

Management of the Biological and Ecological Elements in the Scope of a Motorway Network

The Case of the Iberian Wolf



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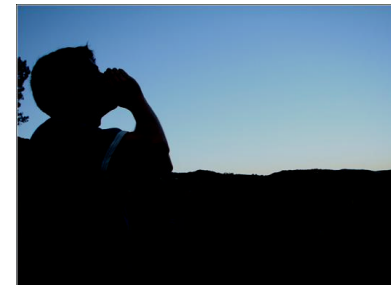
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1 - Introduction

1.1 Scope

- This document aims to present a part of the work developed by the team involved in the Monitoring of the Wolf Population at Rede Natura 2000 Alvão/Marão Site.
- The project, performed under a joint agreement established between Grupo Lobo (Wolf Group) / Centro de Biologia Ambiental (Environmental Biology Centre), Norscut and Aenor, derived from the need to develop a Monitoring Plan concerning the Iberian Wolf in relation to the frame set by the motorway stretches Ribeira de Pena – Vila Pouca de Aguiar (A7/IC5 - Aenor) and the section Fortunhos – Pedras Salgadas (A24/IP3 – Norscut).
- Both sections cross Natura 2000 Alvão/Marão Site and the reports included in their Environmental Impact Declarations were conditioned to the development of such monitoring.





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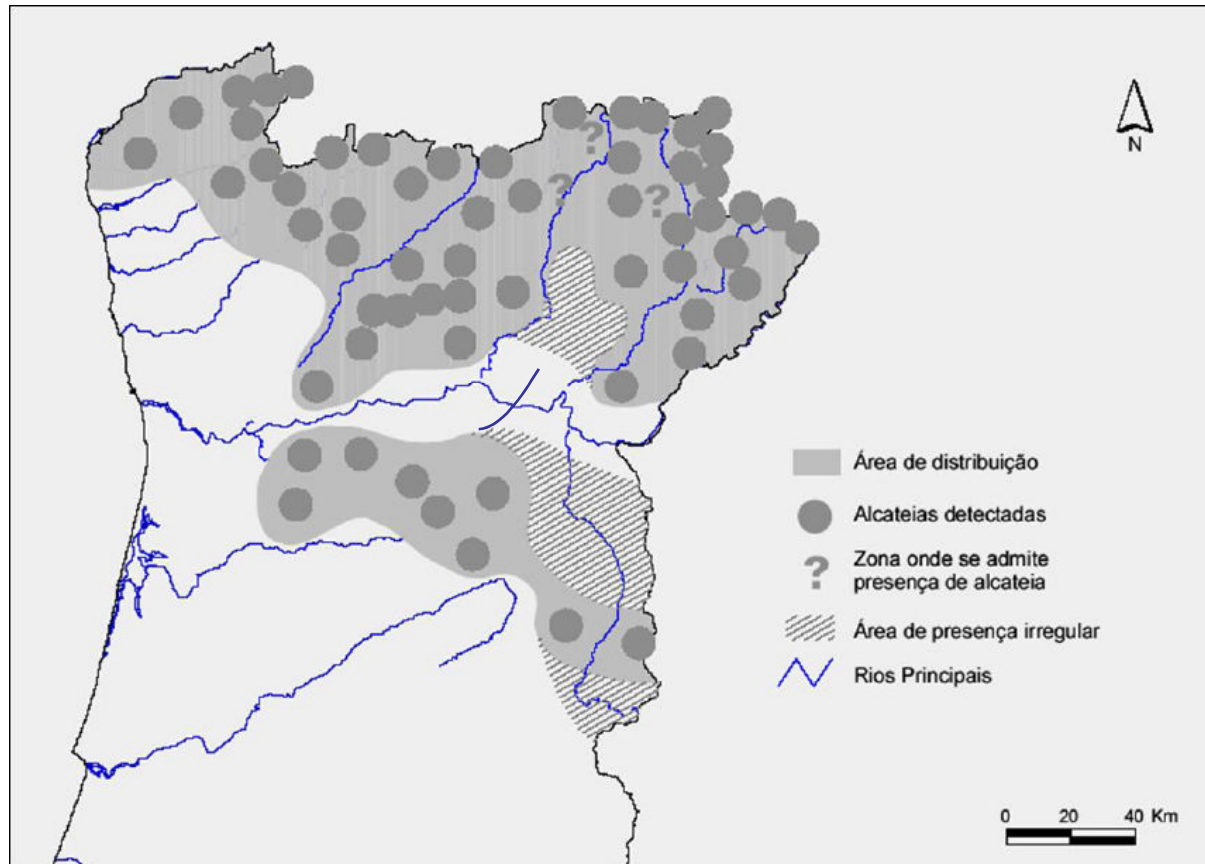
1.2 The Wolf

