



Policy analysis

The continued deficiency in environmental law enforcement illustrated by EU sanitary regulations for scavenger conservation

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ABSTRACT

Enforcement is critical to guarantee the effectiveness of environmental laws for nature conservation. Erroneously assuming an equivalence between the formal implementation of environmental legislation on paper and its practical enforcement in reality can result in biased conclusions with potential to ill-inform conservation actions and influence stakeholder perceptions. Here, using as an illustrative example the implementation of European sanitary regulations EC 1069/2009 and EU 142/2011 to manage livestock carcasses for wildlife conservation in Spain and Portugal, we demonstrate how the legal implementation of these regulations does not mean effective enforcement and compliance in practice. When interviewed, more Portuguese farmers declared to leave carcasses in the field without official authorization, than their Spanish counterparts, who were legally allowed to do so. This unforeseen result was further supported by GPS-tracked vultures feeding on livestock carcasses available in the Portuguese countryside, contrasting to what would be expected considering the sanitary regulations approved at each country at the time of this study. Accordingly, while agreeing with the global trend for weak enforcement and compliance with environmental legislation, our results provide additional evidence against assuming that the formal implementation on paper of environmental laws equals their real implementation on the ground. We highlight the need to systematically assess (not assume) observance of and compliance with environmental legislation and propose some ways to improve enforcement using as an example the above referred sanitary regulations. Communication-based interventions to publicize the regulations, reducing bureaucratic burden, and on-ground monitoring to assess observance and compliance have strong potential to enhance enforcement. Overlooking implementation gaps can give rise to biased interpretations on the effectiveness of these legal tools with consequences at both, the scientific and conservation arenas.

1. The Achilles' heel of conservation policies: lack of enforcement

The increasing implementation of laws and policies dedicated to conservation in the last decades, – from 3 countries with environmental framework laws in 1972 to 176 in 2017 (UNEP, 2019) –, acknowledges the important role that environmental legislation plays in halting, slowing, and even reversing, nature degradation (Trouwborst et al.,

2017; Lees and Viñuales, 2019). Worryingly, these legal frameworks often suffer from deficient enforcement (i.e., to compel observance of or compliance with legislation; UNEP, 2019), which jeopardizes their effectiveness as conservation tools. Enforcement failures identified so far include slow transposition of policies, poor administrative coordination among and within nations, under-resourcing, misfit between rules and traditions, lack of monitoring or deprioritizing legal obligations against economic gain (Markell and Glicksman, 2014; Treib, 2014; Chapron

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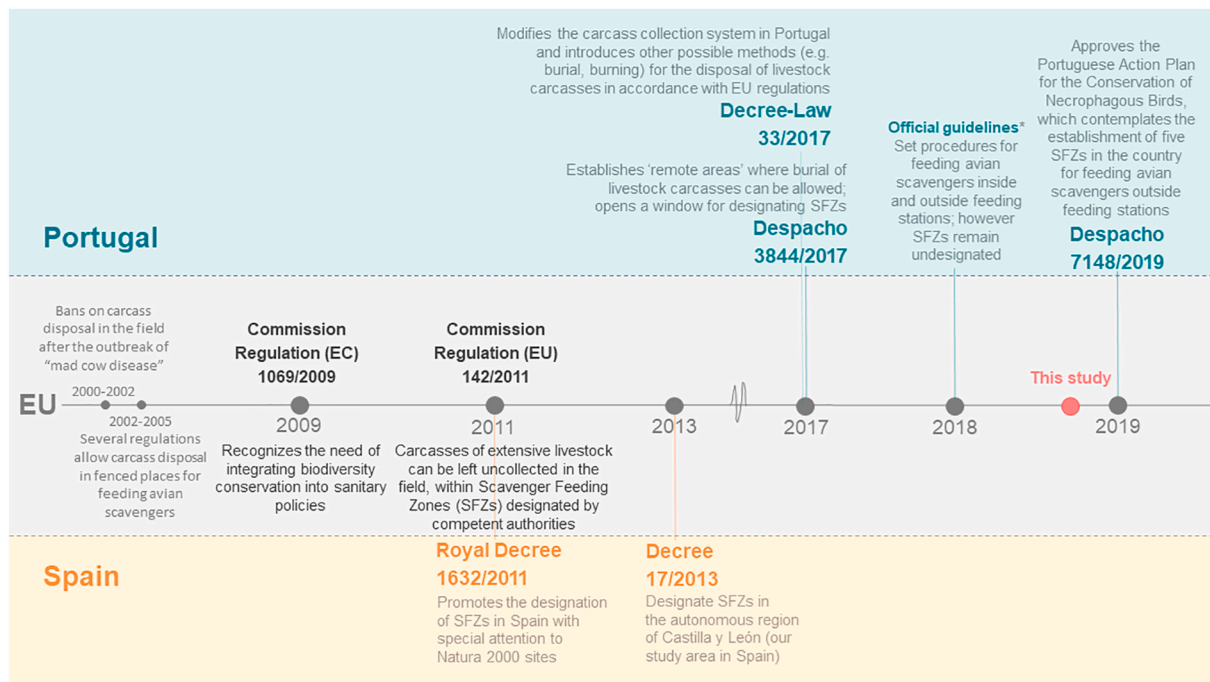


