

**AGREEMENT ON THE CONSERVATION OF
 POPULATIONS OF EUROPEAN BATS**
Report on implementation of the Agreement in Portugal
- 2012 / 17 Advisory Committee Meeting -

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A. General Information

- ◆ *Name of Party:* Portugal
- ◆ *Date of Report:* 9 April 2012
- ◆ *Period Covered:* June 2010 to February 2012 (additional data since October 2000 is present for Madeira Archipelago)
- ◆ *Competent Authority for Mainland Portugal:* Instituto da Conservação da Natureza e da Biodiversidade (ICNB)
- ◆ *Note:* Due to the revision of the geographic scope of EUROBATS (Resolution 6.3), the archipelagos of Madeira and Azores are presently included in the area covered by the Agreement.
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- ◆ *Contributors Madeira Archipelago:* Ana Rainho, 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 22nd 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), José Jesus, Ricardo Antunes, Sérgio Teixeira, Tamira Freitas

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 escalerae* (replacing *M. nattereri*) was confirmed in mainland; it is still uncertain if *M. nattereri* is also present.

Azores Archipelago

According to 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).

2. Status and Trends

Mainland Portugal

Table 1 shows the status and the apparent population trends of the species known in mainland.

*Table 1 - Status and apparent population trends of the species known in mainland (data published in the Portuguese Red Data Book); trends were calculated only for species with status other than Least Concern. *: Portuguese Red Data Book refers to M. nattereri, the presence of M. escaleraei was confirmed after 2005. **: not evaluated because its presence was confirmed after 2005.*

Species	Status	Apparent Trend
<i>Rhinolophus ferrumequinum</i>	Vulnerable	Indeterminate
<i>Rhinolophus hipposideros</i>	Vulnerable	Indeterminate



<i>Rhinolophus euryale</i>	Critically Endangered	Declining
<i>Rhinolophus mehelyi</i>	Critically Endangered	Severe declining
<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	Declining
<i>Myotis blythii</i>	Critically Endangered	Severe declining
<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.*: no records since 1872; **: 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>		

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	Unknown
<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). Around 40 roosts are identified as National Importance in each critical season (hibernation and maternity) and have been monitored annually since 1987.

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

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.

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.

Besides anthropogenic structures, a few natural structures are used by bats as roosts. Within natural roosts, rock crevices and several trees such as Madeira Mahogany *Ocotea foetens*, are used in Madeira Island. Grey Long-eared bats were found roosting under the bark of *Erica arborea* in *Clethro arborea*–*Ocotea foetentis*/*Polysticho falcinelli*–*Erica arborea* ecotone.

Several other sites are listed as areas where potential roosts exist, either by reported or observed swarming and will be prospected soon. Other roosts with considerable numbers were reported during inquiries. However, given that these had been destroyed or abandoned and no specimens were observed, no droppings were visible or echolocation calls recorded, no information is available about the species that roosted in the site.

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 the caves are frequently found. Disturbance is particularly malefic during the hibernation and maternity seasons.

Roost destruction

Currently this problem seems to be very rare in natural roosts. Several calls concerning bats in houses were received and support on exclusion was provided in a few cases.

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

Between 2009 and 2011, a total of 529 bat casualties of at least 13 species (*R. ferrumequinum*, *R. hipposideros*, *P. kuhli*, *P. pipistrellus*, *P. pygmaeus*, *P. austriacus*, *E. serotinus*, *M. daubentonii*, *M. bechsteinii*, *M. escalerae*, *M. schreibersii*, *N. leisleri*, *B. barbastellus*) were found dead in roads, but there is few quantitative data on this subject. Results showed that bats are more vulnerable during specific life-history periods, as lactation, mating and migration to swarming and autumn roosts. The greatest incidence of road-kills was recorded at places where roads crossed high quality habitats.

