

### **Resolution 2.4 – Transboundary Programme: Habitat Proposals**

#### ***Mainland Portugal***

Since underground habitats are particularly important in Portugal, a special attention has been given to them. In the National Conservation Plan of Cave-dwelling Bats (1992), information about the most important roosts is available.

Using the updated criteria for the identification of roosts of national importance (ICNF 2013; reference under point 12), 76 roosts were identified. The list of important underground roosts was sent in to the relevant IWG and were included in the “List of Internationally Important Underground Sites for bats in Europe” published by EUROBATS; the information was updated in 2014.

### ***Azores Archipelago***

Not implemented.

### ***Madeira Archipelago***

Not implemented

### **Resolution 2.5 – Geographical Scope of the Agreement**

#### ***Mainland Portugal***

A study of migratory patterns of some cave-dwelling species (*M. schreibersii*, *M. myotis* and *M. blythii*) is being conducted.

### ***Madeira Archipelago***

Not implemented

### **Resolutions 2.7 and 3.3 – Format of National Reports**

The reports have been prepared accordingly to the new formats.

### **Resolutions 2.8, 3.8, 4.9, 5.10 and 6.16 – On the implementation of the conservation and management plan**

An effort to implement the Article III of the Agreement has been made, as presented in this Report.

### **Resolution 3.7 – Amendment of the Agreement**

The Amendment adopted at the 3<sup>rd</sup> Session of the Meeting of the Parties was approved (Decreto n° 5/2014, 29<sup>th</sup> January).

### **Resolution 4.3 – Guidelines for the Protection and Management of Important Underground Habitats**

#### ***Mainland Portugal***

No recent developments in this area. Several important underground roosts were already protected with fences. Abandoned mines are being protected with bat friendly methods (referred under point 11). Recommendations included in EUROBATS Publication Series n° 2 are being followed.

#### ***Azores Archipelago***

Not implemented due to the lack of known underground roosts.

#### ***Madeira Archipelago***

Not undertaken chiefly due to lack of known underground roosts.

### **Resolutions 4.4 and 6.12 – Bat Conservation and Sustainable Forest Management**

#### ***Mainland Portugal***

In Portugal forests are not managed specifically to protect bat-feeding habitats. However, some planning/management and regulatory rules protect directly or indirectly feeding habitats and roosts.

Two schemes of sustainable forest management certification (PEFC – Programme for the Endorsement of Forest Certification and FSC – Forest Stewardship Council) started to be applied in 2005 and certified area has been growing (over 200.000 ha PEFC certified forest and more than 300.000 ha FSC by end of 2013). These schemes include the identification of protected/threatened natural values and its protection, emphasizing the integration of a specific indicator on the conservation of long-lived and cavernous trees, especially important for forest bats, as well as the monitoring of the actions.

Guidelines for the elaboration of forestry projects in classified areas for nature conservation were prepared in 2011. The purpose of this document is to assist owners, project designers and machine operators in the development of forestry projects and implementation of forest operations, in view of its compatibility with conservation of natural values.

Above a certain area (which varies by region of the country) privately owned forests has to present a Forest Management Plan (FMP). Since 2009 when the forest holding overlaps

with a classified area for nature conservation the Forest Management Plan must include a Biodiversity Management Program whose aim is to ensure the compatibility and contribution of the interventions proposed in FMP to the conservation of protected habitats and species - including bats - whose favorable conservation status relies upon forest management.

A Best Practice Guide to assist SCI of Monfurado and SCI of Cabrela land owners to preserve habitats and species was prepared. Conservation measures to protect *Myotis myotis* and *Rhinolophus* spp. related to agricultural and forest investments are identified.

Mainland Portugal's rural development program includes roosts protecting compliance. The applicants who commit voluntarily to agri-environmental and forest-environmental schemes, in Nature 2000 areas, must not disturb or destroy the existing roosts. Non-productive investment support for maintaining traditional buildings like watermills, traditional corrals and other old buildings used for roosting, as well as funding for correcting field fences are also available.