Fig. 1. Timeline showing the main legislation on livestock carcass management for scavenger conservation implemented in Portugal (green background at the top) and Spain (orange background at the bottom) after EU sanitary regulations EC 1069/2009 and EU 142/2011 (center grey background), which allow carcasses of extensive livestock to remain uncollected in the field for feeding wildlife. Previous EU regulations restricted carcass disposal in the field after the outbreak of the Bovine Spongiform Encephalopathy (BSE) or "mad cow disease". The red point indicates the time when this study was conducted. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

et al., 2017; López-Bao and Margalida, 2018; UNEP, 2019). From climate change or waste pollution (Barrett, 2008) to the effective protection of species and habitats (Donald et al., 2007; Mateo-Tomás et al., 2019a; Szatornil et al., 2019), the implementation of conservation actions (López-Bao et al., 2018) or the fight against poaching and illegal wildlife trade (Milliken, 2014; Bennett, 2015; Linkie et al., 2015; Cooney et al., 2017; Hauenstein et al., 2019), additional efforts are still needed to tackle enforcement failures properly. To guarantee that environmental laws effectively address major conservation challenges, a critical step is to address the gap between the formal implementation of environmental legislation on paper and its practical enforcement in reality.

Several examples are available on the efforts carried out by authorities in charge of enforcing environmental laws. For example, exhaustive environmental controls are in place to approach commitments on greenhouse gas emissions or water pollution (e.g. Nkosi and Odeku, 2014), and increasing efforts are put in place to improve wildlife crime persecution (UNODC, 2020). But noncompliance with regulations involves not only a deliberate violation of the norms, but also a lack of awareness of the implemented legislations, – identified as a major factor behind enforcement and compliance failures (OECD, 2000; Arias, 2015) –, as well as passive failures in enforcing the norms (Börzel, 2001). A worryingly scenario emerges when the lack of enforcement is overlooked, e.g., legal observance and compliance are assumed by default or ignored when inexistent or incomplete (Heyes, 2000). In this context, no actions are expected to fix the unnoticed drawbacks, with substantial consequences for conservation. Assuming a correct implementation of environmental legislation in this scenario can lead to misleading conclusions (Heyes, 2000), with potential to erode the legitimacy of the environmental policies, increase resistance and discontent among stakeholders and trigger distrust in managing authorities, ultimately, undermining the consecution of the legislation objectives (Meinzen-Dick and Pradhan, 2016).

Using as an illustrative example the implementation of European sanitary regulations EC 1069/2009 and EU 142/2011 (Official Journal

of the European Union, 2009, 2011) to manage livestock carcasses for wildlife conservation, we show here how the legal implementation of these regulations on paper did not result in a generalized effective enforcement and compliance in practice. We call attention to the fact that erroneously assuming such equivalence can result in biased conclusions with potential to ill-inform conservation actions. We highlight the need to systematically assess (not assume) observance of and compliance with environmental legislation and propose some ways to improve enforcement using as an example the above referred sanitary regulations.

