

We are seeking a highly motivated PhD candidate interested in developing a thesis project in our research group. A **4-year predoctoral contract (FPI)** is available associated with the project “**Interdisciplinary and multiscale assessment of tools aimed at mitigating human-wildlife conflicts: the case of European rabbits in Spain**” (ref. PID2023-152079OB-I00).

Applicants should hold a degree in life sciences (Biology, Environmental Sciences, etc.) with good academic records (above 7 in the scale 1-10). Previous research experience in ecology, management and conservation of wildlife species will be of great value. In particular, previous participation in research on game species, including European rabbits, will be especially welcome. Experience in collaborating with stakeholders involved in land management (e.g. hunters, farmers, etc.) will be also valuable. Solid communication skills and holding a Spanish driving license is required.

The selected applicant will become skilled in human-wildlife conflicts (HWC), and particularly in those involving the management of wildlife species that cause crop damage. It is intended that she/he addresses both ecological and social aspects considered in the project. Thus, we seek to train a researcher with an interdisciplinary profile; researchers skilled in several different disciplines are often demanded in the Academia (e.g. Nature special issue on Interdisciplinarity published on 17 September 2015). The PhD student will have freedom in his/her investigations but with a well-defined frame in the field of HWCs. It is planned that she/he will join the Natural Resources and Sustainable Management doctoral school in the University of Córdoba. In particular, she/he will be involved in the following research lines of this doctoral school: “animal behaviour” and “population management”. The existence at IESA-CSIC of a specific committee supervising the progress and learning of PhD students warrants a correct development of this PhD Thesis. The student will spend much of her/his time at the associated unit between IESA-CSIC and the University of Córdoba learning skills of both social and ecological sciences. For example, he/she will be trained on the rabbit ecology and management, including rabbit monitoring tools or the analysis of mortality factors. Her/his skills in ecological aspects will be also benefited of frequent stays at IREC-CSIC. In addition, he/she will be also trained in methodologies of the social sciences like personal interviews. Her/his expected frequent collaboration with the Applied Studies Technical Unit (UTEA) of IESA-CSIC will contribute to improve his/her skills in the social sciences. Complementarily, the PhD student will attend several courses to improve her/his training in specific issues (e.g. statistics, machine learning for wildlife images, interdisciplinarity in conservation). Also, this PhD student will conduct two short stays (3 months each) with habitual collaborators of the research team. Finally, the student will have the opportunity to collaborate with other researchers of the applicant institutions (IESA-CSIC-IREC-CSIC and University of Córdoba).

Research team

The team consists of 5 members: 3 researchers based at IESA-CSIC (Miguel Delibes Mateos -MD-, Rafael Villafuerte -RV-, Fernando Garrido -FG-), 1 researcher from IREC CSIC (Beatriz Arroyo -BA-), and 1 professor of the University of Córdoba (Francisca Castro -FC-). All members except one are part of the Associate Unit “Society, ecology

and environmental management” (IESA-CSIC and University of Córdoba). BA has multiple collaborations with the other members of the team in terms of joint projects and coauthored publications. All the members teach in the same masters and they often co-supervise PhD and master students. These previous long-term relationships among team’s members make that this group of researchers is cohesive. The research team has strong international collaborations both in international projects and coauthored publications. Members of the team have led multiple projects assessing wildlife management, and some of these have used multidisciplinary frameworks. There exist multiple evidences that human-wildlife conflicts (HWCs) cannot be managed successfully without a multidisciplinary approach that integrates knowledge of the social and natural sciences. However, integrated socio-ecological approaches to HWCs has had to date little scientific consideration in Spain, and the research team proposing this project have conducted a considerable proportion of this scientific work. Projects led by team’s members have involved both game species (including the European rabbit but also red-legged partridge or European turtle dove, among others) and non-game species (e.g. carnivores and rodents). Among these projects, five were funded by the National Plan of I+D+I (PID2020-114724RB-I00, RTI2018-096348-R-C22, CGL2013-43197-R, CGL2009-11665, FAU 2006-0014 C02 02), four of which dealt with European rabbit management. The first project termed GESCON, which will end in August 2024, has assessed the situation and population trends of rabbit subspecies using a socio-ecological approach with implications for management. Three of the members of the team (FG, MD and RV) are currently involved in the European Life project “[Iberconejo](#)”, which seeks to create a global Iberian governance structure responsible for a coordinated European rabbit management. The applicant researchers have long experience in the study of European rabbit ecology and management. For example, they have evaluated the usefulness of different tools to monitor rabbit populations (e.g. Fernández de Simón et al. 2010; Rouco et al., 2019; Delibes-Mateos et al. 2023). Furthermore, researchers of the team have investigated the impact of mortality factors on rabbit populations, including diseases like myxomatosis or RHD (Villafuerte et al. 1994, 1995, 2017; Cotilla et al. 2010). They have also contributed significantly to the study of rabbit management, mostly in natural areas (e.g. Delibes-Mateos et al. 2008). Importantly, members of the team have been involved with a prominent role in the scarce research conducted to date in Spain on rabbit damage to agriculture and associated conflicts. Such research started approximately a decade ago with the PhD thesis of Isabel C. Barrio, which was supervised by RV. That PhD thesis addressed, among other issues, the origin of rabbit damage (Barrio et al. 2013), the location of rabbit warrens in farmland (Barrio et al. 2011) and the use of cover crops to reduce rabbit-induced damage (Barrio et al. 2012). Later, Ríos-Saldaña et al. (2013) analyzed rabbit control. requests in agricultural areas in the 1960s and early 2000s. That study was also. coauthored by applicant researchers and supervised by RV and FC. More recently, members of the team described the conflicts associated with rabbit management in Iberia (Delibes-Mateos et al. 2014), documented an increase of rabbit damage in Spain, and conducted a national-scale characterization of areas favorable for the occurrence of rabbit damage (Delibes-Mateos et al. 2018). Complementarily, team’s members participated in a study that identified environmental conditions favorable for the presence of rabbit warrens in motorway verges close to crops (Rouco et al. 2019). Researchers involved in the present proposal have been also pioneer in

