



14th International Symposium on Wild Boar and Other Suids

September 9 – 11, 2026
Zagreb, Croatia

“Rooting towards the Future”

BOOK OF ABSTRACTS



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14TH INTERNATIONAL SYMPOSIUM ON WILD BOAR AND OTHER SUIDS

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FOREWORD

It is our great pleasure to welcome you to the 14th International Symposium on Wild Boar and Other Suids, held in Zagreb, Croatia, from 9 to 11 September 2026.

Over the years, this symposium has developed into an important international forum for scientists, wildlife managers, veterinarians, conservationists, hunters, and other professionals interested in wild boar and other members of the family Suidae. The 14th edition continues this tradition by bringing together researchers and practitioners from different countries, disciplines, and professional backgrounds to exchange knowledge, present new findings, and discuss current and emerging challenges related to suid ecology, conservation, health, and management.

The scientific contributions presented at this symposium reflect this complexity. They address a broad range of topics, including population ecology and dynamics, behaviour and movement ecology, wildlife management, human–wildlife interactions, conservation, hunting, monitoring technologies, genetics, disease ecology, and wildlife–livestock interfaces. Particular attention is given to African swine fever (ASF), which continues to represent one of the most significant challenges for wild and domestic suids worldwide. The contributions dealing with ASF demonstrate the importance of integrating epidemiology, wildlife ecology, veterinary science, modelling, surveillance, management, and stakeholder cooperation within a broader One Health framework.

This shift in scientific priorities is clearly illustrated by comparing the thematic distribution of oral presentations over the last four editions of the symposium (Figure 1). Following the spread of ASF in Europe, the proportion of contributions dedicated to diseases has steadily increased, reaching its peak in the current 14th edition in Zagreb, where it constitutes the single largest topic. The 14th edition also marks notable expansion in ecology abstracts compared to previous years. Meanwhile, fundamental themes such as management and behavior remain consistently core to the symposium program, whereas topics such as damages and physiology represent a smaller share than in earlier editions.



14TH INTERNATIONAL SYMPOSIUM ON WILD BOAR AND OTHER SUIDS

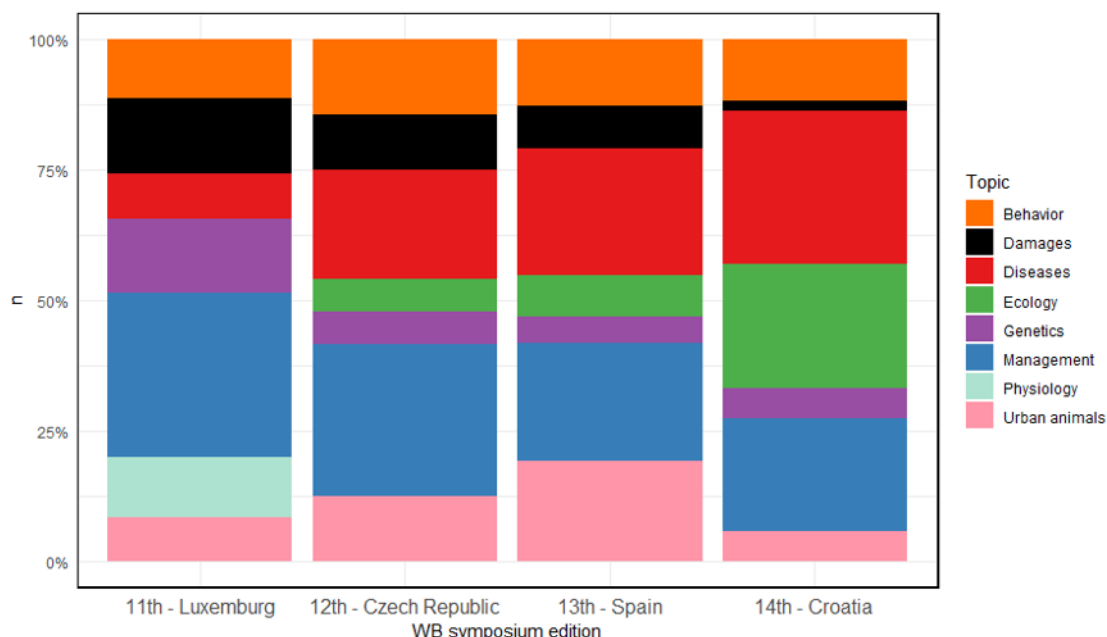


Figure 1: Proportion (%) of oral presentations by thematic topic across the last four editions of the International Symposium on Wild Boar and Other Suids.

The symposium also provides an opportunity to consider how rapidly advancing technologies are changing the way we study and manage wild suids. GPS telemetry, camera trapping, remote sensing, drones, molecular approaches, spatial modelling, artificial intelligence, and other emerging methods are providing unprecedented opportunities to understand animal movements, population dynamics, disease transmission, and interactions between wildlife and increasingly human-dominated landscapes.

This Book of Abstracts brings together the scientific contributions presented during the 14th International Symposium on Wild Boar and Other Suids and provides a snapshot of current research, management experience, and emerging priorities in suid science. We hope that it will serve both as a record of the symposium and as a useful source of ideas for future research and cooperation.

We would like to express our sincere gratitude to all plenary speakers, authors, participants, members of the Scientific and Organizing Committees, reviewers, institutions, sponsors, and partners whose contributions and commitment have made this symposium possible. Finally, we warmly welcome all participants to Zagreb and Croatia. We hope that the 14th International Symposium on Wild Boar and Other Suids will provide an inspiring environment for scientific exchange, constructive discussion, new professional connections, and lasting collaborations.

We wish you a productive and enjoyable symposium.

The Editors
Nikica Šprem, Damir Ugarković & Toni Safner

Zagreb, September 2026



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Wednesday 9.9.2026	
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11:15 - 12:00	Jorge Ramón López-Olvera This little piggy went to town: causes, consequences and management of wild boar synurbization
12:00 - 13:30	LUNCH
13:30 - 13:45	Giovanna Massei Boar, baits and behaviour: a review
13:45 - 14:00	Pauline Emond Rethinking wild boar in times of crisis: wildlife management and human animal relations in Wallonia during ASF
14:00 - 14:15	Julien Fattebert Roadkill patterns in Lithuania: a focus on wild boar, ASF and COVID (if not, why not?)
14:15 - 14:30	Adrian Meyer Multitemporal AI for predicting wild boar collisions on French railways
14:30 - 14:45	Carlos Fonseca The wild boar situation in Portugal: from population assessment to impact mitigation
14:45 - 15:00	Michael Marlow The pig in the room: its time to start talking about feral swine hunting in the United States
15:00 - 15:30	COFFEE BREAK
15:30 - 15:45	Erin Thomas An assessment of methods to measure densities of wild boar
15:45 - 16:00	Agus Jati Complexities in conserving the Togean babirusa: human-wildlife conflict or conflict between humans?
16:00 - 16:15	Lucas Villard Spatio-temporal distribution and human perception of warthog and bushig in a dense protected areas network in western Tanzania
16:15 - 16:30	Claude Fischer A review of the conservation status of subsaharian wild suids: implication for management and conservation
16:30 - 16:45	Mihael Janječić Monitoring seasonal wallow use in wild boar using camera traps
16:45 - 17:00	Loreto Urbina Effect of landscape structure and hunting on the spatial behaviour of wild boar in human-dominated areas
17:00 - 17:15	Rudy Brogi Wild experiments reveal behavioural mechanisms of wild boar success in human-dominated landscapes
17:15 - 17:30	Michaela Masilkova Trap preference and injury risk in wild boar: comparing three capture systems