2. Implementation deficits of European sanitary regulations and their consequences for wildlife conservation

The outbreak of the Bovine Spongiform Encephalopathy (BSE), commonly known as "mad cow disease", in the late 1980s (Aldhous, 2000) forced the removal of livestock carcasses from the European countryside, following different EU regulations at the beginning of the 2000s (Commission Decision 2000/418/EC, Regulation EC 1774/2002 and Commission Decision 2003/322/EC; Fig. 1). At the same time, this decision aroused concerns on scavenger conservation in Europe (Tella, 2001). Several years later, the approval of EU regulations 1069/2009 and 142/2011 reversed the situation, by allowing carcasses of extensive livestock to be left in the field again for feeding wildlife outside collective fenced feeding stations previously authorized for avian scavengers only. These new regulations took into account therefore the natural consumption patterns of both avian and mammalian scavengers, which could feed on livestock carcasses left in situ within large natural areas called Scavenger Feeding Zones (SFZs) designated by the competent authorities (Fig. 1; Mateo-Tomás et al., 2019b). The implementation of these regulations has been outlined as a significant achievement for scavenger conservation in Europe (e.g., Margalida et al., 2012). Nonetheless, several implementation deficits, such as slow or uneven transposition across and within European countries, or insufficient

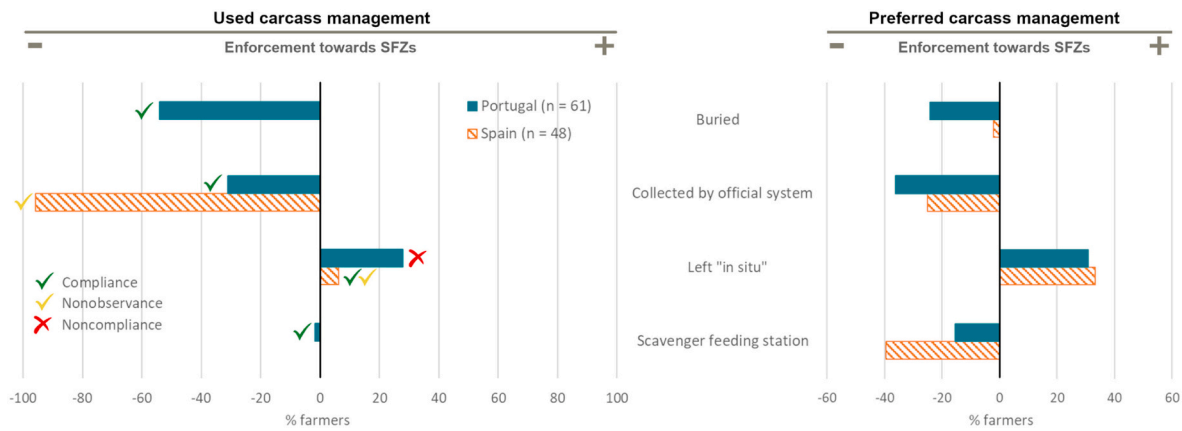


Fig. 2. Results of the methods used (left panel) and preferred (right panel) for livestock carcass disposal by 61 Portuguese (solid bars) and 48 Spanish (striped bars) farmers interviewed illustrate a lack of enforcement (i.e. negative values) of the EU regulations aiming at harmonizing public health and biodiversity conservation through designation of Scavenger Feeding Zones (SFZs; positive values). Despite the fact that the law in force in their country allows (tick sign) livestock carcasses to be either collected or left in the field for wildlife, most Spanish farmers used the carcass collection system, showing therefore a large lack of observance of the enforced legislation (yellow tick); even one out of the three Spanish farmers who declared to leave carcasses in the field was not aware of this law allowing him to do it, showing also a lack of observance with the norm. Contrastingly, in Portugal, more than one quarter of the farmers left carcasses in the field without any official supervision, exhibiting noncompliance (wrong sign) with the current national legislation compelling them to bury or collect livestock carcasses (feeding of necrophagous birds is only possible but under very restrictive rules). Enforcement of both, the legislation currently in force in Spain and the last norm providing for the establishment of SFZs in Portugal, will better match farmers' preferences (right panel), reducing the levels of nonobservance and noncompliance with regulations. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

monitoring of the implementation of the norms, have been highlighted as major issues with strong potential to compromise the effective consecution of the regulations' objectives, i.e. biodiversity conservation and public health (e.g., López-Bao and Margalida, 2018; Mateo-Tomás et al., 2018, 2019a, 2019b).