- The Wolf (*Canis lúpus*) is a terrestrial mammal that inhabits the widest distribution area worldwide.
- The Wolf lives in hierarchized, and territorial social groups, comprised of a reproductive couple, the cubs born that year and some individuals from previous litters. In Portugal the average number estimated is of 6 animals per group.
- The cubs are usually born in May in an average number of 4 to 6 per litter.
- These groups occupy in Portugal a territory of 100 to 300 Km², in average.
- The territory presently occupied by the wolf is about 20% of their distribution area prior to the XX Century, due to the persecution of man, registered from that date, to the decrease of wild preys and to the fragmentation of their habitat.





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Picture 1 – Wolf distribution in Portugal

- Possibly, there are in our country approximately 50 to 60 wolf groups, divided in two sub-populations, apparently isolated:

One, North to Douro River with the larger number of groups (about 50), and in contact with the Spanish population;

and the other to the South of that River, with approximately 6 to 9 groups and isolated from the remaining Iberian Wolf population.



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•1.3 The Roads and Fauna

One of the greater impacts of road networks upon nature is the fragmentation of the habitats, which has been presented as the major factor contributing to the decline of European biodiversity.

The main impacts caused by roads construction upon the fauna can be divided in :

Direct Impacts

- habitat destruction and fragmentation
- barrier effect
- mortality caused by run over
- disturbance and pollution
- increase of habitat frontier areas

Indirect Impacts

- Increase of human presence (urbanization, industrialization, hunting, etc.)

During the Environmental Impact Assessment processes, several alternatives must be studied so as to decide on the least impacting for the several components of the surrounding ecosystems.



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1.4 A7/IC5 Motorway Characteristics

Ribeira de Pena – A24 Sub-stretch

The sub-stretch under analysis corresponds to a motorway type road, with 2x2 lanes, central barrier and a service area. It follows the West-East direction through a length of 17 Km, and links to A24/IP3 in the vicinity of Vila Pouca de Aguiar, spreading to the West until the link to A3 (Porto – Valença).

Also in this road several measures to increase the fauna crossing possibilities were established:

- 6 under bridges (restoring agricultural passages (cattle creeks)) adapted and re-dimensioned to fauna passages (PI1, PI2, PI3, PA4, PA5, PI6);
- 3 hydric bridge adapted to mix fauna, 7m wide per 3,5m height and a 4,5m dry alleyway ;
- One 70m long ecological viaduct mainly for fauna crossing;
- 5 viaducts (EN206 - 275m; Ribeiro da Ponte – 375m; Ribeira de Além Relva –200m; Rio Torto - 275 m; Ribeira do Boco – 240 m);
- 2 Over Bridges

The fences set along this sub-stretch are 2,20m high from the ground in backfilling areas and 1,20m in excavation areas. The fences should be set 1m deep in the ground (to avoid damages caused by the wild pig) with getaways (one-way out) every 500m to assist the exit of animals that might have entered the lane.