Wind-turbines

Since 2001, 689 carcasses of at least 11 species (*P. pipistrellus*, *P. pygmaeus*, *P. kuhli*, *H. savii*, *N. leisleri*, *N. noctula*, *N. lasiopterus*, *T. teniotis*, *M. daubentonii*, *E. isabellinus*, *Eptesicus* sp, *M. schreibersii*) were found, but it is not possible to evaluate its impact on populations.

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 major threats that occur in Madeira archipelago are:

Disturbance

As seen in the roost chapter, disturbance is still a major factor affecting bat populations in Madeira, especially due to the lack of protection and education. Similarly to the mainland territory, there has been an increase in the number of people involved in outdoor activities, chiefly levada walks, trekking in footpaths and canyoning. The type and quantity of disturbance factors is vast and some very hard to control, such as bat shooting and reconstruction or rehabilitation of old buildings, where most roosts are located.

Roost destruction

As aforementioned, roost destruction is predominantly result of indirect anthropogenic action such as building rehabilitation or reconstruction. Some cases were a consequence of direct action towards bats, has reported in the destroyed Madeira pipistrelle roost of Janela.

Loss of feeding areas

Although difficult to quantify, feeding areas where a sharp drop in the number of foraging bats was observed, are located in areas affected by forest fires, especially the great fire of 2010, with 10 kilometres extension, had devastating effects on biodiversity of forest and mountainous areas in Madeira Island. Another observed case was an area where a hotel and a small road network were built where *P. maderensis*, *N. leisleri verrucosus* and *P. austriacus* foraged in considerable number and currently does not reveal the presence of any species. The construction work affected biotopes that existed and may have destroyed some unidentified roost in the area.

An additional factor affecting bat feeding areas is the sudden increase of subsistence farmers and farming areas in result of unemployment growth caused by the present debt crisis. This factor may reveal itself critical to bat populations, considering habitat changes and the use of agrochemicals by untrained farmers. Most threats are exercised in rural and urbanized areas, since most forested areas are located within the boundaries of protected areas.

One positive factor is the enlargement of organic farming verified in the past years, which increases the suitability of the fragmented landscape between habitat patches and the functional connectivity between food patches.

Pesticides



Although pesticides and agrochemicals overall may affect bats, this threat isn't accounted in Madeira Island. The only exception verified, occurred in a roost where a few tenths of bats roosted and the owner applied insecticide to kill the cockroaches' pest. He reported that all the bats inside the roost disappeared after the application of the chemical. Hence, although the chemical application apparently didn't cause any fatalities to bats, it indirectly caused the abandonment of the roost. Thus, we can consider that pesticides can affect bats at least indirectly.

Traffic injuries

Although there are some reports of casualties caused by traffic collisions, there isn't any data concerning the number of individuals and species affected. The data concerning traffic collisions would be quantitatively feasible in the case of a voluntary campaign by local population.

Wind-turbines

Although in the past years several wind-turbine parks were installed in mountainous areas of the central mountain massif, most reports just state the absence of bats in the area, thus disabling any possibility to evaluate its impact on bat populations.

5. Data Collection, analysis, interpretation and dissemination

Mainland Portugal

Data collection, analysis, interpretation and dissemination are done by "ICNB", 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 Relvo – Clube de Montanhismo", "Núcleo de Espeleologia de Leiria", "Espelo 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://portal.icnb.pt/ICNPportal/vPT2007/Valores+Naturais/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://portal.icnb.pt/ICNPportal/vPT2007/O+ICNB/Ordenamento+e+Gestão/Plano+Sectorial+da+Rede+Natura+2000/>) 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).

Azores Archipelago

Data collection, analysis, interpretation and dissemination are done by “Universidade dos Açores” 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 distribution, in 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 Decreto Regulamentar nº 5/2009/A, 3rd June 2009) and the 17 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 a plan (“Plano Sectorial da Rede Natura 2000”, published by Decreto Legislativo Regional n.º 20/2006/A, 6th June 2006, amended by Declaração de Retificação n.º 48-A/2006, 7th August 2006 and by Decreto Legislativo Regional n.º 7/2007/A, de 10th April 2007; <http://www.azores.gov.pt/grasram-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.