In the Iberian Peninsula, – home of >90% of the vultures in Europe, 100% of the Spanish imperial eagles *Aquila adalberti*, and important populations of large carnivores in western Europe, like wolves *Canis lupus* and bears *Ursus arctos* (Chapron et al., 2014; BirdLife International, 2020) –, noticeable among-country (Spain vs. Portugal) and within-country (e.g. among Spanish autonomous regions) differences exist in the implementation of these regulations (Fig. 1; Mateo-Tomás et al., 2018, 2019b). Regarding the among-country differences, although the Portuguese legislation has been progressively adapted for allowing livestock carcasses to be left in the countryside (Decree-Law 33/2017; Despacho 3844/2017, *Diário da República*, 2017a, 2017b; DGAV, 2019; Despacho 7148/2019, *Diário da República*, 2019), the objective of establishing SFZs has not been clearly defined until recently, when the Despacho 7148/2019 set the goal of creating five SFZs for feeding scavengers outside feeding stations across the country (Fig. 1; *Diário da República*, 2019). Therefore, at the time of this study, livestock carcasses should be either collected or buried (i.e., the latter only allowed in remote areas, such as our study area, previously declared by the competent authorities in Despacho 3844/2017; *Diário da República*, 2017b). Livestock carcasses can only be used to feed avian scavengers under very restrictive conditions (e.g. within fenced feeding stations) and upon approval of a specific plan for each facility (Decree-Law 33/2017; Despacho 3844/2017, *Diário da República*, 2017a, 2017b; DGAV, 2019).

Contrastingly, most Spanish autonomous regions (15 out of 17) have already designated large areas as SFZs where fallen livestock can be left uncollected to feeding wildlife (Morales-Reyes et al., 2017; López-Bao and Margalida, 2018; BORM, 2019; Mateo-Tomás et al., 2019b). The implementation of these laws is expected to provide enough food for wildlife scavengers (Morales-Reyes et al., 2017). On the contrary, the lack of implementation of the EU regulations allowing SFZs in neighboring Portugal is considered as negatively influencing scavengers (e.g. through altering their foraging patterns; Arrondo et al., 2018). These effects on scavenger conservation would be expected outcomes of the

uneven implementation of EU regulations across borders (e.g. Mateo-Tomás et al., 2018, 2019b). However, a thoroughly assessment of the practical implementation of these regulations is lacking, agreeing with the less attention paid to enforcement and application issues of EU regulations (Treib, 2014; but see Börzel and Buzogány, 2019). Knowing the level of observance of and compliance with the legislation for managing livestock carcasses in each territory is a critical step to ascertain the real dimensions and potential consequences of the lack of homogeneous implementation on scavenger conservation and make robust recommendations accordingly.

3. Formal implementation does not mean real implementation

The continued deficiency in conservation law enforcement was illustrated by interviewing a total of 109 livestock farmers at the Portuguese-Spanish border in the Douro river in 2018–2019 (i.e. 61 in Portugal and 48 in Spain; see Appendix S1 and Gigante et al., 2021 for further details). Despite EU regulations EC 1069/2009 and EU 142/2011 being adopted more than a decade ago, we found a lack of observance of and compliance with these sanitary regulations in both countries (Fig. 2). Only 2 (4.2%) of the Spanish farmers interviewed had adhered to regulations allowing them to leave livestock carcasses in SFZs. In contrast, leaving livestock carcasses in the countryside without any supervision was frequently acknowledged by Portuguese farmers (27.9% of the interviewed farmers), even when recognizing this as a non-legal practice (Fig. 2). Only one Portuguese farmer (1.6%) declared to have asked for an authorization for disposal of livestock carcasses to wildlife within the limits of his farm (instead of using collective feeding stations). Despite SFZs were designated in 2013 by the competent authority in the Spanish side (i.e. the autonomous region of Castilla y León; Decree 17/2013; BOCYL, 2013), allowing the abandonment of livestock carcasses to feed scavengers, most Spanish farmers (95.8%) declared to use the collection system, which takes livestock carcass away for incineration in authorized facilities. The high rates of nonobservance of and noncompliance with EU sanitary regulations recorded (Fig. 2) seems to respond to a high lack of knowledge of these sanitary legislations by farmers, paradoxically, the stakeholders ultimately affected by the norms. Indeed, only 11 farmers (8 in Spain and 3 in Portugal), i.e. 10.1% out of the total farmers interviewed, declared to be aware of the

regulations for managing livestock carcasses enforced in their respective countries (Fig. 1).

