



*“Egyptian Vulture and Bonelli’s Eagle Conservation in Douro/Duero Canyon”*

**LIFE14 NAT/PT/000855**

-Action A3-

## **REVIEW REPORT**

*Analysis of biological and economic results of current implementation of EU sanitary regulations, and development of recommendations*

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**Project:**

*Egyptian Vulture and Bonelli's Eagle Conservation in Douro/Duero Canyon* - LIFE14NAT/PT/000855

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## BACKGROUND

The Egyptian vulture is Europe's most threatened vulture species – classified as “Endangered” at global level. While the three other European vulture species are registering positive trends across Europe, Egyptian vultures continue to decline in most regions in the continent (and elsewhere).

The LIFE RUPIS project is tackling the most important threats to Egyptian vultures, namely food shortages, degradation of the habitat, electrocution risk and the illegal use of poison.

Egyptian vultures are part of the detrital food web of ecosystems and they provide the important ecological service of recycling carrion to prevent the accumulation of dead biomass, thereby contributing to waste removal, disease regulation, and nutrient cycling.

At the start of the 21st century, European avian scavenger communities were one of the few exceptions to the global decline in Old World avian scavenger birds. Asian and African vulture populations declined or are still declining dramatically as a consequence of ingestion of veterinary drugs (Asia) or due to illegal, indiscriminate and widespread poisoning (Africa). On the contrary, European vulture populations maintained or increased their numbers, partly due to conservation investment and effort, with the only exception being the Egyptian vulture, that is still declining.

However, between 1996 and 2000 the appearance of bovine spongiform encephalopathy swiftly became one of the most serious public health and political crises concerning food safety ever experienced in the European Union (EU). Subsequent sanitary legislation (Regulation CE 1774/2002) that greatly restricted the use of animal by-products not intended for human consumption led to profound changes in the management of livestock carcasses (i.e. the industrial destruction of around 80% of all animal carcasses), thereby threatening the last remaining healthy scavenger populations (vultures and other scavenging birds of prey) of the Old World and thus contradicting the EU environmental and conservation policies.

Several warning signs such as a decrease in breeding success, an increase in mortality in young vulture age classes and an apparent increase in the alleged number of cases of vultures “attacking” cattle, as well as a halt in population growth, suggest that the decrease in the availability of food resources has had harmful effects on vulture populations, and probably also on other scavenging raptors.

This led the EU to relax a bit the regulations and between 2003 and 2009 a number of dispositions to the EU regulations (322/2003, 830/2005 and 1069/2009) enabled conservation managers to adopt rapid solutions (i.e. the creation of vulture restaurants) aimed at satisfying the food requirements of vultures. However, these conservation measures may seriously modify habitat quality and may also have indirect detrimental effects on the sustainability and composition of avian scavenger populations and communities (favouring the larger species dominant at vulture feeding stations over the smallest ones – namely the Egyptian vulture – incidentally, because of this we have developed in this project a supplementary feeding strategy that favours the Egyptian vulture, see Action A2).

Pressure from conservation groups has forced further changes and a new regulation was finally adopted in 2011 (142/2011) that allows for some animal carcasses to be left out in the open for

vultures and other scavengers. This regulation is a complex compromise where the needs of carcass management, sanitary laws and food for avian scavengers are supposedly met. The resulting legislation is still very restrictive and leads to ambiguities and occasionally contradictions, and has been implemented in different ways at national or even regional levels, and in all cases only recently. In some countries (like Portugal) this most recent regulation has not yet been implemented, even though there are new procedures in final stage of implementation.

As part of LIFE RUPIS we had proposed to review the current practice on the implementation of the latest EU regulation on carcass disposal (Regulation 142/2011) in different regions in Spain (so far 10 autonomous regions have transposed this legislation, including Castilla y Leon), and their linkages to vulture feeding areas, and compare it with the situation in Portugal. The idea was to look at issues such as

- current legislative framework
- comparison of the transposition-adaptation of the latest relevant regulation, and its practical implementation, and identification of best practice.
- impact on vultures and other scavenging species (like the red kite) and on the network of vulture restaurants: practices and situation
- economics of the implementation of the 2011 regulation at national and/or regional level (cost, costs savings, etc.), when compared with the previous situation where carcasses had to be collected from the fields and destroyed (still being implemented in Portugal).

This action links partially with Action C2 (artificial feeding for Egyptian Vulture and black vulture) but mainly with Action C9 (Artificial feeding for vultures "outside feeders"). It will also link with action E2 (International Workshop on best practice and main issues on the transposition and national regulations of the relevant EU directives on carcass disposal and sanitary measures in the countryside).

In Portugal, the recent EU regulations have not yet been adequately implemented. We hope that this evaluation can contribute to the debate and help shape future national procedures.