Madeira Archipelago

Since 2000 that data collection, analysis, interpretation and dissemination has been carried out voluntarily by Sérgio Teixeira, David Teixeira and Tamira Freitas. Since 2008, José Jesus (Madeira University) and Danilo Russo (Naples University) have joined the voluntary group and increased the group capacity in molecular and ecological data collection and thus in determining best conservation approaches. However, given the lack of financial and logistical support, data collection and monitoring is severely affected. In the last years, several environmental initiatives, both by private or public institutions have included bats in their programme. Presently the dissemination is supported by “Direcção Regional do Ambiente” (Regional Environmental Directorate), University of Madeira, Centro de Ciência Viva of Porto Moniz and Municipality of Porto Moniz.

All collected bat records are being inserted in the Madeira Biodiversity database BIOBASE. This database is under the responsibility of Direcção Regional do Ambiente (Regional Environmental Directorate). The management and update of BIOBASE is being carried out by Madeira Fauna & Flora, a private company which is also starting an environmental education programme in partnership with several entities to enlighten local population about bats importance and also organizing bat conservation tours. All collected data by Madeira



Fauna & Flora is given to local Regional Environmental Directorate and loaded in BIOBASE.

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.

However on 25th January 2012 Regional Parliament approved, on proposal of the Government, a new legal framework that establishes nature conservation and biodiversity. This document transposes Birds and Habitats Directives and various International Conventions and Regulations to regional law. This legislation waits for publication.

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.

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. The actual list of Portuguese SCI's includes the majority of underground important roosts.

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

The roosts of the remaining species are still poorly known, but the Atlas initiated in March 2011 will certainly change this situation.



Azores Archipelago

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 (Decreto Legislativo Regional n.º 15/2007/A, 25th June 2007).

Natural Island Parks are the basic management unit of the Regional Network of Protected Areas in Azores archipelago.

This structure allows territory management to 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/>).

Natural Island Parks include the most important terrestrial habitats, from coastal to mountain areas including many different habitats that are essential to bats.

Madeira Archipelago

Although several sites are identified in Madeira Island as important feeding areas or roosts, 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.

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 most 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 equipped with management and action tools for conservation of the most representative components of the natural heritage and biodiversity and which occupy a significant proportion of the land territory (around 25%), include various habitats that are essential for bat species.

Control of Invasive flora species in sensitive areas with natural vegetation and its restoration are measures that directly and indirectly influence the availability of habitats.

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



and “LIFE Laurissilva Sustentável” Project.

Madeira Archipelago

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

14th Bat Night was celebrated during 2010 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).

15th Bat Night 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).

The Portuguese “Year of the Bat” campaign was launched in March 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 ongoing Atlas, a FAQ section, and the possibility for asking questions. In December 2011 the website was visited by more than 9500 persons, and dozens of questions were answered.



“ICNB” prepares regular bulletins (with news, summaries of some activities and announcement of events) (http://www.wix.com/anodomorcego/icnb/noticias-eventos#!__docs/newsletter).

A facebook profile was created (“Morcegos de Portugal”; <http://www.facebook.com/people/Morcegos-de-Portugal/100002664247843>). This profile has already proved a fundamental tool to publicise the events that were organised during the first half of 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.

“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.

“Almargem” published the leaflet “Morcegos do Algarve” (Santos 2001 in http://www.wix.com/anodomorcego/icnb/docs#!__docs/diversos)

“ICNB - Parque Natural Sintra-Cascais” produced the poster “Os morcegos do PNSC” (http://www.wix.com/anodomorcego/icnb/docs#!__docs/diversos).

During 2011 more than 30 persons and entities organized many dozens of activities, attend 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 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 Fonteireira”, “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”), 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”.

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).

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

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.

A private company, Natuga, led by biologists created touristic walks with bat detectors in a partnership with São Jorge Castle in Lisboa. In 2011 twelve walks were done throughout the summer with a total of about 200 participants. Additionally, 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.