14TH INTERNATIONAL SYMPOSIUM ON WILD BOAR AND OTHER SUIDS

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9:45 - 10:30	Francesco Ferretti From the sea to mountains: ecology and interspecific interactions of wild boar
10:30 - 11:00	COFFEE BREAK
11:00 - 11:15	Jeremy Hardouin Do wild boar visit the dead? Behavioural responses to conspecific carcasses
11:15 - 11:30	Janine Rietz Scavenger behaviour at wild boar carcasses and implications for disease management
11:30 - 11:45	Joaquin Vicente Banos A decade of wild boar population monitoring in Spain: integrating camera trapping, hunting data, control effort and modelling for long-term assessment
11:45 - 12:00	Niccolò Fattorini Do wild boar impact mammal communities? A behavioural analysis
12:00 - 12:15	Seunghyeok Kang Habitat-contingent behavioural flexibility in wild boar at the human–wildlife interface
12:15 - 12:30	Tamas Tari The role of microhabitats in the urban occurrence of wild boar (<i>Sus scrofa</i>)
12:30 - 12:45	Sungwon Hong Spatiotemporal responses of wild boar (<i>Sus scrofa</i>) to human activity in two South Korean national parks
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15:45 - 16:00	Travis Stoakley Movement ecology of wild boar post human abandonment of the Fukushima Nuclear Exclusion Zone, Japan
16:00 - 16:15	Bernet Jules Space use and behavioral similarity as drivers of dyadic GPS-based interactions in free-ranging wild boar (<i>Sus scrofa</i>)
16:15 - 16:30	Darius Hardalau Multi scale environmental drivers of wild boar activity in Europe
16:30 - 16:45	Alice Comuzzi Sexual segregation in resource selection: how baiting shapes sex-specific movement of wild boar
16:45 - 17:00	Jana Dietrich Wild boar in Lennebergwald: a unique case study of a fenced wild boar population
17:00 - 17:15	Matthew Ward Uncovering the world of the warty pig: identify the social dynamics of the elusive Visayan warty pig (<i>Sus cebifrons</i>)
17:15 - 17:30	Katarina Flajšman Seasonal and ontogenetic variation in the dietary niche of wild boar: a stable isotope approach
17:30 - 17:45	Marwan Naciri Assessing age- and sex-specific contributions to density dependence in wild boar
17:45 - 18:00	Selma Maarouf Improving wild boar relative abundance models by combining environmental and hunting data: insights from municipality-scale landscape analysis



14TH INTERNATIONAL SYMPOSIUM ON WILD BOAR AND OTHER SUIDS

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09:30 - 09:45	Timothy Smyser Leveraging genetic analyses to inform disease preparedness for feral swine in the United States	
09:45 - 10:00	Aja Bončina What's beneath the surface? Wild boar diet across seasons and land use	
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12:00 - 12:15	Per Zakariasson Coordinated management of African swine fever in Sweden, from the hunter's perspective: lessons from the Fagersta outbreak 2023–2024	
12:15 - 12:30	Niels Hahn Drone-assisted wild boar hunting and ASF control: the ambivalent role of recreational hunters	
12:30 - 12:45	Samantha Wisely Innovations in pathogen surveillance for invasive wild boar	
12:45 - 13:00	Ferran Jori A serological survey of porcine pathogens in bushpigs living in sympatry with domestic pig populations in rural areas of Madagascar	
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	<table><tr><td>DO'S AND DON'TS IN ASF MANAGEMENT FOLLOWING PRIMARY INCURSIONS: EXPERIENCES EXCHANGE AND ROUND TABLE <u>Chairs: Carme Rosell, Kevin Morelle</u> Xavier Fernandez Aguilar African swine fever re-emergence in Spain: early outbreak dynamics in wild boar Jorge Ramon Lopez Olvera Challenges for ASFV control in the peri-urban wild boar population of Barcelona, Spain Carme Rosell Fine-scale connectivity modelling for identifying strategic crossing points through barriers during an African swine fever outbreak</td><td>FROM TRAP TO TRACK: BEST PRACTICES IN WILD BOAR GPS TELEMETRY <u>Chairs: Mihael Janječić, Tamás Tari</u> Pietro Pontiggia Measuring what really matters: live-trapping effectiveness and animal welfare in wild boar management Darren Marshall Juha-Petri Lemivaara Lech Iliszko Aki Marttila</td></tr></table>	DO'S AND DON'TS IN ASF MANAGEMENT FOLLOWING PRIMARY INCURSIONS: EXPERIENCES EXCHANGE AND ROUND TABLE <u>Chairs: Carme Rosell, Kevin Morelle</u> Xavier Fernandez Aguilar African swine fever re-emergence in Spain: early outbreak dynamics in wild boar Jorge Ramon Lopez Olvera Challenges for ASFV control in the peri-urban wild boar population of Barcelona, Spain Carme Rosell Fine-scale connectivity modelling for identifying strategic crossing points through barriers during an African swine fever outbreak
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17:00 - 17:45	CLOSING CEREMONY	
20:00	GALA DINNER - RESTAURANT "MAKSIMIR" (click here for location)	

Saturday 12.9.2026	
9:00	TRIP TO PLITVICE LAKES NATIONAL PARK Departure from Faculty of Agriculture at 9:00, transport by bus



Plenary Speakers



Tracking African swine fever in Europe: Wild boar, epidemiology, and emerging challenges

Schulz, K.

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Keywords: anthropogenic resources, habituation, human-wildlife conflict, peri-urban, synurbic

African swine fever (ASF), first described in Africa more than a century ago, has since made several transcontinental jumps and is now widespread worldwide. Since the first German ASF cases were detected in Brandenburg six years ago, Germany has faced significant challenges in controlling the disease. At the beginning of the epidemic, Brandenburg, Saxony, and Mecklenburg-Western Pomerania were particularly affected, with the vast majority of cases reported in wild boar populations. The insights gained from these regions have helped to better understand epidemiological dynamics and to contextualize unexpected events. At the same time, they highlight the tensions between sustainable and effective disease control measures. Particularly surprising was the detection of different virus variants in Germany, which facilitated epidemiological investigations. Equally unexpected was the emergence of ASF in Hesse, especially the temporal and spatial clustering of cases in domestic pigs. Also the next “virus jump” to North Rhine-Westphalia was surprising. These developments challenge the traditional “emergency response approaches” designed for short-term epidemics and clearly demonstrate the need for a paradigm shift toward long-term, sustainable strategies in the sense of endemic management. This requires transdisciplinary collaboration, systems-oriented thinking, and close cooperation among veterinary authorities, hunters, farmers, and other stakeholders. Such a multifaceted approach offers the opportunity to reconcile effective disease control with broader societal and ecological responsibilities.



From the sea to mountains: ecology and interspecific interactions of wild boar

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Keywords: antipredator responses, impact on habitats, predator-prey interactions, wild boar

The management of wild boar *Sus scrofa* populations requires targeted approaches based on local impacts on human activities and biodiversity. While strong population control is often advised for anthropised areas to safeguard agriculture, protected areas are expected to meet conservation goals, requiring locally calibrated approaches. Substantial changes are influencing the wild boar environment, including, e.g., variations in weather patterns and in anthropogenic land-use, as well as the ongoing recovery of the wolf *Canis lupus*. Updated information is necessary on the effects of such factors on wild boar ecology. This is especially relevant considering also the current/expected effects of the spread of African Swine Fever on wild boar populations and the ensuing ecological interactions. In this talk, results of ongoing research on (i) individual-to-population responses to environmental and anthropogenic factors, (ii) predator-prey interactions, and (iii) potential impacts on habitats and mammalian assemblies will be shown. Research is conducted across many protected areas of Italy, from Mediterranean coastal to Alpine ecosystems, over multi-year temporal scales. Major methods included body mass measurements, camera trapping, estimates of population density and rooting impact, as well as assessment of wolf diet. Major results support an important role of landscape, weather and anthropogenic pressures in influencing indicators of individual phenotype (body mass) or behaviour (i.e., activity). The wild boar was a major prey to the wolf across Alpine and Mediterranean areas, and its role as a buffer against temporal changes in the availability of alternative prey was supported. Complex antipredator responses were reported, from sex-specific temporal shifts of activity to changes in group size. While the spatiotemporal variation of rooting was influenced by rainfall, topography and landscape metrics, a positive relationship with wild boar density was also observed, supporting strategies based on population control and preventive measures to mitigate impacts. Long-term analyses from a focal study area indicate the complementary role of active population management and intensive predation in limiting population size, with ensuing consequences for the reduction of damages to crops. At the community level, the wild boar was spatially associated with sites characterised by higher species richness, suggesting co-occurrence in high-quality locations. Nevertheless, some positive or negative associations emerged at the specific levels, providing the ground for targeted investigations.