## INTRODUCTION

The recovery of European populations of avian scavengers was mainly due to the end of legal persecution in the 1960s and 1970s, and the ban on the use of poison implemented during the 1980s and 1990s. Moreover, in the 1990s and at the beginning of 2000s, the European Union (EU) introduced policies to bolster the conservation strategies used in the management of scavenger populations. Thus, the existence of breeding nuclei of these species became a basic criterion for defining Special Protection Areas for Birds (SPAs) and Sites of Community Importance (SCIs) (Donald et al. 2007). Within this framework, the EU-financed LIFE-Natura programmes were designed to directly manage and conserve local populations of threatened scavenger species, investing at least €57 million in 38 projects (<http://ec.europa.eu/environment/life>). Over 90% of European vultures live in EU member states. Of all European countries, Spain boasts the most important breeding populations of these scavenger species.

Between 1996 and 2000 the appearance of bovine spongiform encephalopathy swiftly became one of the most serious public health and political crises concerning food safety ever experienced in the European Union (EU). Subsequent sanitary regulations (EC 1774/2002) led to profound changes in the management of livestock carcasses (i.e. the industrial destruction of around 80% of all animal carcasses), thereby threatening the last remaining healthy scavenger populations of the Old World and thus contradicting the long-term environmental policies of the EU. Several warning signs such as a decrease in breeding success, an apparent increase in mortality in young age classes of vultures and an increase in the number of cases of vultures attacking and killing cattle, as well as a halt in population growth, suggest that the decrease in the availability of food resources has had harmful effects on vulture populations. Between 2002 and 2005, a number of dispositions to the EU regulations (2003/322/CE & 2005/830/CE) enabled conservation managers to adopt rapid solutions (i.e. the creation of vulture restaurants) aimed at satisfying the food requirements of vultures. However, these conservation measures may seriously modify habitat quality and have indirect detrimental effects on avian scavenger populations and communities.

Conservation managers and policy-makers need to balance the demands of public health protection and the long-term conservation of biodiversity. The regulations concerning carrion provisioning need to be more flexible and there needs to be greater compatibility between sanitary and environmental policies. We advocate policies that authorize the abandonment of livestock carcasses and favours populations of wild herbivores to help maintain populations of avian scavengers. Conservation strategies should be incorporated into new European Commission regulations, should aim to make public health and carcass-related ecological processes more compatible, thereby permitting scavenger species to benefit as before from extensive animal husbandry and, when necessary, supplementary feeding. This new regulation started to be effective in 2011 and is the main subject in this report.

In Europe, after the outbreak of bovine spongiform encephalopathy, a restrictive sanitary regulation (EC 1774/2002) prohibited the abandonment of dead livestock in extensive farming (extensive livestock breeding) in the field, which led to negative consequences for scavengers. As an attempt to mitigate this negative impact, in 2011 a new regulation was approved ([EC 142/2011](#)) to allow farmers to leave some carcasses of cattle raised in extensive systems in the so-called 'Protection areas for the feeding of necrophagous species of European interest' (PAFs).

## LEGISLATIVE FRAMEWORK

### European Union legislation:

- Regulation (EU) No 142/2011 of 25 February 2011 laying down detailed rules for the implementation of Regulation (EC) No 1069/2009 of the European Parliament and of the Council on the rules applicable to animal by-products and derived products not intended for human consumption, and Council Directive 97/78/EC as regards certain samples and units exempt from veterinary checks at the border
- Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down sanitary rules concerning animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Regulation on animal by-products)
- Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin
- Regulation (EC) No 322/2003 (12 May), changed by Regulation (EC) No 830/2005 (25<sup>th</sup> November), with a permanent derogation for the use of materials of category 1 in feeding some scavenging species in specific zones (Portugal Spain, Greece, Italy and Cyprus)
- Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down sanitary rules concerning the use of animal by-products not intended for human consumption (category 1) for feeding necrophagous species
- Regulation (EC) No 999/2001 of the European Parliament and of the Council of 22 May 2001 laying down rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies

### Spanish National legislation:

Real Decreto 1528/2012, de 8 de noviembre, por el que se establecen las normas aplicables a los subproductos animales y los productos derivados no destinados al consumo humano, cuyo objeto fundamental ha sido establecer disposiciones específicas de aplicación en España del Reglamento (CE) n.º 1069/2009 del Parlamento Europeo y del Consejo, es otra de las normas que deben ser tenidas en cuenta.