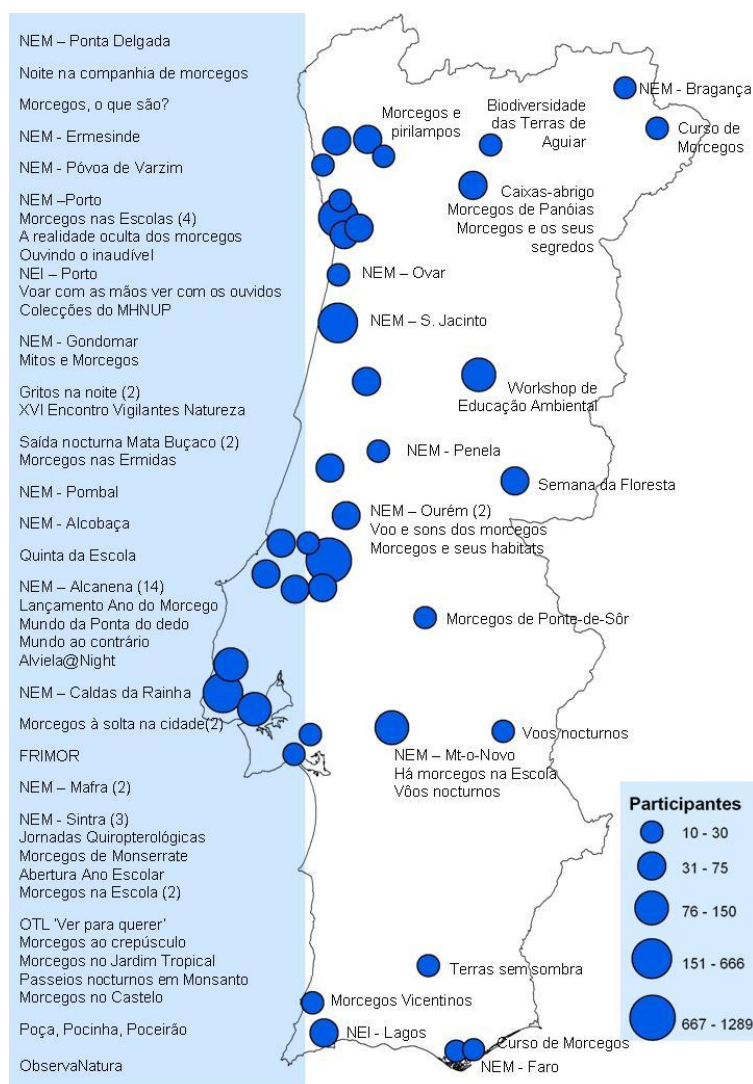


Figure 1 – Events organized in 2011.

There is a website (<http://static.publico.clix.pt/morcegosnaweb>) which includes online images collected in a maternity roost by four infrared cameras and videos. Visitors may ask questions, which are answered by specialists.

There is a blog (<http://morceguismos.blogspot.com/>) which intends to be a way of dissemination and raising awareness about bats. It includes the divulgation of past and ongoing projects, news, activities and technical reviews.

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?option=com_content&view=article&id=30:abrigos-de-importancia-nacional-epocas-de-hibernacao-e-de-criacao&catid=36:quiropteros-cavernicolas&Itemid=65).

Azores Archipelago

In October 2011 a Bats Night was organized in Ponta Delgada, by “Amigos dos Açores” in collaboration with ICNB. Around 50 participants participated in a walk with bat detector, preceded by a talk.

Regional Government decided to proceed with a project for bat protection, included in the Plan “Mais endémicas – plantar o futuro”. It is expected to start the inventorying and monitoring of bat species in the archipelago in the first half of 2012. Thus, as a first contribution to their conservation, training actions will be developed for Natural Island Parks be able to start the monitoring of bat populations in the existing protected areas.

This project supports the efforts advocated worldwide as part of the celebrations of International Year of the Bat (2011-2012).

Madeira Archipelago

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;

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.

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

“ICNB” was designated as the body responsible for the provision of advice on bat



conservation and management (Despacho nº 14536/2010, 26th August 2010). However, since archipelagos of Madeira and Azores are presently included in the area covered by the Agreement, other regional bodies must be designated.