Support is available for investments in forests which enhance the public amenity value of forest and wooded land. Funding forest investment plans targeted to woodland management promoting adaptation to natural conditions, protecting biodiversity and features like hedgerows, scattered bushes, indirectly protects bats habitat.

An intervention plan for one SCI (Intervention Plan for the rural space of the SCI of Monfurado; <http://www.cm-montemornovo.pt/pmot/PIER/Relatorio.pdf>) has already come into force. In this management plan several conservation priority areas were defined and mapped, based on their value to bats, particularly forest bats. Strict forest habitats and tree preservation measures were implemented within these areas: preservation of riparian woodland, preservation of montado areas, limits to livestock density, promotion of ground cover diversity, fire control, restriction to the use of barbed wire, and the preservation of drinking water sources.

EUROBATS forestry leaflet was translated to Portuguese (<http://media.wix.com/ugd/ecc655b92f01b5ed06eda9b076493ffe.ugd?dn=folheto.pdf>).

Other points have not been implemented yet.

### **Azores Archipelago**

In Azores, the forests are not managed specifically to protect bat-feeding habitats. However, some support measures directly or indirectly help the promotion of sustainable forest management.

Under the Rural Development Programme of the Azores (PRORURAL) - 2007-2013 (<http://prorural.azores.gov.pt/>) there are measures support for the afforestation of agricultural and



non -agricultural and for forest areas improvement.

Also in this program there are support measures for forest-environmental payments in Natura 2000 forest areas.

There are also agri-environmental measures granted under this program which are intended to preserve traditional rural landscape, thus protecting environment and maintaining natural areas.

### ***Madeira Archipelago***

In Madeira archipelago, forests aren't specifically managed to protect bat-feeding habitats.

### **Resolution 4.5 – Guidelines for the Use of Remedial Timber Treatment**

Remedial Timber Treatment is not commonly used in Portugal.

### **Resolutions 4.6 and 5.5 – Guidelines for the Issue of Permits for the Capture and Study of captured wild Bats**

#### ***Mainland Portugal***

All issued permits (n=109) and field work activities have taken these guidelines into consideration.

### ***Azores Archipelago***

In Azores there is a specific form of License Application for study and/or handling of wildlife (“Pedido de Licença para estudo e/ou manuseamento de animais selvagens”) for those interested in obtaining licenses for works that have scientific, education or conservation goals. License applications are analysed under the Decreto-Lei No.140/99, 24<sup>th</sup> April 1999, adapted to Azores Region by the Regional Legislative Decree n°18/2002/A, 16<sup>th</sup> May 2002, amended by Decreto-Lei No. 49/2005, 24<sup>th</sup> February 2005 and by Decreto-Lei No. 316/89, 22<sup>nd</sup> September 1989. Since the publication of the Regional Legislative Decree No. 15/2012/A, 2<sup>nd</sup> April 2012, that this form is analysed under this new regional decree.

### ***Madeira Archipelago***

All issued permits (n=2) and field work activities have taken these guidelines into consideration and following national legislation.

### **Resolutions 4.7, 5.6 and 6.11 – Wind Turbines and Bat Populations**

#### ***Mainland Portugal***

Divuligation of the impacts that some wind farms may have on bat populations has been

done.

Current recommendations for Environmental Impact Assessment of wind turbines projects (<http://www.icnf.pt/portal/naturaclas/patrinatur/resource/docs/Mam/morc/morc-recom-p-eolic>) include three components: habitat survey (ground bat detectors surveys), roost inventory/monitoring and mortality (including Carcass Removal and Searcher Efficiency rates). The two first components should be studied 1 year before and 3 years after the construction of the wind farm (as well the third one), to allow comparisons. Depending on the results, the monitoring will continue. A report on the effect of wind farms on bats in continental Portugal (data 2001-2009) is available online (<http://www.icnf.pt/portal/naturaclas/patrinatur/resource/docs/Mam/morc/parq-eol-morc-pt>). The document comprises the analysis of 171 reports regarding 49 wind farms.