- Royal Decree 1632/2011 of 14 November, regulating the feeding of certain species of wild fauna with animal by-products not intended for human consumption
- Royal Decree 664/2007, of 25 May, regulating the feeding of necrophagous raptors with animal by-products not intended for human consumption
- Royal Decree 1098/2002 of 25 October, regulating the feeding of necrophagous raptors with certain dead animals and their products

### Spanish Regional legislation:

- Spanish Decree 68/2009, of 24 March, which regulates the specific provisions for the application of the community and state regulations in the matter of animal by-products not destined for human consumption in the **Autonomous Community of Andalusia**
- Decree 120/2012, of 07/26/2012, which creates the network of feeding necrophagous species of Castilla-La Mancha and regulates the use of animal by-products not intended for human consumption to feed certain wildlife species in the territorial area of **Castilla-La Mancha**
- Decree No. 90/2010, of 7 May, which creates the “Muladares Network” for Necrophagous Raptors Birds managed by the **Autonomous Region of Murcia**
- Decree 102/2009, of 26 May, of the Government of Aragon, which regulates the authorization of the installation and use of feeders for the feeding of necrophagous raptors with certain animal by-products not intended for human consumption, and network of feeders of **Aragon**
- Order of May 2, 2012, jointly by the Ministries of Agriculture and Fisheries and Environment, which develop standards for the control of animal by-products not intended for human consumption and animal health, in game hunting of **Andalusia**
- Order GAN/30/2012, of May 4, regulating the feeding of certain species of wildlife necrophagous with animal by-products not intended for human consumption from livestock farms in the protection zones, in the Autonomous Community of **Cantabria**
- Foral Order 259/2006, of June 27, of the Councillor for the Presidency, Justice and Interior, which creates a network of carrion bird feeders of the Foral Community of **Navarra** and rules are set for its operation
- Order AAM / 387/2011, of 23 November, concerning the feeding of species necrophages of Community interest (**Catalonia**)
- Resolution No. 489, dated 22 May, of the Councillor for Agriculture, Livestock and Environment, which delimits the protection zones for the feeding of necrophagous species of community interest (**La Rioja**)
- Resolution of June 18, 2012 of the Directorate General of Natural Environment, which delineates the protection zones for the feeding of necrophagous birds (**Comunidad Valenciana**) Regional legislation

Decreto 17/2013, de 16 de mayo, por el que se desarrolla en Castilla y León el uso de determinados subproductos animales no destinados al consumo humano para la alimentación de especies necrófagas de interés comunitario. El presente decreto se dicta por tanto en el ejercicio de las competencias de desarrollo normativo y ejecución de la normativa estatal, que la comunidad autónoma tiene en materia de protección del medio ambiente y sanidad animal, de conformidad con lo dispuesto en el artículo 71.1 apartados 7.º y 9.º respectivamente del Estatuto de Autonomía de Castilla y León.

### Portuguese National legislation:

Regulation (Decreto-Lei) n.º 122/2006 (27th June), aims to secure an adequate execution and secure the legal requirements from the obligations imposed by Regulation 1774/2002 (in the meantime revoked by Regulation 1069/2009).

Regulation (Decreto-Lei) n.º 26/2006 (10th February), changes the regulation n.º 387/98, to adapt to the new measure of protection against transmissible spongiform encephalitis, and to the EU's classification of the sub-products of animal origin, as well as to the sanitary rules about their transport, stocking, transformation, use or destruction, annulling the regulation n.º 211-A/2001 (31st July)

Regulation (Decreto-Lei) n.º 387/98 (4th December), restricting the use of some products of bovine, ovine and caprine origin in the human and animal food

Regulation (Decreto-Lei) n.º 204/90 (20th June), established measures of protection of wildlife, including scavengers

## ADOPTION OF THE RELEVANT REGULATION IN SPAIN

This legislation (EC 142/2011) was applied in Spain through the Royal Decree 1632/ 2011, which urged every autonomous community (region) to design their own PAF network, with implementation in 2013 as responsibility and competence of the Autonomous Regional Spanish Governments. The PAFs must be included in Natura 2000 with the presence of necrophagous species of European interest, areas devoted to conservation plans of such species and/or important areas for the feeding of these species. The design criteria for establishing the PAFs are established by the Autonomous Regional Spanish Governments so they are variable between the different regions. In continuation, you find a table summarizing those criteria by autonomous region (**Table 1**).

Once PAFs are approved, every farm within their limits must apply for permission to abandon carcasses in the field; also, farms have to meet several technical (e.g. only livestock in extensive farming) and sanitary requirements (see [Royal Decree 1632/2011](#) for more details). This new regulation was well received among conservationists and wildlife managers (Margalida et al. 2012).

### This Royal Decree contributes in the vulture feeding in several aspects:

- Delimitation of protection zones for feeding necrophagous species of EU interest;
- Feeding at feeding sites or muladares\*;
- Feeding on extensive farms included in protection areas, without previous collection of corpses,
- Feeding with category 3 hunting by-products (Article 18.1 of Regulation EC 1069/2009 and Articles 4, 5 and 8 of the Royal Decree).