11. Additional action undertaken to safeguard populations of bats

Mainland Portugal

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. Several mines were already closed with bat friendly methods.

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 currently being developed by Lúcia Antunes 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.



Mainland Portugal

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. We found very significant differences ($p < 0,01$) between habitats: 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. Although few are known about bat mortality on these structures, we hope to contribute to a better understanding of their impact on bats.

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.

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.

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”, aiming the development of research lines in partnership with several universities and other entities of scientific expertise.

Alviela Ciência Viva Centre (“Carsoscópio”). The Centre is located in the proximities of one of the country's most important maternity roosts and holds an interactive exhibit totally dedicated to bats – The Quiroptário (<http://www.alviela.cienciaviva.pt/home/>). This Ciência Viva 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 Centre has an annual visitation rate of about 17000 visitors. The Centre promoted 27 awareness raising activities in schools with the total participation of 993 students (pre-school to Junior high).

Monitoring programme of cave-dwelling species. A monitoring programme of the cave-dwelling species is in progress since 1987, coordinated by “ICNB”. 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. Co-funded by “ICNB”, “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 Relvo – Clube de Montanhismo”, “Núcleo de Espeleologia de Leiria”, “Espelo Clube de Torres Vedras”, “Núcleo de Espeleologia de Alcobaça”, “Núcleo de Espeleologia da Associação Académica da Universidade de Aveiro” and “Geonauta”).

Bat exclusion. Whenever necessary, exclusion activities in houses are conducted by rangers, after training. There is a document with general information on cohabitation with bats and advices 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://portal.icnb.pt/NR/rdonlyres/AE340217-C2C3-4F30-9FB2-D0C0EBFB5FC3/0/Guia_coabit_exclus_morceg.pdf). 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.

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 already colonized by the colony, and bats started to breed there in 2011. 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.

Monitoring of a complex of roosts of *R. euryale* in Sintra. Less than 1000 individuals of *R. euryale* are estimated in mainland Portugal and it is considered that the population is decreasing. In 2009, speleologists discovered in Sintra Mountain Range a maternity roost 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)”.

Optimization of bats mortality rate monitoring on wind farms. ECOSATIVA is developing an optimized methodology to more accurately access the real mortality rates on wind farms. The high influence of the correction factors on estimating mortality are a well know 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. The final result should be presented by the beginning of 2013.

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 type of 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 is being conducted by Jorge Palmeirim, Ana Rainho, Tiago Marques, Christoph Meyer, Ana Leal and some students) is 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. Both groups are well suited for this investigation because they have a high diversity of species, can reach fairly high densities, and are known to respond to environmentally friendly agricultural practices. In addition, their abundances are relatively easy to estimate, and our team has good experience working with both groups on farmland in southern Portugal. The influence of various montado management options on its richness in birds and bats will be tested. Since this influence is often mediated by the availability of food resources, in several tasks particular attention to insects, the most important food for all our bats and for most passerine birds, will be given. Funded by “Fundação para a Ciência e a Tecnologia”.

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 develop 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).

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 partially logistically supported by the Municipality of Estarreja.

Bats in the City. This ongoing project aims to study the ecology of bat communities at the urban area of Cascais, and is being conducted by Gonçalo Duarte in cooperation with the Cascais City Council (Sara Saraiva, João Melo and Vasco Silva) and scientifically coordinated by Hugo Rebelo. The project aims to: identify the species present in the urban parks and other urban green areas relating them to the area characteristics, acknowledge the importance of every green area and relating it to its characteristics, search and characterize the roosts present in older green areas, accompany the colonization process of the recently constituted urban parks. At the end, the project should result in a management manual to promote and increase the presence of bat communities in urban green areas.

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.