the study of the social aspects of rabbit management in farmland areas. For example, they provided a general overview of how the main stakeholders involved in the conflict perceive rabbit damage, its potential causes and management interventions to reduce such damage (Delibes-Mateos et al. 2020). This research line has continued during the LIFE Iberconejo and GESCON projects in which the research team has evaluated how the European rabbit is viewed by the main stakeholders involved in its management (i.e. farmers, hunters and representatives of official agencies) and by the general public.

Literature cited

Barrio et al. 2011. Harbours pests: rabbit warrens in agricultural landscapes. *Wildlife Research* 38: 756-761.

Barrio et al. 2012. Can cover crops reduce rabbit-induced damages in vineyards in southern Spain? *Wildlife Biology* 18: 88-96.

Barrio et al. 2013. Rabbits, weeds and crops: Can agricultural intensification promote wildlife conflicts in semiarid agro-ecosystems? *Journal of Arid Environments* 90: 1-4.

Cotilla et al. 2010. Establishing a serological surveillance protocol for rabbit hemorrhagic disease by combining mathematical models and field data: implication for rabbit conservation. *European Journal of Wildlife Research* 56: 725-733

Delibes-Mateos et al. 2008. Rabbit populations and game management: the situation after 15 years of rabbit haemorrhagic disease in central-southern Spain. *Biodiversity and Conservation* 17:559-574.

Delibes-Mateos et al. 2014. Conservationists, hunters and farmers: the European rabbit *Oryctolagus cuniculus* management conflict in the Iberian Peninsula. *Mammal Review* 40: 190-203.

Delibes-Mateos et al. 2018. A large-scale assessment of European rabbit damage to agriculture in Spain. *Pest Management Science* 74: 111-118.

Delibes-Mateos et al. 2020. Conflict and cooperation in the management of European rabbit *Oryctolagus cuniculus* damage to agriculture in Spain. *People and Nature* 2: 1223-1236.

Delibes-Mateos et al. 2023. Cooke's index: A simple, cost-effective method for multiple practitioners to estimate European rabbit abundance. *Ecological Indicators* 150: 110255.

Fernández de Simón et al. 2011. Towards a standardized index of European rabbit abundance in Iberian Mediterranean habitats. *European Journal of Wildlife Research* 57:1091–1100.

Ríos-Saldaña et al. 2013. Control of European rabbit in central Spain. *European Journal of Wildlife Research* 59: 573-580.

Rouco et al. 2019. Favourability for the presence of wild rabbit warrens in motorway verges: Implications for the spread of a native agricultural pest species. *Ecological Indicators* 104: 398-404.

Villafuerte et al. 1994. First epizootic of rabbit hemorrhagic disease in free living populations of *Oryctolagus cuniculus* at Doñana National Park, Spain. *Journal of Wildlife Diseases* 30: 176-179.

Villafuerte et al. 1995. Incidence of viral hemorrhagic disease in wild rabbit populations in Spain. *Mammalia* 59: 651-659.

Villafuerte et al. 2017. Large-scale assessment of myxomatosis prevalence in European wild rabbits (*Oryctolagus cuniculus*) 60 years after first outbreak in Spain. *Research in Veterinary Science* 114: 281-286.