25 years of tracking, 10 years of Euroboar: where did the wild boar move (and where will it move next?)

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Keywords: *Sus scrofa*, movement ecology, GPS telemetry, biologging, collaborative research

This talk will follow the development of wild boar movement ecology from the first earmark and VHF-telemetry studies of the 20th century to the present-day GPS-based tracking project. I will look back in the mirror at original motivations behind wild boar tracking, and attempt at highlighting the major ecological insights gained over the past decades, and discuss how telemetry has improved our understanding of wild boar behaviour, space use, and to some extent reshape our opinion of this still highly controversial, yet fascinating, species.

I will also reflect on the role of the Euroboar network, established in 2015, in advancing collaborative research in Europe. Beyond ecology, I will discuss the technological evolution of animal tracking, from early systems to current high-resolution biologging approaches. Finally, taking a crystal ball approach, I will look ahead and explore the key ecological and technological challenges that may shape the next generation of studies and discuss how we, as a community of wild boar researchers, can move the field forward.



This little piggy went to town: causes, consequences and management of wild boar synurbization

López-Olvera, J.R.

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Keywords: anthropogenic resources, habituation, human-wildlife conflict, peri-urban, synurbic

Urbanization is one of the main environmental transformations characterizing our times. The increase in human population, urbanised area, and anthropic space occupancy clash with environmental resources, biodiversity, and wildlife. While being a concern for conservation since most wildlife are threatened by the current unparalleled urban development, certain mainly generalist species manage to adapt to anthropized environment, colonising and even doing better in such settings than in natural ones. Such synurbization has long been known for insect, rodent, bird, and other small-sized species. However, increasing encroachment, combined with sociocultural changes, has extended synurbization to new macromammal species, which pose new concerns, challenge coexistence with humans, and require conflict management. Wild boar (*Sus scrofa*) is probably the best representative in Europe of these big mammal species newly arrived to urban and peri-urban settings. The recency of this phenomenon, and the variety of urban environments and socioecological contexts where it is occurring, generate the need for advancing knowledge on urban wild boar ecology, as well as requests on research for evidence-based management. This knowledge must be built while simultaneously managing synurbic wild boar populations and conflict, requiring fluent and close collaboration and implication of researchers and managers working together. The potential remote and proximate causes of wild boar synurbization and the associated interactions, coexistence, and conflicts with humans in specific environmental and socioecological urban and peri-urban settings will be presented and discussed, as well as the results of management experiences of synurbic wild boar populations and their interaction with humans.



Human-wildlife interactions and management policies



Rethinking wild boar in times of crisis: wildlife management and human - animal relations in Wallonia during ASF

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Keywords: coexistence, ASF crisis, wild boar management, killing practices, human-animal relations

In the autumn of 2018, the African swine fever virus triggered a major animal health crisis in Belgium, leading to forest closures and large-scale wild boar eradication operations. This event raises a central research question: what does this crisis reveal about the ways in which wild boar are managed and about the practices associated with their management? More specifically, how do the actors involved in wildlife management bring wild boar into being through shifting modalities of existence? This presentation examines how relationships between humans, wild boar, and technical devices such as traps were transformed throughout the crisis. Initially regarded as game animals, wild boar progressively became sanitary risks, animals to be eradicated, and, after the crisis, sensitive animals whose welfare had to be taken into account. The crisis highlights the limits of conventional approaches to wildlife management, which tend to treat wild boar as stable management objects, even though their modalities of existence evolve profoundly through changing relationships, practices, and socio-technical arrangements. Drawing on the accounts of hunters, foresters, and wildlife managers, this research shows how the trajectories of hunting and wild boar constitute a shared history in which management and killing practices contribute to shaping different forms of coexistence. Wild boar appear not only as targets of management, but also as active and creative partners that resist, orientate, and transform human practices. This perspective proposes a reconsideration of wildlife management through situated relational dynamics and the distributed competencies that emerge within anthropozoological relations. This presentation draws on work and data produced within a PhD project in Environmental Sciences and Management (2020–2026) at the University of Liège, funded by the Belgian Fonds de la Recherche Scientifique. The analysis is based on qualitative interviews, participant observation, and fieldwork conducted during and beyond the crisis.



This presentation focuses on the African swine fever (ASF) crisis in Belgium (2018) and examines how wild boar shifted from game animals to sanitary risks, then to targets of eradication, and later to “sensitive animals” after the crisis. Overall, it asks what this crisis reveals about wildlife management and the ways wild boar are enacted through changing socio-technical relations.



Roadkill patterns in Lithuania: a focus on wild boar, ASF and COVID (if not, why not?)

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Keywords: african swine fever, COVID-19 lockdown, lunar phase, spatio-temporal risk, wildlife-vehicle collisions

Wildlife-vehicle collisions (WVC) pose risks to road safety and animal populations. Wild boar (*Sus scrofa*) are a frequent roadkill species in Lithuania. Using police-reported collision data (2014–2022), we tested for effects of African Swine Fever (ASF), COVID-19 lockdowns, temporal patterns, and spatial risk factors. Annual data showed an apparent decline after the 2014 ASF outbreak and during the 2020 lockdown. However, monthly time-series revealed no sustained ASF effect. Compared against monthly averages of 2014–2022, 2020 roadkills fell within the interannual range, showing no lockdown reduction in March–April across. WVC peaked at dawn and dusk. Across all months, night kills exceeded day kills, a pattern that persisted after correcting for night length. Raw data suggested more kills on weekdays, but daily rates showed no weekend effect. Wild boar roadkill was highest during new moon and lowest during full moon. Spatially, N-mixture modelling indicated that wild boar collision risk peaked near human settlements, agricultural land, and forest. We conclude that ASF outbreaks and COVID-19 lockdowns had no detectable effect on wild boar roadkill in Lithuania. Risk is driven by nocturnal activity, new moon darkness, and proximity to settlements and land cover. Mitigation should prioritise dark-phase traffic warnings and habitat-sensitive road segments.



A review of the conservation status of subsaharian wild suids: implication for management and conservation

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Keywords: conservation status, african suids, threats, research needs, call for data

We review the conservation status of the five recognised species of African wild pigs, as recently reassessed by the IUCN wild pig specialist group (African chapter). The Common Warthog, *Phacochoerus africanus*, the Bushpig *Potamochoerus larvatus* and the Red River Hog, *Potamochoerus porcus* have been assessed as Least concern but decreasing. These species suffer of anthropogenic stressor, especially by habitat degradation, loss and fragmentation; competition with livestock and people for water and forage; and unregulated hunting. Bushpig represents a pest for farmland and it is often persecuted. The assessment of the giant forest hog *Hylochoerus meinertzhageni*, has been changed from least concern to near threatened. This species is relatively widespread with high reproductive potential but it is undergoing a rapid range contraction and population decline, across much of its distribution. Subpopulations are increasingly isolated by forest loss and fragmentation, particularly in West Africa, and local extirpations have been recorded. Unsustainable hunting for bushmeat and trophies may exacerbate its decline where regulations are inadequate. Targeted population assessments and adaptive management measures are urgently required for vulnerable subpopulations. The desert warthog *Phacochoerus aethiopicus* has been recognised as a separate species quite recently. Its distribution is limited to the Horn of Africa with some limited range overlap with the common warthog. Interestingly, the historical range included part of southern Africa where it got extinguished at the end of the XIX century. It represents a typical example of Rand fauna distribution caused by the alternance of contrasting climate conditions.