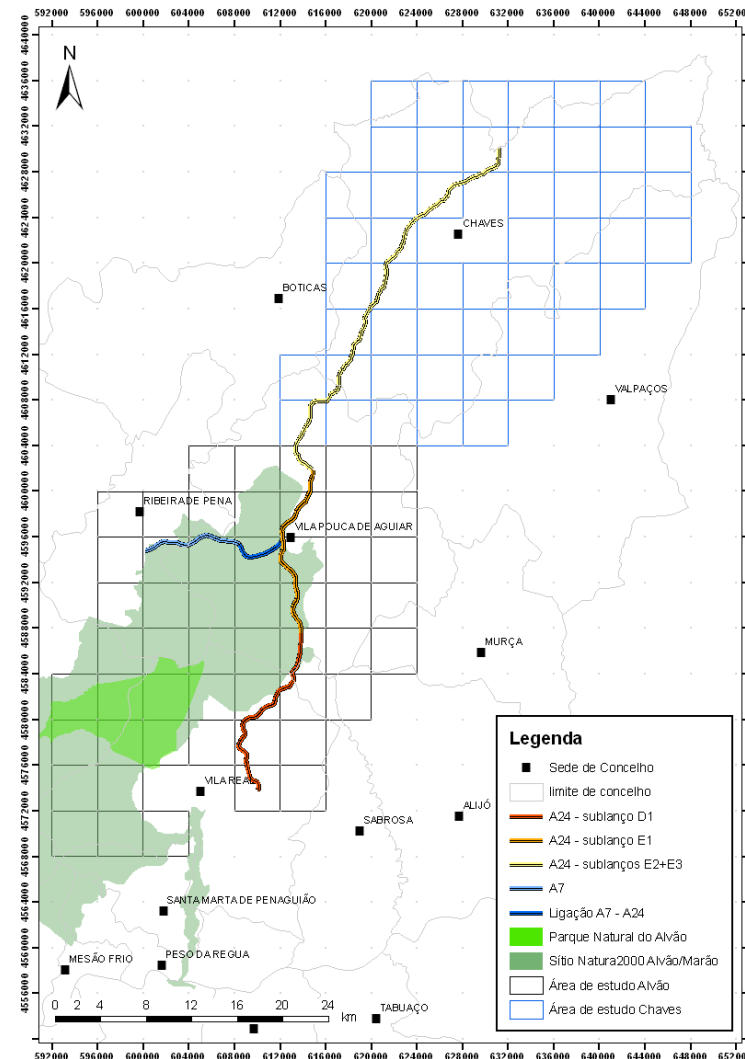
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1.5 Study Area

Considering the wolf's great mobility and the average dimensions of the areas occupied by the Iberian groups – approximately 100 to 300km², the field area defined for this study encompasses not only the roads, but also adjacent areas, in order to enable a better understanding of the population structure, especially in regard to the family groups in the region.

The study area covers part of two zones with the status of legal protection: the Natural Park of Alvão (PNAL) with 7220ha and site Natura 2000 Alvão / Marão with 54530ha. This region is mostly mountainous, with pronounced slopes, an average altitude above 400m and a very rich river system.

Picture 4 – Location of the work area





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Picture 2 – Fauna Underpass

At sensitive areas whose crossing is impossible or impracticable to avoid, efficient mitigation measures should be implemented, such as the increase of fauna lane crossing possibilities (viaducts, ecoducts, fauna crossings, etc...) while diminishing the run over mortality (setting adequate fences and runway passages for fauna entering the road).



Picture 3 – Ecoduct



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2 - Work methodology

- There is an intrinsic difficulty underlying wolf field studies, mostly due to the difficulty in observing these animals in nature and to the low density of wolf population normally observed in their distribution area.
- For these reasons, it becomes hard to estimate the totality of individuals in a certain region and the use of indirect detection methods is necessary to enable an approach to their distribution area, to their population effectiveness and to the ecological parameters to be studied.
- In wolf ecological studies (as well as for most great wild mammals) throughout their worldwide distribution area, and namely in the Iberian Peninsula, the investigation of evidences indicating their presence, such as excrements, trails and attacks to domestic animals, is the most common method. Shepherds, hunters or forest rangers are another source of very useful information to this type of study.