**Table 1. criteria for the establishment of PAFs per Spanish Autonomous Region**

Region	Design criteria
Andalusia	<i>Distribution area of scavengers Gypaetus barbatus, Gyps fulvus, Aegypius monachus, Neophron percnopterus and partially Aquila chrysaetos, Aquila adalberti, Milvus milvus and Milvus migrans</i>
Aragon	<i>List of relevant municipalities+</i>
Asturias	<i>NA</i>
Basque Country	<i>Special Protection Areas (SPAs) and Sites of Community Importance (SCIs) of the Natura 2000 and other protected areas and lands above 500 or 700 metres altitude (depending on the region)</i>
Cantabria	<i>Public Utility Forest</i>
Castile La Mancha	<i>List of regions and relevant municipalities</i>
Castile and Leon	<i>List of relevant municipalities</i>
Catalonia	<i>Public forests or other lands above 1400 metres</i>

\* Spanish traditional large feeding sites

+ Where the authorities deem that there are necrophagous species

	<i>altitude and list of relevant municipalities</i>
Extremadura	<i>All municipalities of the Region</i>
Galicia	<i>NA</i>
La Rioja	<i>List of municipalities fully or partially included in the Natura 2000 and municipalities not included in the Natura 2000</i>
Madrid	<i>NA</i>
Murcia	<i>NA</i>
Navarre	<i>All municipalities, except those within the area of influence of the Pamplona-Noáin airport</i>
Valencian Community	<i>Special Protection Areas (SPAs) of the Natura 2000</i>

## IMPLEMENTATION OF THE OF THE RELEVANT REGULATION IN SPAIN

### Establishment of the PAFs

By the end of 2015, thirteen of the 17 autonomous communities (Andalusia, Aragon, Cantabria, Castilla-La Mancha, Castilla y León, Catalonia, Valencia, Extremadura, La Rioja, Murcia, Navarra and the Basque Country) had officially approved PAFs where some carcasses could be left on the ground. As a result, the percentage of autonomous communities with their own rules delimiting the protection zones for the feeding of necrophagous species reaches 76.4%.

**Figure 1.** Map of regions of peninsular Spain, indicating if they have approved or drafted specific regulations regarding PAFs\*.



\*\* Data source: MAGRAMA Report 2015. Evaluación del cumplimiento del R.D. 1632/2011, de 14 de noviembre, por el que se regula la alimentación de determinadas especies de fauna silvestre con subproductos animales no destinados a consumo humano.

## Authorization of supplementary feeding sites

13 autonomous communities that are outlined in the following table (**Table 2**) have sent updated information regarding the supplementary feeding sites authorized for the years 2014 or 2015.

**Table 2.** Number of authorized supplementary feeding sites, biomass supplied (in kg) and number of authorized providers of animal by-products not intended for human consumption in different Autonomous Communities.

Autonomous Communities	Nº Feeding sites	Kg Supply per year	Nº Suppliers of corpses
Aragon	49	1.597.163	2.896
Baleares	0	0	0
Cantabria	0	0	0
Castilla-La Mancha	39	353.673	118
Castilla y León	54	500.435	438
Cataluña	17	166.080	
Comunidad Valenciana	4	117.085	26
Extremadura	23	68.107	
Galicia	0	0	0
La Rioja	5	33.900	12
Madrid	0	0	0
Murcia	1	0	0
Navarra	16	316.189	
TOTAL	208	3.152.632	3.490

## Number of authorized extensive farms for the abandonment of carcasses

In 2015, eight autonomous communities have granted authorizations to extensive livestock farms for feeding of necrophagous species without the need for removal of carcasses, although precise data are not available for Catalonia. The total number of farms in Spain is 7,005, as reflected in the following table (**Table 3**).

**Table 3.** Number of authorized farms to feed necrophagous species of EC interest with livestock carcasses, without prior removal, in PAFs, authorized biomass (in kg) of deposit and biomass (in kg) finally contributed in authorized farms, in different autonomous communities. \* Authorized for implementation in 2016.

Autonomous Communities	Nº Authorized farms	Annual biomass prevision at the authorized farms (kg)	Actual biomass prevision at the authorized farms (kg)
Andalusia	2.439 (2013 data)		
Aragon	6		
Baleares	0	0	0
Cantabria	0	0	0
Castilla-La Mancha	940	1.829.795	529.881
Castilla y León	1.273	1.101.030	
Comunidad Valenciana	0	0	0
Extremadura	876*	792.014	
Galicia	0	0	0
La Rioja	337	116.509	116.509
Madrid	0	0	0
Murcia	0	0	0

Navarra	1.134	826.000	
TOTAL	7.005	4.665.348	

### Authorization of the use of category 3 by-products coming from hunting

At least five Autonomous Communities (Andalusia, Castile-La Mancha, Castile and Leon, Catalonia and Extremadura) have granted limited permits for the deposit of category 3 animal by-products during the hunting season of 2014-2015. Most of these by-products have gone to authorized supplementary feeding sites.