There are ongoing discussion for its reintroduction in southern Africa. Our review has clearly demonstrated that for most of these species (and specifically for the desert warthog) there is a critical lack of essential scientific knowledge upon which to develop policies of conservation. Our plea to IWBS delegates is to develop projects for the study of this group of suids.



The wild boar situation in Portugal: from population assessment to impact mitigation

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Keywords: agricultural damages, ecosystem management, human-wildlife conflict, road traffic collisions, *Sus scrofa*

Wild boar populations have increased in Portugal, intensifying conflicts with agriculture, road safety, and ecosystem management. In response, the Portuguese Strategic Plan for Wild Boar, conducted from 2020 to 2022 and financed by the Institute for Nature Conservation and Forests (ICNF), was developed to provide an integrated basis for monitoring and management. The results reveal a national population of approximately 277,385 animals characterised by significant regional heterogeneity. These densities align with the species' ongoing range expansion and the intensification of human-wildlife conflict. Among the most relevant impacts are agricultural damage and road traffic collisions, which showed a marked increase in recent years, rising from 364 cases in 2019 to 985 in 2022. Overall, the results support the need for coordinated monitoring, adaptive harvest strategies, and targeted mitigation measures to reduce impacts on agriculture and improve coexistence. A follow-up of the Portuguese Strategic Plan for Wild Boar is currently ongoing (IMPACTO project), directly targeting the prevention and mitigation of damages caused by wild boar to agricultural or forestry production. IMPACTO focus on three lines of action: (i) to devise and test measures for prevention and mitigation of damages caused by wild boar on agriculture; (ii) to update population numbers and detect trends; (iii) to raise awareness, deliver training and disseminate good practices for population management and damage prevention and mitigation. This Portuguese case study provides a useful framework for wild boar management in other regions experiencing population expansion.



Complexities in conserving the Togean babirusa: human-wildlife conflict or conflict between humans?

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Keywords: national park governance, endangered species, crop raiding, participant-observation, local perceptions

Human-wildlife conflict was suspected as a serious threat to the Togean babirusa (*Babirusa togeanensis*), an Endangered suid endemic to the Togean Islands, Indonesia. However, a specific investigation on this topic was absent, so the causes and impacts of the conflict were highly speculated. To understand this issue, we explored the relationships between a local community, the babirusa, and the conservation authority (i.e., Togean Islands National Park) by performing a participant-observation approach and interviewing locals as well as the national park authority, from February to July 2025. Human-babirusa conflict in the Togean Islands was dynamic: from intense conflict to a subsiding, only to resurface with renewed negative sentiment. Livelihood development has changed locals' agricultural practices from subsistence to market-based. In the past, the babirusa was considered a significant pest because locals depended on growing crops to sustain their daily life. Nowadays, most locals grow plants that are less attractive to babirusa to supply market demand elsewhere, and their daily staple is acquired through a cash economy, making economic loss from babirusa crop raiding insignificant. However, the presence of the Togean Islands National Park is negatively affecting how locals view the babirusa. Locals opposed the establishment of the national park, and their negative sentiment is expressed in their attitude towards the babirusa, which is viewed as a symbol of the national park's oppression. Research and conservation programs targeting the babirusa, regardless of the organizers, would be viewed as national park programs and would experience resentment. To resolve human-babirusa conflict, as well as to improve species conservation, the conflict between locals and the national park authority should first be resolved. We suggest evaluating and improving the communication strategy of the national park authority. The national park should also collaborate with the local government to build trust among them.



Spatio-temporal distribution and human perception of warthog and bushpig in a dense protected areas network in western Tanzania

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Keywords: West Tanzania, protected areas, occupancy, human-wildlife conflict, population survey

The republic of Tanzania has been expanding the implementation of protected areas since its independence in 1961, reaching a total of approximately 36% of its territory dedicated to biodiversity conservation. However, as the human population grows in rural areas and more and more settlements are being established on the outskirts of protected areas, interactions and conflicts with wildlife are increasing, which could trigger negative perception of the population towards wildlife conservation policies. In this context, Warthogs (*Phacochoerus africanus*) and particularly Bushpigs (*Potamochoerus larvatus*), which are common suid species in the miombo woodland ecosystem of west Tanzania, are susceptible to be perceived as major sources of conflict due to their crop raiding habits in African farming landscapes. Here we will present the results of two studies supervised by the Association for the Development of Protected Areas (ADAP), an NGO based in Geneva involved in promoting community-based wildlife resource management in the Katavi region of Tanzania. Firstly, we assess the spatio-temporal distribution and occupancy of Warthogs and Bushpigs in three different protected areas surrounding the Inyonga village land using systematic camera trap monitoring. Secondly, we present the results of a survey regarding human wildlife conflict and coexistence conducted in these villages, focusing on the results obtained about Warthog and Bushpig perception and acceptance by locals. Taken together, the findings might help implementing conflict mitigation actions to promote human-wildlife coexistence in the region.



The pig in the room: It's time to start talking about feral swine hunting in the United States

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Keywords: feral swine, invasive species, hunting

In the United States, millions of dollars are spent annually by farmers, ranchers, and various levels of government towards efforts to control invasive feral swine (*Sus scrofa*) and mitigate their widespread damage. However, feral swine remain a pervasive issue, often due to their perpetual existence and spread that has been primarily driven by deliberate, anthropogenic introductions for the creation and maintenance of huntable populations. The behaviors of those facilitating the spread of this destructive species are attributable to hunting as an element of regional cultural identities, capacity for individuals to profit from feral swine, and exploitation of public perception that meat from wild animals is healthier than traditional, domestic products. Even with broad outreach highlighting numerous risks to native wildlife, estimates of economic damage exceeding \$3.4 billion annually, and increasing threats to human health and safety, hunter tolerance of feral swine continues throughout much of the U.S. today. While counterintuitive, states that have been most successful in keeping feral swine at bay, or have made significant, positive gains at feral swine population reduction, either had or have implemented laws pertaining to restrictions or bans on hunting of feral swine. Additionally, organizations that have historically been staunch proponents of hunting and hunter's rights are beginning to recognize a need to explore alternative approaches to their management. While discussion of the metaphorical elephant in the room may continue to be avoided, we can no longer afford to ignore the pig in the room.



Trap preference and injury risk in wild boar: comparing three capture systems

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Keywords: animal welfare, behaviour, capture, human-wildlife conflict, trapping efficiency

Wild boar populations are rapidly increasing across Europe, resulting in substantial economic damage and biodiversity loss. Trapping is an important alternative to conventional hunting methods and is an essential step prior to GPS collar deployment. However, trapping methods must be both efficient and compliant with animal welfare standards. This study evaluated wild boar preferences for three trap types and assessed the welfare of captured individuals. We compared a metal cage trap, a wooden corral trap, and the Pig Brig Trap System, deployed in a triangular arrangement approximately 50 m apart at two sites in Czechia over six months in 2024. Wild boar behaviour and trapping success were monitored using camera traps, and animal welfare was assessed by injury rates among captured individuals. Generalized linear models were used to evaluate trap preference. We recorded 27 trapping events and captured 71 wild boars. Trap choice probability differed among trap types, with wild boars showing the highest preference for the Pig Brig Trap System (67%), followed by the metal cage trap (26%) and the wooden corral trap (7%). Preference for the Pig Brig Trap System was significantly higher than for the wooden corral trap ($p < 0.001$). Welfare outcomes also differed markedly among trap types. The metal cage trap showed the highest injury incidence, including abrasions, fractures, tooth fractures, and tongue injuries. In contrast, only minor abrasions occurred in the Pig Brig Trap, while no injuries were recorded in the wooden corral trap. Our findings revealed a clear trade-off between trapping efficiency and animal welfare. Although see-through traps were more attractive to wild boar, they were associated with poorer welfare outcomes. These results highlight the need to optimize trap design to balance efficiency with ethical considerations in wild boar management and research.