Summary of CV of Miguel Delibes-Mateos (January 2024)

I am a CSIC Senior Researcher at IESA since 2018. My research intends to address through an interdisciplinary approach the complex relationships between biodiversity conservation and other human activities making use of natural resources, with the ultimate goal of searching for solutions that help to mitigate environmental conflicts. My research line is innovative and have been very relevant in terms of generation of cutting-edge knowledge. For example, my investigations on the role of European rabbits as a multifunctional keystone species in their native ecosystem (Delibes-Mateos et al. 2007 *Biol. Conserv.*; Delibes-Mateos et al. 2008 *Conserv. Biol.*) are good examples of the study of a keystone species at worldwide scale, and have contributed to change people's view of rabbits at the international level, as outside the Iberian Peninsula rabbits were only perceived as a harmful pest species. It is also remarkable my research on different conflicts over the management of wildlife species (e.g. Delibes-Mateos et al. 2021 *STOTEN*; Delibes-Mateos et al. 2022 *Conserv. Scienc. Pract.*), particularly those involving small mammals that cause agricultural damage (e.g. Lauret et al. 2020 *Ambio*), including rabbits (Delibes-Mateos et al. 2011 *Biol. Conserv.*; Delibes-Mateos et al. 2014 *Mammal Rev.*; Delibes-Mateos et al. 2020 *People an Nature*). I have published 112 contributions in peer-review journals, including 96 in SCI journals. My papers have been cited >2,500 times according to Scopus search engine (Scopus H-index: 27), which supports the interest of my research for the scientific community. I have participated in near 100 presentations in conferences and workshops. The projects in which I have acted as principal investigator over the past 10 years have received >470,000€. These projects included one funded by the Spanish National Research Plan (RTI2018-096348-R-C22). My research is only possible thanks to a strong international network of collaborators. For example, I'm currently participating in a LIFE project on the baselines for the good management of the European rabbit (LIFE20 GIE/ES/000731) in cooperation with researchers and practitioners of Spain and Portugal, and in a worldwide assessment of wildlife value orientations together with more than 40 researchers from America, Europe, Asia and Oceania. Regarding the transfer of scientific knowledge to other sectors, findings obtained during my career has been often of great interest both for conservation and the hunting industry. For example, my research has been highly useful to the recent assessment of the European rabbit as endangered by the IUCN. Some of this knowledge transfer corresponds to results available in unpublished reports. For example, we demonstrated that the antlers of the roe deer in Andalusia (this population has been isolated since long ago) were different of those of roe deer in other populations within the Iberian Peninsula and other European regions. Following our study, the International Council for Game and Wildlife Conservation catalogued the Andalusian roe deer as a singular hunting trophy, increasing the value of its hunt. My publications of >40 articles and popular journals and book chapters have also

contributed to the dissemination of my results. I have supervised the work of several Postdoc students, 3 PhD theses, and several master and graduate students. I am currently co-supervising 3 PhD students.

Summary of CV of Rafael Villafuerte (January 2024)

Doctor in Biological Sciences and Scientific Researcher at the CSIC. His doctoral thesis dealt with the ecology of the rabbit in the Doñana National Park and its relationship with predators. He completed his postdoctoral at the University of New Hampshire (USA) where he specialized in the study of the relationships between the physical conditions of prey and predation. In these >30 years of research, his work has focused mainly on the ecology of wild species, analyzing management measures for their conservation, use, or even their control. He has been researcher at the Doñana Biological Station (EBD-CSIC), and at the Institute for Research on Game Resources (IREC-CSIC), where he was appointed as the institute first director. He has also been General Director of Research and Technological Innovation of the Castilla-La Mancha Community Board. Initially transferred to Córdoba through an agreement between the CSIC and the University of Córdoba (UCO), he is currently a Scientific Researcher at the Institute for Advanced Social Studies (IESA-CSIC), and director of the Associated Unit UCO-CSIC "Society, conservation and management of the environment ". He has published more than one hundred scientific works in journals included in the SCI. He has participated in more than thirty research projects, most of which as Principal Researcher. After joining IESA, his research has focused on linking the fields of natural and social sciences to address the conflicts that threaten the conservation of wild species and their habitats as well as human activities related to natural resources. He is editor or associate editor of several international journals, and an invited member of the IUCN group of specialists. To date, he has supervised 17 completed doctoral theses, with many of his former doctoral candidates becoming senior scientists at the CSIC, associate or full professors at universities, or senior technicians in government or regional autonomous communities. He is member of Editorial Committees of several Journals like Wildlife Research (Associated Editor), Animal Conservation and Biodiversity (Editor), Galemys (Editor).