It is necessary to indicate that in the different Autonomous Communities of the center, east and north of Spain, the system of collection animal by-products does not apply to the management regulations of SANDACH. That is, only rests of hunted animals not intended for sale, the carcasses of which are intended for consumption in small quantities by people. This is the case of Castilla y León, where the remains of these hunted animals may be available to feed necrophagous species without legal requirements, without prejudice to compliance with good hunting practices.

### Trophic requirements of necrophagous species in Spain

**Table 4** shows an estimate of the biomass needs of necrophagous species in Spain, based on scientific and technical publications examined by the General Sub-directorate of the Natural Environment of MAGRAMA, on individual daily requirements, the proportion of carrion in their diet and population size (see bibliographic references for the various superscripts listed).

**Table 4.** Estimated individual and population trophic requirements, in kg, for the different priority necrophagous species according to Royal Decree 1632/2011, of February 14, following bibliographical references indicated in the corresponding section (end of document).

Species	Daily individual requirements (kg biomass)	Nº pairs	Nº territorial individuals approx.	Floating population approx.	Total estimate individuals Nº	Percentage of carrion in diet	Days per year of presence	Total biomass (kg/year)
Bearded Vulture	0,4 <sup>1</sup>	134 <sup>8</sup>	290	200	490	1,0	365	71.540
Griffon Vulture	0,52 <sup>1</sup>	24.609 <sup>9</sup>	49.218	15.000	64.218	1,0	365	12.188.576
Black Vulture	0,57 <sup>2</sup>	2.068 <sup>10</sup>	4.136	1.000	5.136	1,0	365	1.068.544
Egyptian Vulture	0,2 <sup>1</sup>	1.452 <sup>11</sup>	2.904	200	3.104	1,0	200	124.160
Imperial Eagle	0,26 <sup>3</sup>	409 <sup>12</sup>	818	300	1.118	0,04 <sup>18</sup>	365	5.304
Golden Eagle	0,3 <sup>4</sup>	1.553 <sup>13</sup>	3.106	600	3.706	0,05 <sup>19</sup>	365	20.290
Red Kite	0,2 <sup>5</sup>	2.176 <sup>14</sup>	4.352	800	5.152	0,05 <sup>20</sup>	365	18.804
Kite	0,17 <sup>5</sup>	10.300 <sup>15</sup>	20.600	1.500	22.100	0,1 <sup>21</sup>	200	75.140
Wolf	1,7 <sup>6</sup>				2.000 <sup>16</sup>	0,4 <sup>22</sup>	365	496.400
Bear	15 <sup>7</sup>				275 <sup>17</sup>	0,07 <sup>23</sup>	310 <sup>24</sup>	90.750
<b>Total</b>								<b>14.159.508</b>

According to the above table, the estimate of the biomass needs of the necrophagous species in Spain, would be around 14,000 MT/year.

According to the distribution of the breeding population of necrophagous species among the autonomous communities, **Table 5** presents a proposal for the distribution of annual trophic requirements. Based on the information on animal by-product contributions made by the 13

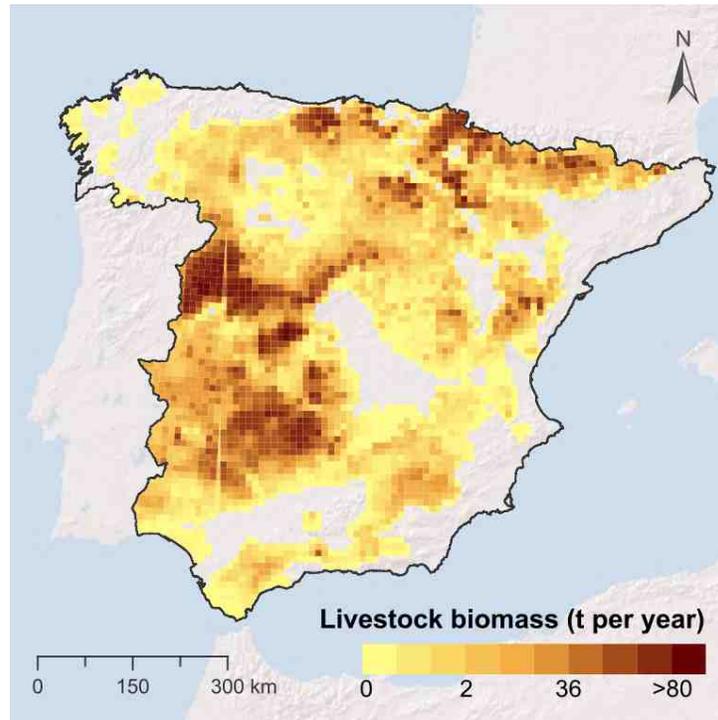
autonomous communities (where information available), the table has assessed the level of adequacy of the biomass requirements of these species. In this sense, it is necessary to take into account that necrophagous species consume carrion from sources other than those derived from official food programs, both from domestic cattle (approximately 65-80%, 40%, 25-43% and (35-20%, 60%, 75-57% and 72% for Black vulture, Griffon vulture and Bearded vulture respectively, 2, 24, 25, 26, 27, 28), so the needs coverage data need to be carefully evaluated.