Boar, baits and behaviour: a review

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Keywords: bait delivery, bait uptake, population management, wild boar

Wild boar (*Sus scrofa*) have expanded globally, causing significant ecological, agricultural, and economic impacts. The species is involved in crop damage, vehicle collisions and transmission of pathogens such as classical and African swine fever and bovine tuberculosis, posing risks to animal and human health. As culling is often insufficient to reduce wild boar impact, bait systems for delivering biologically active agents such as vaccines, contraceptives, and toxicants, have emerged for disease control and population management. Bait-based delivery of these agents employs a variety of matrices designed to maximize palatability, stability, targeted delivery and bait uptake. Oral vaccination represents the most established application, with demonstrated success against diseases such as classical swine fever. Toxicant-laced baits are used where wild boar cause severe agricultural impact, and bait-based contraceptives are increasingly explored to manage wild boar populations. The effectiveness of these approaches depends on multiple factors, including bait composition, delivery systems, species-specificity, and patterns of bait uptake. Despite substantial advances, challenges remain, including optimizing bait attractiveness, ensuring stability of active compounds, minimizing non-target exposure, and navigating regulatory and ethical constraints. This review will synthesize a rapidly expanding body of research and highlight the effectiveness and limitations of bait-mediated drug delivery for wild boar. Specifically, it examines advances in bait formulation, the design and deployment of bait delivery systems, strategies to enhance species-specificity and reduce non-target risks, and factors affecting bait uptake by wild boar. By synthesizing findings across vaccines, contraceptives, and toxicants, the review will identify common principles, knowledge gaps, and opportunities for innovation. As bait-based delivery systems are increasingly important for integrated wild boar management, continued refinement of bait composition and deployment strategies, alongside improved understanding of uptake dynamics, will be essential to maximize efficacy, safety, and scalability in future applications.



Multitemporal AI for predicting wild boar collisions on French railways

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Keywords: artificial intelligence applications, remote sensing, decision-support modelling, wildlife mortality assessment, evidence-based mitigation

Wild boar (*Sus scrofa*) incidents on the French rail network are increasing, causing disruption, infrastructure damage and wildlife-management conflicts. We present a multiyear framework that links ecological habitat modelling with operational collision-risk forecasting for rail managers. First, we developed national, seasonally explicit habitat-suitability models from railway collision records, national roadkill data and species observations. Spatial sampling bias was corrected before combining these records with climate time series and annually updated 30 m land-cover maps derived from satellite imagery using a Vision Transformer. The resulting suitability layers identify key resource areas, including forest-agriculture interfaces, mast-producing woodland and peri-urban greenbelts. Second, we translated habitat suitability into monthly collision-risk estimates for standardized 1 km rail segments. Ecological predictors were combined with operational and infrastructure variables, including train frequency, speed, curvature, barrier passability, hunting-pressure proxies and proximity to relevant vegetation classes. We compared multiple modern machine learning model families, evaluating transferability, interpretability and suitability for operational forecasting. Camera-trap observations provided complementary field validation. Model outputs are delivered through an interactive web dashboard for French railway stakeholders. The platform supports hotspot visualization, monthly and annual risk forecasting, and prioritization of mitigation measures such as fencing, monitoring, deterrence and targeted habitat management. By integrating wildlife mortality data, remote sensing, machine learning and railway operations, this work converts ecological monitoring into actionable decision support for safer and more nature-compatible rail infrastructure.



Multitemporal AI for Predicting Wild Boar Collisions on French Railways

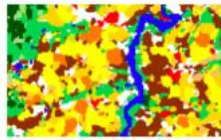


Fachhochschule
Nordwestschweiz



- Satellite RS Time Series
- Climate, Hunting, ...

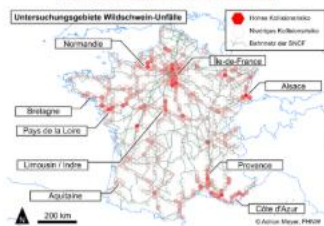
- SNCF GIS Datasets
- Train Density, V_{max} , Curvature, ...



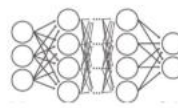
«Habitat Suitability»



«Permeability»



Accident Statistics



Machine
Learning

Prognostic
Risk Model
Dashboard



Multitemporal AI models combine wildlife observations, collision records, remote sensing and railway operations data to forecast wild boar collision risk on the French SNCF network.

Our framework translates habitat suitability into monthly 1-km rail-segment risk maps for hotspot detection, mitigation planning and safer, more nature-compatible infrastructure.



The role of microhabitats in the urban occurrence of wild boar (*Sus scrofa*)

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Keywords: activity patterns, avoidance behaviour, camera trapping, human-wildlife conflict, relative abundance index

As in many European cities, the presence of wild boar in urban areas is increasingly common in Hungary, leading to a variety of human-wildlife conflicts. Effective management of this issue necessitates city-specific data to support evidence-based decision-making. To collect such data, camera trap monitoring serves as an excellent methodological tool, which formed the basis of this research. The study was conducted over a two-year period in the peri-urban areas of Sopron, Northwest Hungary, with SpyPoint camera traps. The monitoring protocol adhered to the SnapshotEurope standards: cameras were positioned at a height of 50 cm, spaced at least 200 metres apart, and monitored for 21 nights per station. A total of 53 camera locations and 1,113 camera nights provided the dataset for analysis. During data processing, a 30-minute time window was applied to distinguish independent events. These events were used to determine the Relative Abundance Index (RAI) per 100 trap nights and the Frequency of Occurrence (FOO) relative to both total events and camera locations. Camera stations were categorised into four distinct microhabitats through cluster analysis, utilising the Hungarian Ecosystem Base Map (20x20-metre resolution) and 100-metre radius buffer zones. The study detected a total of eight huntable mammal species across 748 events. Within these, wild boar recorded the second-highest frequency of occurrence at 18.58%. Regarding camera locations, the FOO value was 45.3%, indicating the species occurred at 24 of 53 sites. The mean RAI per camera location was 12.5 ± 3.4 (mean $\pm$ S.E.), while the average number of individuals per event was 1.68 ± 1.27 (mean $\pm$ S.D.). RAI and FOO values varied across the different microhabitats. Our findings indicate that the study area is significantly affected by wild boar presence, primarily during nocturnal periods. Furthermore, it was confirmed that microhabitat characteristics exert a substantial influence on occurrence.



An assessment of methods to measure densities of wild boar

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Keywords: wild ungulates, random encounter model, camera traps, wildlife management, drones, thermal imaging, distance sampling, ungulate densities

Rising populations of wild ungulates are creating growing ecological, economic and epidemiological pressures. In Europe, the continued spread of African Swine Fever among wild boar and domestic pigs has become a major concern. Effective epidemiological modelling and contingency planning depend on reliable information about the distribution, movements and population densities of wild mammals. Data-collection methods therefore need to be practical, rapid and cost-efficient. Advances in technology have expanded the range of available survey tools, making it necessary to assess which approaches are most appropriate for a given species, landscape and research objective. The Random Encounter Model (REM) camera-trap method allows non-invasive estimation of absolute density for unmarked species and has been used extensively across Europe to measure ungulate density. This study aimed to trial the REM protocol in the UK, evaluate practical applicability across contrasting landscapes, and compare outputs with two other methods, Thermal Distance Sampling (TDS) and Thermal Imaging Surveys using uncrewed aerial vehicles (UAVs). This study compares results from field trials on two contrasting wild boar populations in the UK, using thermal imaging with distance sampling, thermal-equipped drones, and the Random Encounter Method applied to camera-trap data. Estimated boar densities were broadly consistent between methods. However, all methods were constrained by practical limitations which may have impacted on the results and introduced a level of bias and each technique carried its own strengths and limitations. Methods are evaluated in terms of their suitability for different habitats, and management or research goals.