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- Presence evidences enable the assessment of the specie's distribution along the study area (presence/absence), as well as the respective quantification (in Kilometric Abundance Indexes – IQA), enabling the identification of areas mostly used by the species and individualizing groups of wolves (their social organization), as well as identifying their activity centre (especially their breeding sites).
- In places with a higher concentration of wolf presence evidences, direct methods are applied (hearing stations with howling simulation, waiting stations, photo traps with movement and temperature sensor cameras, ex: Picture 5). These provide higher success rates in terms of observation, counting of individuals and confirmation of their reproduction.
- The analysis of the information gathered in the scope of the Dead Wolves Monitoring System (Law of 13 August; Decree-Law 189/90 of 27 April), carried out by the Nature Preserving Institute (Instituto de Conservação da Natureza (ICN)), is also important in terms of distribution and demographic parameters, such as the reproduction success rate (should there be dead cubs), as well as mortality causes.

Picture 5 – Example of metallic boxes for protection of cameras





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Effectiveness of the permeability of the road

- All possible wolf passages (viaducts, ecoducts, under and hydric passages and over bridges) between Vila Pouca de Aguiar and Ribeira de Pena (A7) have been identified, geo-referenced and characterized in terms of physical structure and environmental surroundings.
- At the passages around Sítio Natura2000 (our study's goal) samples of wolf presence were gathered every three months, in walks of a 100m radius around each passage exit and at their interior.
- The possible use of the wolf passages, and therefore the lane crossing, were studied through photo cameras with movement sensors. Initially, several metallic boxes were set to the walls or piers of the monitored passages. The monitoring focused on the already concluded sections, namely at A7 between Lixa do Alvão and Portela de Santa Eulália.
- Thus, several passages were monitored monthly (the number varied in accordance with the available machines, since some were stolen). Each machine was set for 15 consecutive days and verified every 3 days to check batteries and film.
- The data obtained were treated in terms of usage of each passage: by animals, by humans, by vehicles, and in regard to the number of photos per sampling day.



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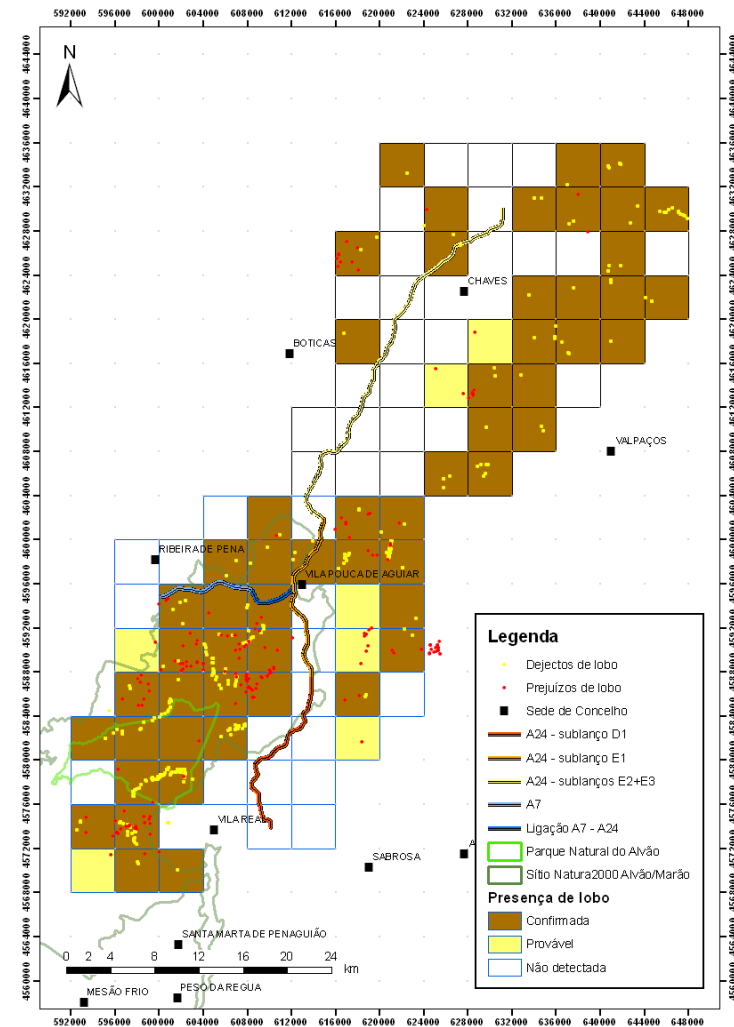
3 – Results

3.1 Distribution of the Wolf along the Studied Area

The wolf presence was in 2007 mainly patent along the mountains Alvão/Padrela.