Interestingly, contrasting with previous expectations on the implementation of EU regulations in each country (e.g. higher livestock carcass availability in Spain than in Portugal; Morales-Reyes et al., 2017; Arrondo et al., 2018), four times more Portuguese farmers declared leaving carcasses in situ than their Spanish counterparts (27.9 vs. 6.3%, respectively; Fig. 2). This could result in ~1.4 times more dead biomass from livestock left annually in the countryside by the Portuguese than by the Spanish farmers interviewed (i.e. 6.7 vs. 4.8 tons, respectively; see detailed calculations in Appendix S2). Considering the percentage of farmers who left dead livestock in the field at both sides of the border, numbers of livestock mortality declared by the interviewed farmers, and the 2018/2019 livestock censuses in the study area (Appendix S1; Gigante et al., 2020), we estimated that 1.2 times more biomass from dead livestock could be left in the field in the Portuguese than in the Spanish side of the border, i.e. 43.6 vs. 35.6 tons, respectively (see Appendix S2 for detailed calculations).

The lack of enforcement of EU regulations in Spain may contribute to the rise of an emergent conflict between the farming sector and some scavenging species, as illustrated by the negative perception of farmers towards vultures that we have previously recorded in the Spanish side of the border (Gigante et al., 2021). We observed how almost half of the Spanish farmers interviewed (i.e. 45.8%) related vulture attacks on livestock with food shortages caused by the removal of carcasses from the field, a procedure that they wrongly considered still mandatory (by 97.8% of the interviewed farmers). Since the perception of farmers towards scavengers improved for those leaving livestock carcasses in the field, when compared with farmers using feeding stations or burying carcasses (Gigante et al., 2021), not only the designation of SFZs but, overall, a better enforcement of the existing legislation that allows leaving livestock carcasses in the field may help to mitigate this emerging human-scavenger conflict. On the contrary, the lack of observance of the current EU sanitary regulations could compromise the conservation of these and other scavenging species in the long term (e.g., through retaliatory killing of livestock predators; Woodroffe et al., 2005).

4. Improving enforcement and compliance for effective biodiversity conservation

While agreeing with the global trend for weak enforcement and compliance with environmental legislation (UNEP, 2019), our results provide additional evidence against assuming that the formal implementation on paper of environmental and conservation laws means their real implementation in practice. Overlooking implementation gaps can give rise to biased interpretations on the effectiveness of these legal tools at both, scientific and management arenas.

In the particular case of the consequences of a deficient implementation of EU sanitary regulations for scavenger conservation, the absence of SFZs in Portugal has been previously related to altered foraging patterns of Spanish vultures, arguing that vultures seem to prefer foraging at the Spanish side of the border, because of a much higher availability of livestock carcasses (Arrondo et al., 2018). However, our results indicate that livestock carcasses would be also available at the Portuguese side, and could be even locally more abundant in Portugal than in Spain (Appendix S2). Similarly, our results warn against assuming that the designation of SFZs in most Spanish regions would guarantee carrion availability for wildlife (Morales-Reyes et al., 2017).

The level of nonobservance and/or noncompliance with EU sanitary regulations among farmers should be therefore further considered when assessing the potential impacts of this legislation on scavenger conservation. For example, in the concrete case of the griffon vulture, – which feeds mainly on large ungulate carcasses, such as those of livestock –, although food shortages due to the mandatory collection of livestock carcasses could have negatively affected some vulture populations at

local scale (Camiña and Montelío, 2006), overall, the Iberian populations have shown increasing trends in the last decades, including the period of food shortage associated with the BSE outbreak (Del Moral and Molina, 2018). Concretely, the griffon vulture population in Spain has increased from 2283 breeding pairs in 1979, to 7519 in 1989, 17,337 in 1999, 24,609 in 2008 and 30,945 in 2018, i.e., a 26% increase in the last decade (Del Moral and Molina, 2018). Both the speed of increase and the breeding parameters seem to have decreased since the first census carried out in 1979 (i.e. from 0.65 to 0.56 fledglings per breeding pair; Del Moral and Molina, 2018). Besides several census limitations, such as incomplete coverage or delayed visits, the observed slowdown in vulture population growth could be attributed to the species reaching the carrying capacity of the environment in several areas (e.g., Navarra, Burgos or Teruel provinces, which account for the 8.7, 7.0 and 4.5% of the total griffon population in Spain, respectively; Del Moral and Molina, 2018). To ascertain to what extent EU sanitary regulations have contributed to the observed vulture population trends needs to consider the level of enforcement and compliance with the successive legislations implemented after the BSE outbreak (Mateo-Tomás et al., 2019a).