**Table 5.** Trophic requirements of the necrophagous species covered in the framework of feeding programs managed or supervised by the different Autonomous Communities.

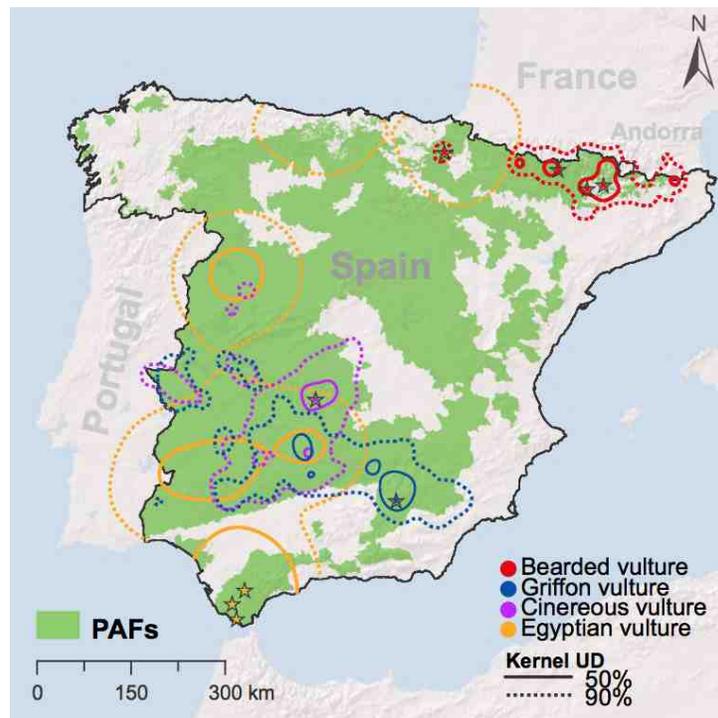
<b>Autonomous Communitie</b>	<b>Biomass needs (kg)</b>	<b>% of the total needs</b>	<b>Kg. supplied food</b>	<b>% of the needs fulfilled</b>
Andalusia	1.635.006	11,5	No data	No data
Aragon	2.515.901	17,8	1.597.163	63,5
Asturias	233.070	1,6	0	0,0
Baleares	136.484	1,0	0	0,0
Canarias	2.483	0,0	No data	No data
Cantabria	142.877	1,0	0	0,0
Castilla-La Mancha	1.459.375	10,3	883.554	60,5
Castilla y León	3.344.842	23,6	1.601.465	47,8
Cataluña	526.712	3,7	166.080	31,5
Extremadura	1.497.755	10,6	860.121	57,4
Galicia	131.117	0,9	0	0,0
Madrid	304.640	2,2	0	0,0
Murcia	1.157	0,0	0	0,0
Navarra	1.361.407	9,6	1.142.189	83,9
País Vasco	372.027	2,6	No data	No data
La Rioja	369.559	2,6	150.409	40,7
Com. Valenciana	125.096	0,9	117.085	93,6
<b>Total Spain</b>	<b>14.159.508</b>		<b>6.518.066</b>	<b>46,0</b>

As a conclusion of the above table, Aragon, Castilla-La Mancha, Extremadura, Navarra and Valencian Community, have all values of over 50% on the estimated coverage of necrophagous species foraging needs covered by the livestock sanitary policies implemented (either through supplementary feeding sites or through abandonment of carcasses in extensive farms). In general, there is a positive progress in all the autonomous communities that develop official programs for the feeding of necrophagous species, in relation to the fulfilment of their nutritional needs.

**Figure 2.** Spatial distribution of carrion biomass availability (t) per 10 x 10 km grid per year and protection areas for the feeding of necrophagous species (PAFs) in peninsular Spain. [Figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)].