Due to close locations regarding important underground roosts, two projects were authorized with cut-in speed increased. A project including 7 turbines, one located 158 m from one important hibernating roost (around 4000 *Miniopterus schreibersii* and 150 *R. ferrumequinum*), was authorized with cut-in speed increased to 5 m/s in October, November, December, March and April. A project including 4 turbines located less than 7 km from the most important underground roost known in mainland, occupied all over year by many thousands of bats of several species, was authorized with cut-in speed increased to 3.3 m/s.

Some papers were published, and PhD and projects have been prepared or are under preparation (referred under point 12).

Three companies (Bio3, ECOSATIVA and STRIX) are already using dogs in carcass searches.

Since 2001, 870 carcasses of at least 11 species were found (*P. pipistrellus*, *P. pygmaeus*, *P. kuhli*, *H. savii*, *N. leisleri*, *N. noctula*, *N. lasiopterus*, *T. teniotis*, *M. daubentonii*, *E. isabellinus*, *M. schreibersii*) (Table 7) but it is not possible to evaluate its impact on populations. *P. pipistrellus* and *N. leisleri* are the most affected species. Data were recorded by several companies: AgriPro Ambiente, Bio3, Biota, Ecomind, Colmus, Ecosativa, Ecosfera, EDP, ENEOP 2, EolFlor, Iberwind II, LEA/UTAD, Lestenergia, Naturibérica, NOCTULA, Plecotus, Procesl, Profico Ambiente, ProSistemas, STRIX and Tecneira.

Table 7 – Fatalities observed in Portuguese wind farms, per species.

Species	Fatalities number	% mortality/species
<i>P. pipistrellus</i>	243	27,9
<i>N. leisleri</i>	206	23,7
<i>Pipistrellus</i> spp.	85	9,8
<i>H. savii</i>	43	4,9

<i>P. kuhli</i>	37	4,3
<i>P. pipistrellus/pygmaeus</i>	35	4,0
<i>P. pygmaeus</i>	31	3,6
<i>T. tenotis</i>	22	2,5
<i>P. pipistrellus/kuhli</i>	19	2,2
<i>Eptesicus</i> spp.	16	1,8
<i>Nyctalus</i> spp.	16	1,8
<i>N. lasiopterus</i>	8	0,9
<i>M. schreibersii</i>	3	0,3
<i>M. daubentonii</i>	2	0,2
<i>N. noctula</i>	1	0,1
<i>E. isabellinus</i>	1	0,1
no identified	102	11,7

Most fatalities belong to more abundant species, with “Least concern” status (52%), indicating a reduced effect in species known to be threatened. However, the relative high percentage belonging to “Insufficient information” species (34%) may indicate worrier negative impacts on species that may have a unfavourable status.

Observed fatalities occurred between April and October, with a major peak in September and a smaller peak in May (Table 8 and Figure 3).

Table 8 – Fatalities observed in Portuguese wind farms, per month.

Month	Fatalities number	% mortality/month
September	252	30,2
August	188	22,5
May	116	12,4
October	92	9,2
June	81	9,4
April	81	9,4
July	49	5,8
March	5	0,5
November	5	0,5
February	1	0,1
January	0	0,0
December	0	0,0

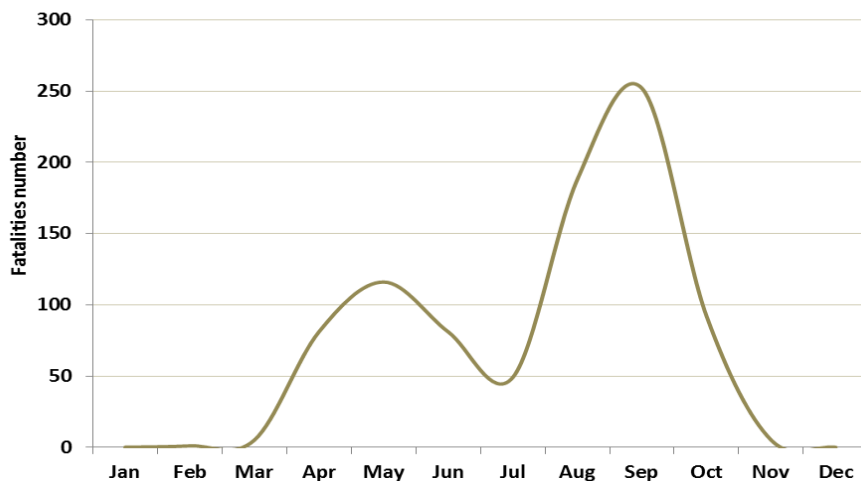


Figure 3 – Variation of observed mortality along the year.