Measuring what really matters: live-trapping effectiveness and animal welfare in wild boar management

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Keywords: *Sus scrofa*, trapping, effectiveness, animal-welfare

The wild boar (*Sus scrofa*) is a highly problematic invasive/overabundant species, causing major ecological, agricultural, and socioeconomic impacts. With expanding populations and the spread of African Swine Fever (ASF), effective and humane control is critical. Live-trapping is a widely used management method, yet rigorous empirical assessments of its actual effectiveness and animal welfare implications remain scarce. This study aims to evaluate and compare the trapping effectiveness and animal welfare outcomes of three commonly used live-trapping systems (modular, stationary, and net traps) and to develop a standardized, practical protocol to optimize the effectiveness and humaneness of live-trapping operations. The study was conducted in the Castelporziano Presidential Estate (Rome, Italy), a 6,000-ha fenced Mediterranean site with high biodiversity. The area was divided into three subzones serving as spatial replicates. In each subzone, four units of each trap type (modular, stationary, and net) were randomly deployed, yielding 36 trapping sites in total. During 2024–2025, we recorded 122 successful trapping events and captured 452 wild boars (including recaptures). All captured individuals were marked, weighed, examined for injuries, and released. Trapping effectiveness was defined as the ratio of individuals captured to those exposed (i.e., present and conditioned to the trapping site). Net traps demonstrated significantly higher effectiveness (0.95) compared to stationary (0.47) and modular corral traps (0.57). Furthermore, net traps showed a drastically lower injury rate (1.5%) than both stationary (60.7%) and modular designs (68.1%). Net traps clearly outperformed corral-based systems in both effectiveness and animal welfare. Beyond this comparative result, our findings highlight the need for rigorous, standardized protocols to assess effectiveness and welfare outcomes. These protocols are an essential foundation for evidence-based and humane wild boar management.



A practical evaluation of a warfarin-based toxicant for wild pigs in Texas, United States of America

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Keywords: wild pig, *Sus scrofa*, toxicant, management

Toxicants represent a contentious tool for the management of wildlife species, with acceptance varying by national customs, experience, and tolerance for the concept. In the United States of America (USA), acceptance for toxicants has declined over the last 100 years, with relatively few species managed using these methods. Recently, research in development of a toxicant for wild pigs (*Sus scrofa*) has reinvigorated conversations about levels of humaneness that are acceptable to the public for the management of this prolific invasive species. A warfarin-based toxicant received national registration, and its proposed registration in the State of Texas ignited a conflict among policymakers. In 2023, the Legislature of the State of Texas directed Texas A&M University to conduct a practical field application of this product to determine its ability to effectively manage wild pigs, and reduce damaged experienced by landowners, particularly agricultural producers. We selected 12 properties across Texas that represent the ecological variability of the state, as well as varied types of agriculture. Over the course of a year, we monitored private applicators of the product and the wild pigs on their properties. We found that the product effectively reduced the abundance of wild pigs, as well as reduced damages. Additionally, we found no non-target interest in the consuming the product, aside from raccoons (*Procyon lotor*), which were excluded from access by the legally-required toxicant delivery device. This trial did not consider cost-effectiveness, nor humaneness in determining effectiveness of the product. We demonstrated the product had the ability to effectively reduce wild pigs when applied according to the manufacturer's instructions. Following the conclusion of this study, the Legislature of the State of Texas approved this product for use.



The good life, African swine fever and rural transformations in Norway

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Keywords: agrarian transformations, management conflicts, rural aspirations, Norway, hunting

In the wake of the African Swine Fever outbreak in Sweden in 2023, Norway decided to eradicate its own wild boar population. While the disease only affects wild boar and domestic pigs, it has affected hunting, farming and the overall relationship between rural populations and their natural environment. Simultaneously, the last decades have seen a significant agrarian restructuring in which specialization and intensification have been the norm. Today, only three supply chains deliver to the market in what has effectively become a market triopoly, leading to corporate concentration and oligopsony or even monopsony in some areas for farmers. As such, a constellation of socio-natural moments is differentially affected by the threat of the disease, leading to policy changes, supply chain adaptations and changes in rural aspirations to a good life. Focusing here on the latter, this paper seeks to contribute to earlier debates by treating aspirations as socially embedded and collectively mediated orientations toward the future. As such, aspirations are articulated through concerns that exceed the individual and even the household. They are bound up with the future of the village, the farm, the forest, the pork sector, and the wider rural social fabric. We seek to analyse the intersections of i) the collective reproduction of rural life, ii) territorial belonging, iii) moral obligations to the collective, and iv) the notion of a bio-secure modernity. As such, moving beyond the notion of aspirations as simply an expression of lifestyle preferences, this paper critically engages with disease as a driver of agrarian change.



Blood and hair cortisol as indicators of stress in hunted wild boar

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Keywords: enzyme immunoassay, endocrinology, hormones, *Sus scrofa*, wildlife

Interest in wild animal welfare and stress physiology is increasing, particularly regarding the effects of natural and anthropogenic stressors on wildlife. The acute stress response enables animals to cope with immediate threats such as predators or adverse weather conditions; however, prolonged exposure to stressors may negatively affect health and welfare. In mammals, cortisol is the primary glucocorticoid hormone released during stress and can be measured in different biological matrices. Blood cortisol reflects acute stress, whereas hair cortisol provides an indicator of long-term stress exposure. The wild boar (*Sus scrofa*) is one of the most widely distributed game species, with hunting representing the main population management tool. The most common hunting methods are single (individual) hunts and driven (group) hunts involving hunting dogs. In this study, blood and hair samples were collected from wild boar harvested during single and driven hunts in Croatia to assess acute and chronic stress levels using enzyme immunoassay (EIA). Cortisol concentrations in neither blood nor hair were significantly associated with sex or age, and no significant interaction between age and sex was observed. A moderate positive association was found between blood and hair cortisol concentrations, suggesting that individuals with higher acute stress levels may also tend to exhibit higher long-term stress levels; however, the correlation was not statistically significant. Assessment of cortisol concentrations in wild animals provides valuable insight into their physiological responses to both natural and human-induced stressors. The combined use of blood and hair as matrices enables evaluation of stress exposure over different time scales and contributes to a better understanding of wildlife welfare and management practices.



Emerging urban presence of wild boar (*Sus scrofa*) in Türkiye and potential drivers

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Keywords: wild boar, human-wildlife conflict, urbanization, anthropogenic food sources, Türkiye

Over recent decades, wild boar populations have expanded and increasingly adapted to peri-urban and urban environments globally, intensifying human–wildlife conflicts. This study examines reported wild boar occurrences in Türkiye within this context. Data were obtained through systematic screening of national and local news sources and social media platforms. Keywords such as “wild boar” and “urban wild boar sightings” were used to identify relevant reports. The dataset reflects documented human–wild boar encounters rather than population density; therefore, results are interpreted as indicators of public visibility rather than abundance. Wild boars are widely distributed across all regions of Türkiye. In Western and Southern Anatolia, particularly in coastal and tourism-oriented urban centers, wild boars are reported more frequently in urban environments, suggesting higher adaptation and persistence. In Central and Eastern Anatolia, sightings are mainly associated with rural settlements and adjacent agricultural lands, often linked to winter foraging. Potential drivers include direct food provisioning and indirect anthropogenic food sources, such as pet food left outdoors for stray animals, which may attract wild boars. Additional factors include deficiencies in municipal waste management, insufficient regulatory oversight, and varying societal attitudes toward wildlife. However, these should be considered explanatory hypotheses rather than confirmed causal mechanisms due to data limitations. In conclusion, mitigating these conflicts in Türkiye likely requires an integrated approach combining improved municipal waste management, public awareness campaigns discouraging intentional feeding, regulatory measures to restrict or prohibit leaving food for wild boars and stray animals in urban areas, and context-specific population control. Municipalities play a critical role through timely waste collection and reducing attractants that facilitate wildlife intrusion into settlements. Strengthening local implementation capacity is essential for long-term mitigation.