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 is being conducted by dozens of volunteers and coordinated by “ICNB”) is thus to overcome this issue, specifically: (a) map the present distribution of the 25 bats species known to occur in mainland Portugal; (b) understand and model some factors that may hinder bat distribution and richness; (c) populate a database that will make this information to all interested parts; (d) gather data on the knowledge that Portuguese population has on bats, through ethnozoological enquiries; and (e) 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 external characters). To train volunteers, nine courses on morphological identification (129 participants) and four courses on acoustic identification (41 participants) were organized.

Wildlife Fatality Estimator: from bias correction factor to corrected fatality estimates. The Wildlife Fatality Estimator is totally free on-line platform that can be used to estimate bat mortality associated with wind farms or other human infrastructures (www.wildlife-fatality-estimator.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.

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 will end 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. The study was conducted 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 lower and central Alentejo and citrus in the Algarve. The study on bats is being conducted by Tiago Marques. The second phase of the project will advise the farmers on which management practices can increase the biodiversity value of each group. 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”.

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”.

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 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”.

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.

Winter activity of bat communities. The principal objective of this PhD, 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”.

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, in preparation by Regina Bispo, is intended to be a contribution to the study of methodologies for monitoring wind farms in particular regarding the methods to estimate mortality and optimize the monitoring strategies.

Factors affecting bat diversity and activity patterns at the lagoon system of Baixo Vouga and Ria de Aveiro. This MSc, in preparation by Eduardo Mendes, aims 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 is 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. Funded by Aveiro University and partially logistically supported by the Municipality of Estarreja.

*Temporal patterns of roost use and food selection by *Rhinolophus hipposideros* (Chiroptera, Rhinolophidae).* This MSc, in preparation by Ana Lino, aims 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 Regaleira Research Centre.

*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 the months of April through September 2010.

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.

Influence of the dam reservoirs in bats on small streams of the Northeast of Portugal. This MSc, in preparation 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 lead to an analysis problem due to the amount of data obtained. This MSC, in preparation by Bruno Silva, proposes a possible solution for this, automated identification of bat recordings based on artificial neural networks using a reference data base of recordings obtained in mainland Portugal. It has been estimated that around 2000 recordings from the 25 species would be the minimum number for a robust analysis. The recordings are made after capture and hand identification or outside known roosts and R software is being used for the coding of the analysis and identification algorithms. Works begun in July 2011 and by now about one third of the recordings are made. The analysis algorithm is already implemented in R and tested and preliminary results of the identification algorithm indicate that identification (at least to the genus level) is feasible with high precision. This study received a grant from Bat Conservation International.

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Azores Archipelago

Regional Government decided to proceed with a project for bats protection, included in the Plan "Mais endémicas – plantar o futuro". It is expected to start the inventorying and monitoring of bat species in the archipelago in the first half of 2012. Thus, as a first contribution to their conservation, training actions will be developed for Natural Island Parks be able to start the monitoring of bat populations in the existing protected areas.

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Madeira Archipelago

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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*”.

Several Portuguese bat workers attended 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), *Anual 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, 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). 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 nº 1 (1991-2006 *EUROBATS celebrates its 15th anniversary.*), nº 3 (*Guidelines for consideration of bats in windfarm projects*), nº 4 (*Protection of overground roosts for bats, particularly roosts in buildings of cultural heritage importance*) and nº 5 (*Guidelines for Surveillance and Monitoring of European Bats*).

Luísa Rodrigues and Ana Rainho participated in EUROBATS Publications Series nº 2 (*Protecting and managing underground sites for bats*),

Azores Archipelago

No information.

Madeira Archipelago

Sérgio Teixeira and José Jesus cooperate with Italy (Università degli Studi di Napoli Federico II) regarding data collection for conservation 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

Considering the recent extension of the geographical scope of EUROBATS and the inclusion of Azores and Madeira archipelagos, none of the resolutions has been implemented yet. Measures adopted to implement the resolutions will be addressed in the next report.