**Figure 3.** Spatial distribution of home ranges (k50% and k90% UD) of vultures and protection areas for the feeding (PAFs) of necrophagous species in peninsular Spain. Stars show places of capture. [Figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)].



## IMPACT ON VULTURES AND OTHER SCAVENGING SPECIES

In order to know the effects of different regulations on the management of animal by-products not intended for human consumption on vulture populations in Spain, several variables could be considered:

- Population size and evolution of reproductive indexes;
- Negative effects in individuals more sensitive to the availability of food (eg juvenile specimens less expert in the search and acquisition of food),
- Interactions with economic farming activities in the rural areas.

Population size and reproductive parameters could be revealed with updated data on censuses of species of vultures and other necrophagous species at national level. Unfortunately, this information is not available, as the national census for the Griffon vulture, Black vulture and the Egyptian vulture have not been carried out since 2008 – the next griffon national census is now planned for next year (2018).

### Entrance of necrophagous birds in wildlife recovery centers

In relation to the effects on the health status of individuals, data on the temporal evolution of the registration of individuals in official recovery centers can be used as a proxy to know the impacts of the policies impacting on food availability on the populations of necrophagous birds. To do this, we can use the data on entrance of black and griffon vulture in recovery centers due to causes related to a possible lack of food (malnutrition, dehydration, inexperience, disorientation, ...), and compare it with other causes (intoxication, trauma, shooting, etc.), in two different periods in six autonomous communities (before -2002-2007- and after -2010-2015- the entry into force of EC Regulation 1069/2009 and Royal Decree 1632/2011, **Figure 4**). The results of entrances of vultures for five Autonomous Communities with data only for the period 2010-2015 are also presented (**Figure 5**).

**Figure 4.** Temporal evolution of the number of incoming Black and Griffon vulture in official recovery centers of the Autonomous Communities of Castile and Leon, Catalonia, Extremadura, Murcia, Navarra and Comunidad Valenciana, due to causes related to a possible food shortage, prior to the entry into force of Regulation CE1069/2009 and after.



**Figure 5.** Temporal evolution of the total number of incoming Black and Griffon vulture in official recovery centers of the Autonomous Communities of Aragon, Balears, Cantabria, Galicia and Madrid, for the period 2010-2015 (after entry into force of the Regulation CE1069 / 2009). For the year 2015, only the data for Aragón are included until September.



### Claims of damages by “attacks” of necrophagous species on live cattle

In the last few years, with the increase in some populations of scavenging birds, and with the changes in the policies affecting the availability of their food, some claims started to appear that some obligatory scavenging species like griffon vulture were starting to “attack” cattle. The VCF has recently published a position paper on this issue (see in the Annex).

In this sense, claims of “attacks” by vulture species on live cattle can be indicative of both changes in feeding behaviour of these species and social perception factors on the acceptance of these species. For this reason, **Figure 6** shows the evolution of data submitted by eight autonomous communities in relation to the total number of complaints received from “attacks” (spotted or untested, checked or discarded) from vultures to live cattle. The data are shown for two different

periods: before 2002-2007 and 2010-2015, after the entry into force of Regulation EC 1069/2009 and Royal Decree 1632/2011.

**Figure 6.** Temporal evolution of the number of complaints received in the autonomous communities of Aragon, Balearic Islands, Castile and Leon, Catalonia, Extremadura, Murcia, Navarra and Comunidad Valenciana by attacks on live cattle by vultures (Griffon vulture and/or Black vulture), for the periods 2002-2007 (before the Regulation EC1069 / 2009) and 2010-2015 (after the Regulation EC1069 / 2009).