Managing periurban wild boar hotspots by addressing structural drivers: green area adaptation in Barcelona's WUI

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Keywords: periurban wild boars, wildland–urban interface (WUI), preventive management, human–wildlife conflict, spatial analysis, hotspot identification, urban green areas, Barcelona

The frequent wild boar incursions into the urban area of Barcelona, particularly in the districts bordering the Serra de Collserola Natural Park (PNSC), are driven by a combination of ecological and urban configuration factors that make certain parts of the city highly attractive for this opportunistic species. The present study considers the issue from a preventive and structural perspective, focusing on the spatial analysis of elements that determine the entrance and presence of wild boar in the city, and the transformation of those that generate a higher ecological reward. The spatial analysis addresses the Wildland-Urban Interface (WUI), integrating proximity to PNSC and waterways –the main ecological corridor for this species–, distribution of rubbish bins and feral cat colonies, urban landscape fragmentation, presence of green areas and historical concentration of wild boar-related incidences. These elements have been combined into an index of probability of wild boar presence in a raster format, allowing for the identification of hotspots along and around the WUI, where preventive action is a priority. Once hotspots are identified, the focus is set on transforming urban green areas, since these remain largely unmanaged from the perspective of wild boar deterrence. This could complement existing measures that already address the attractiveness of certain urban features, such as securing waste containers or limiting access to feral cat feeding sites, by further reducing food availability and limiting resting areas. This approach is particularly relevant in Mediterranean contexts, where summer drought reduces vegetation and water availability in natural habitats, whereas irrigated and intensively maintained urban green areas continue to offer highly favourable conditions, including moist soils and sustained plant productivity. Within these spaces, specific elements that increase attractiveness to wild boar—such as water-demanding plant species—are identified, and alternative configurations are proposed, tailored to the biogeographic and climatic conditions of Barcelona.



The current state of wild boar management in Japan

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Keywords: wild boar management, hunting, culling, agricultural damage control

In Japan, due to changes in land and natural resource use, the distribution of wild boars, expanded 1.9 times between 1978 and 2020. With this expansion of the wild boar distribution and increase in population, conflicts between wild boars and humans have increased in recent years, such as agricultural damage, and efforts to strengthen wild boar capture are being made throughout the country. In recent years, in addition to recreational hunting, culling for the purpose of agricultural damage control has become common, with approximately 600,000 wild boars being captured annually. The number of licensed hunters engaged in wild boar capture halved from 500,000 to 200,000 between 1975 and 2015, but now a days, the number has been increasing, mainly among those with trapping licenses. The number of wild boars captured has also increased 6 times in the last 30 years, from 100,000 in 1989 to 600,000 in 2016. In addition, with the widespread use of box traps to capture wild boars, an analysis of approximately 40,000 captured individuals in Nagasaki Prefecture revealed that 61.4% weighed 20 kg or less, and 81.4% weighed 40 kg or less, indicating that the captures mainly consisted of piglets and juveniles. While box traps are very effective as a countermeasure against CSF because they allow for the priority capture of susceptible individuals, it can be said that in order to control the wild boar population more effectively, it is necessary to consider not only the quantity but also the quality of the wild boars captured while selecting the capture method. This study was conducted under the Regulatory Research Projects for Food Safety, Animal Health and Plant Protection (25133213), funded by the Ministry of Agriculture, Forestry and Fisheries of Japan.



Relative density mapping of wild boar using effort-corrected capture data under data-limited conditions in Japan

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Keywords: wild boar, relative density, hunting effort, species distribution model, negative binomial model

Estimating the spatial distribution and population density of wild boars at regional scales remains challenging in Japan due to limited availability of standardized survey data. Capture records are available but are strongly influenced by heterogeneous hunting effort, leading to biased representations of true population. This study aimed to develop a practical framework to estimate effort-corrected relative density using existing capture data. We focused on Mie Prefecture, Japan, and applied a two-stage modeling approach. First, habitat suitability was estimated using a bias-corrected MaxEnt model based on capture locations and environmental variables. Next, a “well-surveilled” area was defined using a previously developed algorithm, where surveillance coverage was relatively sufficient. Within this area, the relationship between capture counts and habitat suitability was quantified using a negative binomial regression model, incorporating hunting effort and area as offset terms. The fitted model showed a significant positive association between habitat suitability and capture counts ($\beta = 5.84$, $p < 0.001$), and overdispersion was appropriately accounted for ($\theta = 0.276$). The Spearman rank correlation between observed and predicted values was 0.334, indicating moderate agreement in spatial patterns. The model was extrapolated across the entire prefecture to produce an effort-normalized relative density map. The resulting map revealed high-density areas not only in regions with high capture numbers but also in mountainous areas with limited hunting activity, highlighting discrepancies between observed captures and underlying population structure. Extrapolation diagnostics indicated that only 1.3% of cells fell outside the calibration range, and sensitivity analysis confirmed the robustness of spatial rankings. This study represents an initial yet practical framework for deriving effort-normalized relative density from biased capture data. This study was conducted under the research project on “Regulatory research projects for food safety, animal health and plant protection (25133213)” funded by the Ministry of Agriculture, Forestry and Fisheries of Japan.



The individual cost of synurbization for wild boar (*Sus scrofa*) in Barcelona, Spain

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Keywords: animal welfare, coexistence, human– conflict, trade-off, urban wildlife

The increasing presence of wild boar (*Sus scrofa*) in urban and peri-urban environments is a growing socio-ecological challenge across Europe and other regions worldwide. Managing wild boar in anthropized settings poses human-dimension issues, generating conflict between humans who perceive synurbic wild boar as a potential threat to public safety and demand lethal control, and those who support coexistence and oppose wild boar elimination. Such human-human conflict increases tensions between public perception of wildlife and management needs. We argue that animal welfare and health reasons may provide a wider framework to engage both positions on a common ground for discussion. We hypothesized that urban environments may negatively affect wild boar welfare and health. Between 2015 and 2018, we necropsied 860 wild boars collected during routine management actions in the Metropolitan Area of Barcelona. The individuals were either hunt-harvested in non-urban areas (n=255) or captured and euthanized in urban and peri-urban settings (n=605). Necropsy findings and lesions not attributable to the capture method were classified using a severity score (SS) ranging from 1 (least severe) to 3 (most severe). The urban wild boars were more likely to have severe trauma lesions (SS=2.21 for youngs and 1.99 for adults) and die younger, mostly because of urban-associated risks such as vehicle collisions, dog attacks, and poaching. Conversely, the non-urban wild boars had a lower hunting score (SS=1.20 for youngs and 1.26 for adults) and died at older ages. These findings suggest that urban environments could act as attractive sinks in the trade-off between higher and easily accessible food resources and significant impacts on individual wild boar welfare and health. Our results suggest that practices promoting habituation to urban environments (e.g., feeding) and calls for coexistence that encourage such habituation are individually detrimental for wild boars and should be reconsidered because of their implications for animal welfare and health.



Spatial distribution and management of wild boar in Serbia after the outbreak of African swine fever

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Keywords: wild boar, spring count, population, losses, prevention

The outbreak and spread of ASF is currently one of the most significant challenges in wild boar management in Serbia. The disease was first identified in wild boar in January 2020 (Kladovo Municipality), due to natural migration from neighbouring infected areas in Romania and Bulgaria and hunting of wild boar in them. The aim of this paper is to analyze the spatial distribution and management of wild boar in the period 2011-2025. We used the data of the Statistical Office of the Republic of Serbia (Form LOV-11) collected at the level of municipalities and statistical units (areas and regions). Maps of the spatial distribution of wild boar were created using the ArcGIS 10.3 software package (ArcMap). In addition, we used data available from the official website of the Veterinary Directorate (Ministry of Agriculture, Forestry and Water Management), as well as data submitted by the Republic of Serbia to the European Commission (ADIS system, 2019-2026) and the World Animal Health Information System (WAHIS database, 2026). In the period 2019-2025, a total of 2,342 outbreaks of ASF were reported, of which 634 were in wild boar (range by years from 0 to 213), indicating that wild boar represents a reservoir of the virus and makes it difficult to control the disease. Most outbreaks occurred in 2022 and 2023 (146 and 213, respectively) in the territory of 6 municipalities in Vojvodina and 35 municipalities in Central Serbia, covering 27.9% of the total territory of Serbia. Outbreaks of ASF have catastrophically affected the traditional model of intensive wild boar management in fenced hunting grounds, especially in Vojvodina. For example, in 16 hunting grounds managed by the PE "Vojvodinašume" (about 109,000 ha), the number of wild boar was significantly reduced (4,274 individuals in 2021 vs. 1,303 in 2026; $t = 2.818$, $p = 0.008$), which caused a drastic decline in culling implementation (1,895 vs. 219 individuals, respectively). It is concluded that more effective biosecurity measures and improvement of the monitoring system are necessary.