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

Mainland Portugal

In mainland Portugal, since 1987 there has been a programme to monitor cave-dwelling species, coordinated by “ICNB” and developed in collaboration with “Faculdade de Ciências de Lisboa”, “Universidade do Porto”, “Universidade de Évora”, “Universidade de Trás-os-Montes e Alto Douro” and “Federação Portuguesa de Espeleologia” (referred under point 12). 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 30 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 n° 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. escalerae* and *M. emarginatus*, although most maternity colonies are known in underground roosts, since normally they use hidden places (especially *M. escalerae*), very often they are not observable inside. Often, only the capture of flying juveniles enables the identification of maternity sites. Details of monitoring programme have been sent to the relevant IWG.

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 “ICNB”.

A database including all observations done during the Monitoring Programme was prepared and is currently being updated.

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.

Details of the most important underground roosts have been forwarded to the relevant IWG and were included in the “List of Internationally Important Underground Sites for bats in Europe” recently published by EUROBATS.

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.

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

This point has not been implemented yet.

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

Mainland Portugal

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.

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. These schemes include the identification of protected/threatened natural values and its protection, as well as the monitoring of the actions.

After the internal guidelines for the analysis of forestry projects, “ICNB” prepared recently guidelines for the elaboration of forestry projects. 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.

Mainland Portugal’s rural development program includes, for the first time, 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>) was prepared. 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 forests are not managed specifically to protect bat-feeding habitats. However, some support measures directly or indirectly help to improve forest including the promotion of sustainable forest management through the use of forest without compromising its environmental and economic functions.

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.

Even 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.

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=16) and field work activities have taken these guidelines into consideration.

Azores Archipelago

In Azores there is a specific form (“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 analyzed under Decreto-Lei nº140/99, 24th April 1999, adapted to Azores by Decreto Legislativo Regional nº18/2002/A, 16th May 2002, amended by Decreto-Lei nº49/2005, 24th February 2005 and by Decreto-Lei nº316/89, 22nd September 1989.

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 (document ICNB 2009 in http://www.wix.com/anodomorcego/icnb/docs#!_docs/diversos) 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.

A report on the effect of wind farms on bats in continental Portugal (data 2001-2008) is available online (http://portal.icnb.pt/NR/rdonlyres/3F411993-BB16-485D-B7B7-5ABAE30F93BD/0/Relat_morceg_par_eolicos.pdf). The document comprises the analysis of 171 reports regarding 49 wind farms.

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

Since 2001, 689 carcasses of at least 11 species (*P. pipistrellus*, *P. pygmaeus*, *P. kuhli*, *H. savii*, *N. leisleri*, *N. noctula*, *N. lasiopterus*, *T. teniotis*, *M. daubentonii*, *E. isabellinus*, *M. schreibersii*) were found (Table 5), but it is not possible to evaluate its impact on populations. Data were recorded by several companies: AgriPro Ambiente, Bio 3, Ecomind, Colmus, Ecosativa, Ecosfera, EDP, EolFlor, ENEOP 2, LEA / UTAD, Mãe d'Água, Naturibérica, Plecotus, Procesl, Profico Ambiente, ProSistemas, Strix and Tecneira.

Table 5 – Fatalities observed in Portuguese wind farms, per species.

Species	Fatalities number	% mortality/species
<i>P. pipistrellus</i>	200	29,0
<i>N. leisleri</i>	152	22,1
not identified	91	13,2
<i>Pipistrellus</i> sp	67	9,7
<i>H. savii</i>	35	5,1
<i>P. pipistrellus/pygmaeus</i>	28	4,1
<i>P. kuhli</i>	26	3,8



<i>P. pygmaeus</i>	24	3,5
<i>P. pipistrellus/kuhli</i>	16	2,3
<i>Nyctalus</i> sp	16	2,3
<i>Eptesicus</i> sp	13	1,9
<i>T. teniotis</i>	11	1,6
<i>N. lasiopterus</i>	5	0,7
<i>M. daubentonii</i>	2	0,3
<i>N. noctula</i>	1	0,1
<i>M. schreibersii</i>	1	0,1
<i>E. isabellinus</i>	1	0,1

Most fatalities belong to more abundant species, with “Least concern” status (52,7%), indicating a reduced impact in species known to be threatened. However, the relative high percentage belonging to “Insufficient information” species (31,9%) may indicate worrier negative impacts on species that may have a unfavourable status.