The area occupied by wolfs has been decreasing since the beginning of this monitoring, namely at Serra da Falperra, as well as the intensity of use regarding the entire sub-area of Chaves.

As an example we may refer that in 2005 the presence of wolfs was detected in 94% of the grid composing Alvão sub-area, regressing to 81% in 2006 and to 68% in 2007.



Picture 6 - Distribution of wolf evidence in 2007 and subsequent classification of UTM boxes every 4km.



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The presence of wolves along the corridors of both the motorways under study (A24 and A7) was reduced in 2007, especially in the areas surrounding A24.

This is mainly due to the fact that A7 has been under operation since 2006, which means the species has had some time to accustom itself to the infrastructure. Also, a great part of this motorway is located in the plateau of Serra do Alvão, where the wolf's moving facility is higher and where the habitat still presents good conditions.

During the Spring and Summer (breeding time) practically no evidences are found, which demonstrates the wolfs' breeding areas are far from the motorway. During the Autumn and Winter, with the rise in the number of wolfs and their spatial dispersion, it is evident that some of the areas around the motorway are used.



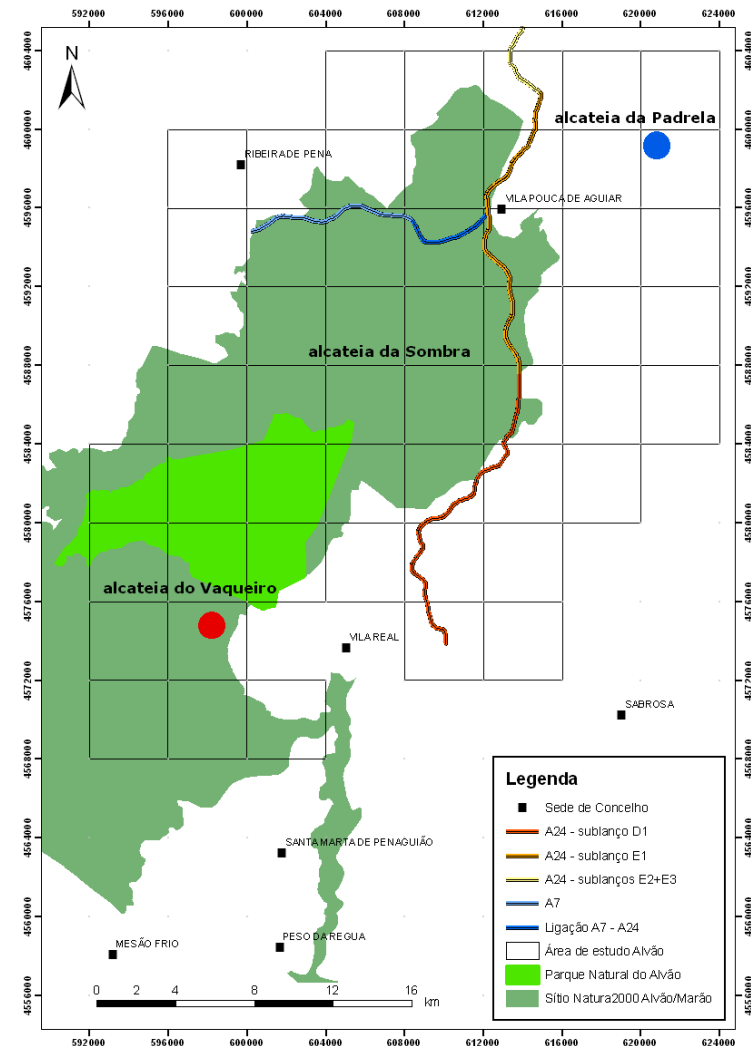
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3.2 Demographic parameters

Number and description of the wolf groups

Based on the field work developed in 2007, it has been possible to confirm the presence of 3 wolf groups at Alvão sub-area (Vaqueiro, Sombra and Padrela), as well as to consider the probable existence of a wolf groups in Chaves sub-area (Mairos and Nogueira da Montanha).