A workshop between “ICNB”, “Agência Portuguesa do Ambiente” and technicians who are monitoring wind farms was organized in 2010. It was the second meeting of this forum, and it was an opportunity to analyse monitoring data and to discuss monitoring methodologies and procedures.

An experiment on changing cut-in speed was carried out in a wind farm located in the “Serra do Alvão” (Parque Eólico Outeiro), North-western Portugal, with 15 turbines. Each turbine was searched in 2010 every day from 15 September to 15 October. A circular plot with a radio of 60 metres was centred and superimposed to each turbine. Since no bat activity was detected above 3,2 m/s of wind speed (recorded at ground level), the experiment with changing of cut-in speed at 3,3 m/s was tested in six turbines, 4 where fatalities were found in 2006 (12) and 2008 (20) and 2 where no mortality was detected. During the study period, 10 bat carcasses were found, including 6 *Pipistrellus pipistrellus* (60%), 2 *Pipistrellus pygmaeus* (20 %) and 2 *Nyctalus leisleri* (20 %). The initial 2 carcasses (1 *Pipistrellus pipistrellus* and 1 *Pipistrellus pygmaeus*), found in the first day of the fatalities search, were discarded, since only in the second day it was possible to take into account all the requirements for accurate mortality estimates. Overall, from the 8 fatalities considered (6 *P. pipistrellus* and 2 *N. leisleri*), only 1 was detected in the changed-speed turbines and the remaining 7 were found in the normal-speed turbines. The estimated mortality was 0,332 bats/turbine in changed-speed turbines and 1,554 bats/turbine in normal-speed turbines. Considering the resultant global tendencies, the expected reduction in the bat mortality estimates ranged from 78,5%, if all 15 turbines were working in changed-speed regime (4,98 fatalities), to 31,4%, if only 6 turbines were working in changed-speed regime (15,99 fatalities), which represents a relevant result when compared with the scenario where all the 15 turbines were working in normal-speed (23,31 fatalities). The study was performed by the Laboratory of Applied Ecology from the Centre

for the Research and Technology of Agro-Environment and Biological Sciences (CITAB), “University of Trás-os-Montes e Alto Douro” in collaboration with “Mãe d’Água, Lda” and was funded by “Parque Eólico do Outeiro, Lda”.

### ***Azores Archipelago***

The use of wind power for electricity production is subject to Environmental Impact Assessment, depending on their size and location, according to the Legal regime of impact assessment and environmental licensing, by the Regional Legislative Decree N°. 30/2010/A of November 15<sup>th</sup>, specifically in the Annex II.

### ***Madeira Archipelago***

As written in several monitoring reports made by a few companies about some Wind Turbine parks on the Island, bat monitoring wasn’t made. This situation is extremely serious, especially considering that most species are threatened or poorly known. Some of reports read, state that bats don’t occur in those areas, so no monitoring was performed. Logically, if no information is available it doesn’t mean that there aren’t any bats on the area. Hence, prime importance should be given to data collection about bat presence in the area before park implementation works start.

## **Resolution 5.2 – Bats and Rabies in Europe**

### ***Mainland Portugal***

The analysis of several species was carried out by “Instituto Nacional de Investigação Agrária e Veterinária”. Oral swabs of seven *Myotis blythii*, one *Myotis daubentonii*, 24 *Myotis myotis*, 12 *Myotis escalerai* and 26 *Myotis emarginatus*, and pools of guano from *Myotis myotis*, *Myotis escalerai*, and *Miniopterus schreibersii*, were collected in different geographical points of the country; all the samples tested negative by RT-PCR for classical rabies and rabies-related bat lyssaviruses.