Our results detect a lack of compliance with EU sanitary regulations banning carcass disposal in the field. This could especially occur in remote areas such as, for example, our study area in Portugal, where burial by farmers instead of mandatory collection by an external service could facilitate carcass abandonment, or in mountainous ranges where carcasses would be hard to locate (Mateo-Tomás, 2009). In this regard, the interviewed Spanish farmers could have over-reported compliance with the former regulations of carcass disposal to “save face” (Pollnac et al., 2010). Nonetheless, even under this scenario, such over-reporting would not have affected one major result of our work, i.e. the lack of awareness of Spanish farmers regarding the current legislation that allows them to leave livestock carcasses in the field.

Existing recommendations to counteract the lack of enforcement of environmental laws include publicizing rules and regulations as a first step for building a culture of compliance (UNEP, 2019). Aligned with this, the noticeable lack of knowledge of farmers on the EU regulations enacted in Spain and Portugal for managing livestock carcasses highlights the need of communication-based interventions to enhance enforcement (Leisher et al., 2012); especially considering that most people tend to comply when informed (Winter and May, 2001; UNEP, 2019). Previous results from our study area showed that those farmers who leave carcass in situ have a more positive perception towards vultures, compared to those farmers using other methods for livestock carcass disposal (Gigante et al., 2021). Considering this, and that leaving carcass in situ was highly preferred by both, Spanish and Portuguese farmers (33.3 and 31.0%, respectively; Fig. 2), improving communication of the current norms among farmers would be a major step towards the effective consecution of the objective of wildlife conservation under EU regulations EC 1069/2009 and EU 142/2011. In this line, a common claim of the few Spanish farmers aware of these new regulations was to reduce the bureaucracy burden to be authorized to leave their fallen livestock within SFZs. The veterinary units or equivalent competent authorities in charge of in situ surveillance of livestock health issues should act as information points to publicize the regulation among farmers, and assist them with the bureaucracy needed for inclusion into SFZs, while tracking enforcement and compliance through, for example, on-ground monitoring (Mateo-Tomás et al., 2019a).

Effectively counteracting weak enforcement and compliance requires accurate information on, for example, the type of noncompliance activities, where and why they occur and who is involved (Solomon et al., 2015). This information will increase the chances of success by guiding the selection of the interventions that best addresses enforcement failures in each particular case (Solomon et al., 2015). Besides improved communication with farmers about the implemented EU sanitary regulations (see above), we urge to implement a program to monitor the presence and consumption of livestock carcasses on the ground (Mateo-Tomás et al., 2019a). On-ground monitoring of livestock