Picture 7 – Location of Padrela (blue circle) and Vaqueiro (red circle) wolf groups breeding in the year 2007.





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Vaqueiro Wolf Group

This group of wolfs occupies the Southern area of Serra do Alvão and by the end of the 2007 breeding season should be comprised of at least 7 wolfs (4 adults and 3 cubs). The number of cubs may be slightly higher, since it is difficult to identify more than three simultaneous howling during the hearing sessions.

During the waiting sessions a maximum of three adults were identified together. Nevertheless, information supplied by local livestock owners indicates there is a higher number of adults (or sub-adults), i.e., about 6 animals. Thus, the group of wolfs would be comprised of 9 animals.



Picture 8 – Sub-adult wolf photographed on 7 August 2007 in Vaqueiro wolf group territory, close to their breeding area.



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Sombra Wolf Group

This group occupies the Eastern side of Serra do Alvão, North to Vila Real. Due to the great fire of 2005 the main part of this group's activity area suffered major damages; hence the decrease of evidences found in 2006.

Throughout 2007 scattered evidences of wolfs presence were found along the entire territory of the group. Nevertheless, a specific location with the highest number of evidences was never identified. The number of wolf damages in this area is still high, especially throughout Serra do Alvão plateau, which demonstrates the presence of the species. In spite of the efforts made in hearing sessions, it was not possible to determine whether there was reproductive success in this group of wolfs or which was the breeding location.

The higher number of wolfs sighted was of 5 adults, at the Alvão plateau. Thus, and since there is no information on reproduction, the minimum number of animals for this group is 5 adults.



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Padrela Wolf Group

The territory of this group of wolves is situated in the Southern area of Serra da Padrela. For this group the demographic results derive mainly from pictures obtained close to the 2005 breeding area and from the probable existence of reproduction.

In a conservative perspective, and with no information of more than two close animals, we can state that by the end of the reproduction season the minimum number of this group was of 5 individuals (2 adults and 3 cubs).

Picture 9 – Adult wolf photographed on 17 August 2007 in the territory of the Padrela group, close to their breeding area.





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| Group | Existence | Reproduction | Nº of adults | Nº of cubs* | Mortality** |
|-----------------|-----------|--------------|--------------|-------------|-------------|
| Padrela | Confirmed | Confirmed | 6 | 3 | 0 |
| Sombra | Confirmed | Confirmed | 5 | - | 0 |
| Vaqueiro | Confirmed | Probable | 2 | 3 | 0 |

* corresponds to calculated minimum number

** corresponds to individuals known to the work team.

Chart 1 – Summary of field data obtained in regard to the groups of wolfs in the study area in 2007.



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4 – Final Statements

The data evolution since 2005 and the results obtained during 2007 point to a reduction in the wolf's usage of the area under study, as well as to the decrease in the intensity of use concerning areas that are still occupied.

The 2007 monitoring enabled us to continue identifying two stable groups of wolfs in the Alvão sub-area (Vaqueiro and Padrela) and another one whose condition is more unstable (Sombra).

The instability of the Sombra group is quite disturbing in terms of preservation of the species, since this is the only group of wolfs identified in the Northern area of Serra do Alvão, which used to be a source of dispersing animals to more unstable areas, such as Minhéu, Falperra or the Wester slope of Alvão.



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Next works (2008):

- Continuing the quarterly investigation of wolf evidences in the Alvão sub-area.
- Monitoring the structures of the lanes' crossings (ecoducts, adapted passages) in the Alvão sub-area, resorting to photo cameras with movement sensores.
- Possibility to use GPS telemetry in some wolfs, from October 2008, should the stability conditions of the lupine population be adequate.

5 – Work Team

The technical authorship of this report is the responsibility of biologists Ana Margarida Guerra (field work, data treatment and analysis, report development), Gonçalo Ferrão da Costa (field work, data treatment and analysis, report development) and Francisco Petrucci-Fonseca (general coordination of the project and report development – Grupo Lobo (Wolf Group), Centro de Biologia Ambiental (Environmental Biology Centre), Faculdade de Ciências de Lisboa (Lisbon Science College)).



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Thanks for your attention