All bat workers are advised to handle bats in the expectation that they may have rabies and are encouraged to get rabies vaccinations and to use gloves.

Other points have not been implemented yet.

### ***Azores Archipelago***

Not implemented.

### **Madeira Archipelago**

Not implemented

### **Resolution 5.7 – Guidelines for the protection of overground roosts, with particular reference to roosts in buildings of cultural heritage importance**

#### **Mainland Portugal**

The known overground roosts are included in the database on bat observations. The roosts occupied by important colonies of species with cave-dwelling habits (*R. ferrumequinum* and *R. hipposideros*) are being monitored, and an agreement about its maintenance has been achieved with the owners.

Two alternative overground roosts were built in the past. One roost (“Morcegário de Tróia”) was built in 2003 to compensate the destruction of one building that harboured *T. teniotis*, *Eptesicus* spp. and *Pipistrellus* spp; the roost is currently used by *T. teniotis*, *Eptesicus serotinus* and *Pipistrellus pipistrellus*, but there is no confirmation on its use as a maternity. The other roost (“Morcegário da Regaleira”) was temporarily created in 2008 and definitely created in 2009; the roost is used all over the year by *R. hipposideros*, and the maternity colony is one of the biggest known in the country.

An informative guide for the general public regarding cohabitation with bats and bat exclusion was prepared and is available on-line (referred under point 12).

Suggestions contained in EUROBATS Publication Series nº 4 are being followed.

Other points have not been implemented yet.

### **Resolution 6.5 – Guidelines on Ethics for Research and Field Work Practices**

#### **Mainland Portugal**

This Resolution was divulgated among investigators from Universities and Natural History Museums and technicians who are doing field work.

### **Azores Archipelago**

Not implemented.

### **Madeira Archipelago**

Undertaken by local researchers.

**Resolution 6.6 – Guidelines for the Prevention, Detection and Control of Lethal Fungal Infections in Bats**

***Mainland Portugal***

Relevant information on fungal infection in bats has been forwarded to investigators, technicians doing field work and speleologists.

Particular care is being taken regarding the identification of signs of potential fungal infection in bats during field work.

Realization of MSc, PhD and projects in this area are being fostered. Samples regarding the project “Investigations in to the distribution, prevalence and population structure of *Geomyces destructans* across the Western Palearctic” were collected.

Other points have not been implemented yet.

***Azores Archipelago***

Not implemented.

***Madeira Archipelago***

Not implemented

**Resolution 6.7 – Conservation and Management of Critical Feeding Areas, Core Areas around Colonies and Commuting Routes**

***Mainland Portugal***

Divulcation of the importance of critical feeding areas, core areas around known colonies and commuting routes for bats has been done.

An effort for environmental impact assessments take into consideration bats’ needs has been made.

Other points have not been implemented yet.

***Azores Archipelago***

Not implemented.

***Madeira Archipelago***

There isn’t any management or conservation of important feeding areas. As stated above, some of most important feeding areas have been destroyed in recent years.

**Resolution 6.8 – Monitoring of Daily and Seasonal Movements of Bats**

***Mainland Portugal***

A study of migratory patterns of some cave-dwelling species (*M. schreibersii*, *M. myotis* and

*M. blythii*) is being conducted, using capture-recapture data of banded individuals. Cooperation with Spain regarding the shares of information about recaptured bats is being carried out.

Banding is being done accordingly to Resolution 4.6.

Other points have not been implemented yet.

### ***Azores Archipelago***

Not yet implemented.

## **Resolution 6.9 – Year of the Bat**

### ***Mainland Portugal***

Year of the Bat campaign achieved extraordinary results in 2011 and 2012, as referred under point 9.

“ICNB” prepared a very informative website, a bulletin (with news, summaries of some activities and announcement of events) and an agenda for 2011 dedicated to this theme, and provided translation for EUROBATs resources. “Carsoscópio” published an agenda for 2012 dedicated to bats.