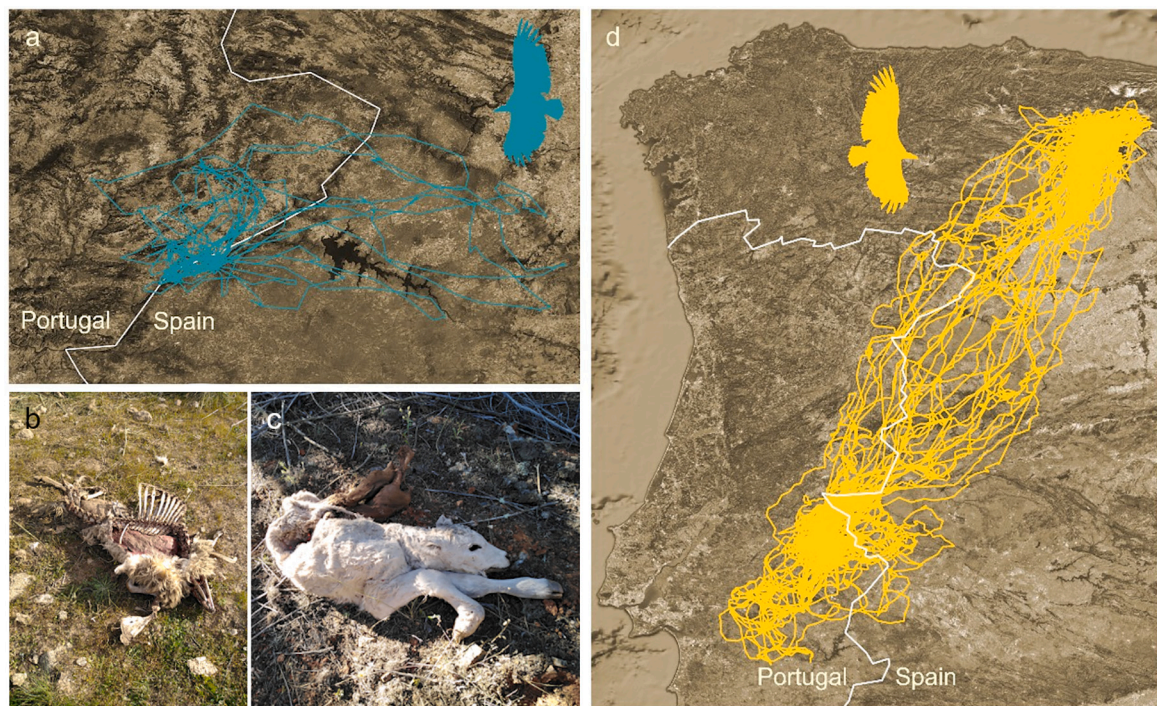


Fig. 3. a. Griffon vultures tracked with GPS in Spain and Portugal have allowed us to detect livestock carcasses of sheep (b) and cow (c) available in the Portuguese countryside. d. Example of periodic long-distance movements recorded for one GPS-tracked vulture from northern Spain to central-southern Portugal, presumably to feed into areas with extensive livestock, where long stays with on-ground locations have been registered. Photo credits: João P.V. Santos.

carcass consumption has been previously recommended to assess the achievement of EU regulation objectives regarding both biodiversity conservation (through food provisioning for scavengers) and public health (by minimizing the presence of unconsumed carcasses in the field; Mateo-Tomás et al., 2019a). On-ground carcass monitoring will contribute to assess the real implementation of these laws instead of assuming their effective enforcement, while contrasting the information provided by farmers regarding carcass management (Pollnac et al., 2010). Furthermore, on-ground monitoring will inform the regulations in line with the current strategies of the European Commission of amending existing legislation, instead of set new laws, to enforce compliance (Börzel and Buzogány, 2019).

Several ways exist in which this monitoring could be performed, from camera trapping of livestock carcasses (e.g. Fundación CBD-HABITAT, 2019; Mateo-Tomás et al., 2019a) to on-ground monitoring of the feeding activities of GPS-tracked vultures (Pérez-Rodríguez, 2020). For example, current vulture GPS tracking activities have allowed us to confirm that, as declared when interviewed, Portuguese farmers leave livestock carcasses in situ in our study area even when they were not authorized to do so (Fig. 3a, b and c). Although we acknowledge that this situation may differ along the entire border, the long-distance movements of GPS-tracked vultures from northern Spain to southern Portugal, presumably to feed into areas with abundant extensive livestock (Fig. 3d; authors, direct observation), suggests that livestock carcasses could be available elsewhere in the country.

Regular assessment and monitoring are key to strengthen the environmental rule of law (Lyons et al., 2008; Solomon et al., 2015; UNEP, 2019). The lack of accurate data on the drivers of enforcement and compliance can give rise to erroneous assumptions on the effective implementation of environmental legislations. In the concrete case of EU sanitary regulations, this can result in misleading conservation recommendations such as, for example, establishing supplementary feeding points in places where low carcass availability is wrongly suspected, or limiting the number of carcasses authorized to be left in the countryside on the basis of complete compliance with existing regulations, which

may also trigger human-scavenger conflicts.

CRediT authorship contribution statement

P.M.T. led the project and the writing. P.M.T. and J.V.L.B. conceptualized the paper. F.D.G., J.P.V.S., P.M.T. and J.V.L.B. did fieldwork. F. D.G. and P.M.T. did the analyses. All authors contributed to the further discussion and writing of the manuscript.

Declaration of competing interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.biocon.2022.109558>.

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