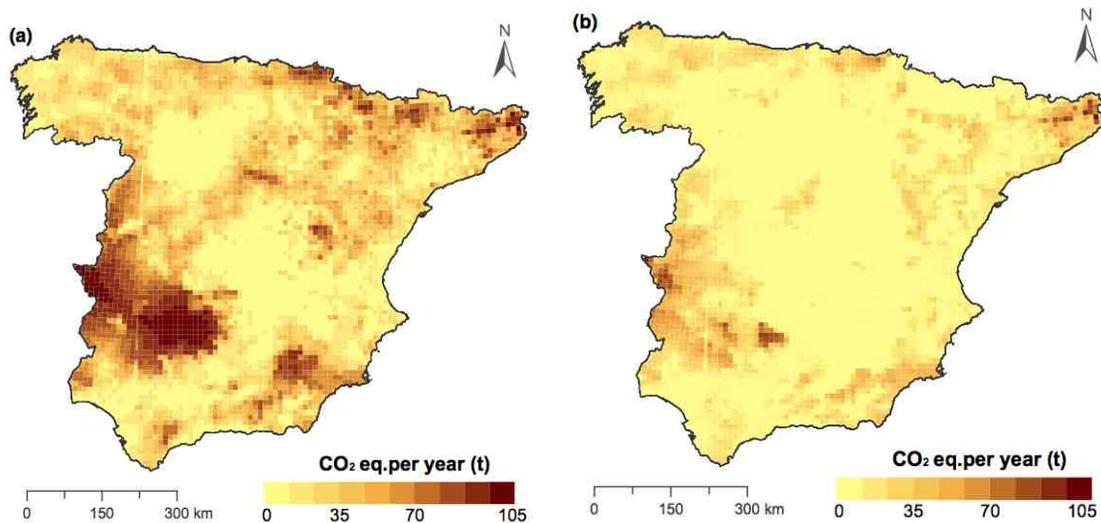


## ECONOMICS OF THE IMPLEMENTATION

### COLLATERAL BENEFITS OF PAFS – SAVINGS OF GREENHOUSE GASES EMISSIONS

The transport of dead livestock from farms to authorized plants after the new regulation (considering both the livestock outside of PAFs and the livestock species that must be collected inside PAFs according to each regional rule) represents a minimum emission of 34 300 metric tons of CO<sub>2</sub> equivalents (greenhouse gas emission or GHG) to the atmosphere per year. The south-western and north-eastern extremes of peninsular Spain show the highest levels of GHG emissions (Fig. 7a). Considering that the GHG emissions in the pre-PAF scenario was 77 344 metric tons of CO<sub>2</sub> equivalents to the atmosphere per year (Morales-Reyes et al. 2015), the post-PAF scenario (Fig. 7b) means a potential reduction of c. 55.7% in GHG emissions/year. The percentage of reduction in GHG emissions ranged between 23% and 95.7% (mean = 44.7%, SD = 30.7%) depending on the region considered.

**Figure 7a & 7b.** GHG emissions (in metric tons of CO<sub>2</sub> eq. per 10 x 10 km grid per year) before (a) and after (b) the implementation of the protection areas for the feeding (PAFs) of necrophagous species in peninsular Spain. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)].



## DISCUSSION AND CONCLUSIONS

The PAFs created specifically to ensure areas for the feeding of necrophagous species after the new European sanitary regulation (EC 142/ 2011) have resulted in significant improvements in relation to the previous regulation based on the percentage of the breeding distribution of the targeted species covered by these areas and the amount of feeding resources available within them.

Importantly, the breeding distribution of priority species, particularly vultures, are better represented in PAFs than the distribution of other facultative scavengers not included as targeted species. In this sense, Spanish PAFs may meet their purpose reasonably well. However, there are still populations of targeted species outside PAFs. Efforts to protect these populations should be especially encouraged in the case of the most endangered species at the national and global scales, i.e. *N. percnopterus*, *A. adalberti* and *M. milvus*.

As expected, a consequence of the application of the new European regulation permitting the disposal of carrion in the field was a significant increment in the availability of food resources for scavengers (measured as tons of carrion) within these areas. This may alone imply a significant step in the conservation of the Spanish and, by extension, European vulture populations. In particular, the Spanish PAF network could potentially provide c. 4–6 times the carrion needed annually by the whole Spanish vulture population (Margalida & Colomer 2012).

Moreover, to predict the carrying capacity of these areas to maintain healthy populations of vultures and other facultative scavengers in Spain, it is important to simultaneously assess the role played by wild ungulate carcasses as another source of food for these species (Mateo-Tomás et al. 2015).

Also, the implementation of the new regulation potentially leads to a considerable reduction in the GHG emissions associated with artificial carcass disposal.

### How can be the PAF network improved?

Non-targeted facultative scavengers can also benefit from the resources available within PAFs. For example, the application of the previous EU sanitary regulation led to changes in the diet of wolves (e.g. increased large domestic ungulate consumption; Lagos & Barcena 2015; Llaneza & Lopez-Bao 2015), possibly affecting their role in the ecosystem (Lagos & Barcena 2015) and exacerbating human–wolf conflicts (Llaneza & Lopez-Bao 2015). Regarding *U. arctos*, carrion is an important resource for this species (Clevenger & Purroy 1991; Naves et al. 2003; Mateo-Tomas et al. 2015), which is critically endangered (CR) in Spain. Its inclusion as a priority species in PAFs might significantly contribute to improving its conservation status.

The most important failure of current PAF design is probably their focus on the breeding distribution of scavengers. Vultures are soaring birds that can travel several hundreds of km daily from breeding to foraging areas across physical and political boundaries. In these cases, conservation strategies that consider movements outside of breeding areas are highly desirable (Lambertucci et al. 2014). This clearly highlights another important avenue for the improvement of the new sanitary regulation, which should recognize the combination of breeding and foraging areas.

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