In both years more than 70 persons and entities organized many dozens of activities, attend by more than 15000 participants. Activities included talks in schools and Universities, ateliers in schools, talks for general public, talks in National Conferences, walks with bat detectors, exhibitions, workshops on morphological and acoustic identification of bats, visit to Museum’s bat collection’s, and divulgation papers in magazines and newspapers. Additionally, many schools studied bats and organized activities, such as talks, contests and exhibitions.

Several activities and 2 big exhibitions were organized in 2013.

Several newspapers, magazines, radios and televisions divulgated news on bats and the Year of the Bat.

### ***Azores Archipelago***

The start of the project “Bat Census of the Azores” coincided with the Year of the Bat. This project has a strong monitoring objective, but also an important environmental awareness component. Since it started in March 2012, several environmental awareness sessions were made. See chapter 9 “Activities carried out to promote the awareness of the importance of the conservation of bats”.



### ***Madeira Archipelago***

Several activities have been carried out in Madeira:

- Bat night included within the Researchers' Night 2011 organized by Centro de Ciência Viva of Porto Moniz;
- Publication of the book "Vertebrados terrestres autóctones dos Arquipélagos da Madeira e Selvagens. Répteis e mamíferos. Biodiversidade Madeirense: Avaliação e Conservação", published by Direcção Regional do Ambiente (Regional Environmental Directorate).
- Additionally several articles about bats were published in regional and national magazines and newspapers as well as close contact awareness and demystification with farmers and general population during field work carried out voluntarily by Sérgio Teixeira, David Teixeira, José Jesus and Tamira Freitas.
- Porto Santo Island Municipality in association with Porto Santo Verde dedicated its VII Environmental Symposium to Bats, under the theme "À descoberta do morcego do Porto Santo"
- Under the program Ecoescolas (Ecoschools), the "Escola Básica do 1º Ciclo do Porto Santo" School displayed the movie "O Morcego – A extinção é para sempre" on the symposium. The movie was made by its students and supported by the teacher Rosa Afonso.
- Lecture at the VII Environmental Symposium of Porto Santo Island by Sérgio Teixeira.
- On the 30th of December, under the EUROBATS International Bat Night event, the ecotourism company Madeira Fauna & Flora organized an open Bat watching night to the closing of the International Year of Bat on Madeira Archipelago.
- Numerous bat watching nights and open International bat nights carried out by Madeira Fauna & Flora company.

### ***Resolution 6.10 – Synergies between the Agreement and Other European Treaties for Nature Conservation***

An effort to implement this Resolution has been made, as presented in this Report.

### ***Resolution 6.13 – Bats as Indicators for Biodiversity***

#### ***Mainland Portugal***

The only action was the participation in the project "Streamlining European Biodiversity Indicators (SEBI): Development of a prototype indicator of European bat population trends" (prepared by Karen Haysom, Jasja Dekker, Jon Russ, Tom van der Meij and Arco van Strien, 2011), providing hibernation data.

***Azores Archipelago***

Not implemented.

***Madeira Archipelago***

Not implemented.

**Resolution 6.14 – Impact of Roads and Other Traffic Infrastructures on Bats**

***Mainland Portugal***

An effort for environmental impact assessments of roads and other traffic infrastructures take into consideration bats' needs has been made.

There is a manual (“Manual de apoio à análise de projectos relativos à implementação de infra-estruturas lineares”; <http://www.icnf.pt/portal/naturaclas/ordgest/aa/resource/doc/man-infra-lin>) which aims to be a guideline for the analysis of new infrastructures (roads, railway lines and canals) projects. The manual gathers referenced information on impacts, minimization measures, compensation and monitoring of natural values.

Other points have not been implemented yet.

***Azores Archipelago***

Not implemented.

***Madeira Archipelago***

Not implemented.

**Resolution 6.15 – Impact on Bat Populations of the Use of Antiparasitic Drugs for Livestock**

***Mainland Portugal***

This Resolution was divulgated to “Direcção-Geral de Alimentação e Veterinária”, the entity in charge of this subject.

***Azores Archipelago***

Not implemented.

***Madeira Archipelago***

Unknown.