Observed fatalities occurred between February and November, with a major peak in September and a smaller peak in May (Table 6 and Figure 2).

Table 6 – Fatalities observed in Portuguese wind farms, per month.

Month	Number of searches / month	Fatalities number	% mortality/month
September	124	209	30,3
August	121	154	22,4
May	108	91	13,2
June	116	62	9,0
April	101	61	8,9
October	117	59	8,6
July	114	46	6,7
March	65	3	0,4
November	33	3	0,4
February	21	1	0,1
January	14	0	0,0
December	22	0	0,0

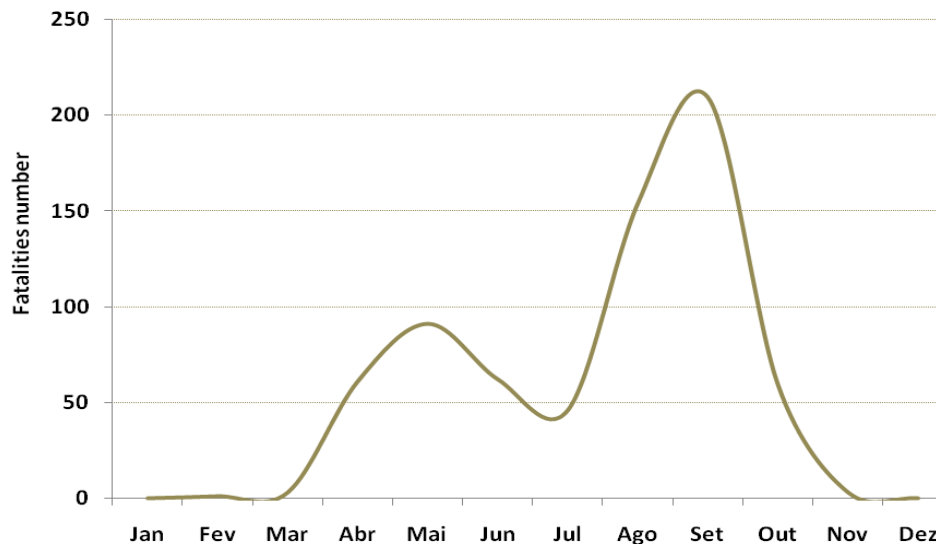


Figure 2 – Variation of observed mortality along the year.

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”.

Three companies are already using dogs in carcass searches.

Other points have not been implemented yet.

Resolution 5.2 – Bats and Rabies in Europe

Mainland Portugal

The analysis of several species was carried out by “Laboratório Nacional de Investigação Veterinária (LNIV)”. 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.

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* sp and *Pipistrellus* sp; the roost is currently used by *T. teniotis*, *Eptesicus* sp and *Pipistrellus* sp, 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 giving advice on bat exclusion was prepared and is available on-line (referred under point 12).

Bat exclusion is being carried out by rangers, after training.

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.

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.

Other points have not been implemented yet.

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

Mainland Portugal

Divulgation 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.

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.

Resolution 6.9 – Year of the Bat



Mainland Portugal

Year of the Bat campaign achieved extraordinary results in 2011, 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.

More than 30 persons and entities organized around 100 activities (talks in schools and for general public, ateliers in schools, walks with bat detectors, exhibitions) for more than 3700 participants.

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

Many schools studied bats and organized activities, such as talks, contests and exhibitions. “Carsoscópio” published an agenda for 2012 dedicated to bats.

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

Mainland Portugal

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

Resolution 6.13 – Bats as Indicators for Biodiversity

Mainland Portugal

“ICNB” participated 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.

A programme to monitor cave-dwelling species is being carried out since 1987.

Other points have not been implemented yet.

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://portal.icnb.pt/NR/rdonlyres/999BBAF3-41CE-40DD-9697-DBAC22AB3F38/0/manual_apoio_infra_linear.pdf) 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.

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.