Wild boar (*Sus scrofa*) as bioindicators of antimicrobial resistance: a pilot study

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Keywords: wild boar, antimicrobial resistance, *Staphylococcus*, *Mammaliicoccus*, Transdanubia

Antimicrobial resistance (AMR) emerging in wildlife threatens a global health crisis affecting both human and veterinary medicine. A possible method to assess AMR circulating in the ecosystem is to explore the resistance profiles of model bacteria. Bacteria belonging to the genera *Staphylococcus* and *Mammaliicoccus*, due to their ubiquitous distribution and simple isolation techniques based on halotolerance, serve as excellent models for the ecosystem's AMR load. In our pilot study, submandibular lymph node samples were collected from clinically healthy wild boars in two seminatural game management areas in Transdanubia to determine their *Staphylococcus-Mammaliicoccus* prevalence and the phenotypic resistance of the bacteria using the VITEK 2 Compact system. During the study, 19 and 15 lymph node samples were collected, yielding 23 and 15 isolates belonging to the genera *Staphylococcus* or *Mammaliicoccus* at the two locations, respectively. Although the bacterial communities were dominated by different species at the two sites, the same phenotypic resistance traits were found most frequently in both locations. While *M. sciuri*, *S. hyicus*, and *S. simulans* were the most common in the Zselic habitat, most isolates belonged to the *S. epidermidis* species in the Zala habitat. However, phenotypic resistance to penicillin and fusidic acid was among the most prevalent AMR traits in both habitats. Based on our findings, bacteria belonging to the genera *Staphylococcus* and *Mammaliicoccus* can be detected in large numbers even from the submandibular lymph nodes of healthy wild boars; thus, the cultivation technique based on salt tolerance makes the model suitable for larger-scale comparative studies. Furthermore, penicillin and fusidic acid resistance at both study sites confirms that AMR accumulating in synanthropic environments spills over into natural habitats. In our view, monitoring studies based on the submandibular lymph nodes of wild boars could help identify habitats that are exposed to particularly high AMR contamination.



Research on the current status of usage of foot-hold snares in a local region of Japan and the development of a rostral snare trap for safety

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Keywords: snare trap, hunting device, restraint

In Japan, wild boar management primarily relies on traps and firearms. While foot-hold snares are legally regulated by loop diameter and wire rope thickness, the recent expansion of online retail has simplified component procurement, significantly increasing the structural options available to users. Despite this diversity, the actual use and structural characteristics of snares in the field remain undocumented. In this study, we surveyed 80 foot-hold snares in Tochigi Prefecture and classified them into three structural types. The most prevalent design consisted of a non-locking mechanism, a coil spring of approximately 18 kg, and an oval treadle plate with guides. Although these tools are widely used for capture, counter-attack accidents involving captured wild boars remain a major concern in Japan, particularly for hunters and cullers who work without firearms. To prevent such accidents, we developed a "rostral snare trap" for snout restraint that is highly effective for immobilization. Using measurements from the heads of approximately 150 wild boar, we optimised trigger placement to maximize capture probability. Through field validation using the prototype and five improved structural variants, we successfully captured nine wild boars. All captured individuals exhibited consistent backward stepping rather than aggression, confirming that the rostral snare trap provides safe and effective restraint. These results demonstrate that integrating field survey data with anatomically informed engineering can provide a vital technological solution to reduce hunting accidents and enhance the safety of wildlife management safety.



The feral hog delima in the United States

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Keywords: feral hog, population control, invasive species, economic damage, wildlife management

Feral hogs in the United States originated from domestic animals introduced by Spanish explores and settlers in the 1500's. The explorer Christopher Columbus in 1493 travelled to the West Indies with domestic hogs. Later Hernando de Soto explored Florida in 1539 transporting pigs as a food source. These animals were often allowed to range freely, leading to many escaping. There was a genetic mix, when in the late 1900's, Eurasian wild boars were brought in for sport hunting and hybrids resulted in modern day populations. Wild boars were later introduced into Texas in the 1930's. Populations within the US are most common in Texas, with an estimated number of 3-5 million hogs, through the southern and southeastern states, along with California in the west. Hogs are often sold to holding facilities for meat processing. Economic drives include hunting with guides, helicopters, and night-vision hunts. The impacts in Texas alone estimate hog damage to crops and landscape at \$500 million annually. Trapping is also common with numerous types and configurations available from manufacturers. Efforts to control annual hog numbers have been ineffective, with increases estimated at 21% each year. Removal methods include hunting, trapping, exclusion, and use of a toxicant. The situation has become more complex within the last 10 years because black bear numbers have increased dramatically and have hindered hog control. As an example, bear harvests are quite numerous, with New York having 1,750 killed in 2025. Recent estimates put annual harvest numbers across the U.S. at 40,000 to 50,000 bears. Data will be presented on feral hog numbers by state, harvest records, detailed controlled methods, and black bear densities in feral hog overlapping states.



Risk factors for invasion in the US National Park Service identified using a profile of pig-populated parks

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Keywords: invasion, protected areas, United States, wildlife management, wild pigs (*Sus scrofa*)

Wild pigs (*Sus scrofa*) are an invasive species in the United States of America (USA) that are continually growing in range and abundance, with high densities in the Southeast region and the states of Texas, California, and Hawai'i. Wild pigs are known to occupy public land as a means of escape from nearby pig farms and sport-hunting preserves or through intentional release by people to create hunting opportunities. The National Park Service (NPS) stands out among managers of public land in the USA, managing over 34 million ha across the country and its five inhabited territories. Policy directs the NPS to preserve natural and cultural resources for the enjoyment, education, and inspiration of current and future generations, including controlling invasive species. Management of these species is more costly and difficult the later it begins; therefore, early detection and rapid response are integral for efficient control. This relies on park preparedness for invasion; thus, parks must develop and maintain vigilance against invasive species like wild pigs. We aimed to understand factors associated with wild pig presence in parks to develop a profile of parks that wild pigs are likely to invade by distributing a survey to natural resource park employees. We received completed responses from 45% of all parks, and a total of 37 parks reported having wild pigs present within park boundaries. We created a profile of parks with wild pigs using a dimensionality reduction analysis focusing on park locality, attributes, and social factors. This analysis resulted in a simplified series of factors associated with the presence of wild pigs in parks that park managers can use to determine their likelihood of wild pig invasion, thus increasing vigilance.



Development of cost-effective remote drug delivery device for large-scale wildlife capture programs

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Keywords: remote drug delivery, chemical immobilization, wild boar management

Since the mid-20th century, research on live capture through chemical immobilization has provided valuable knowledge, enabling studies of the ecology, and management of free-ranging wildlife. The effectiveness, safety, and ethical acceptability of these interventions depend not only on immobilization drugs and capture strategies, but also critically on the performance and reliability of the capture devices themselves. However, most published studies primarily focus on pharmacological protocols and physiological responses, while rigorous evaluations of capture devices remain limited. Device performance is often assessed indirectly within operational reports or extrapolated across species without systematic validation. At the same time, wildlife management is increasingly challenged by overabundant and conflict-prone species, including wild boar. Effective management programs therefore require capture tools that are selective, welfare-compliant, operationally reliable, and economically accessible. Although several high-quality remote drug delivery systems are commercially available from well-established manufacturers, their high costs— not only the projectors themselves, but also projectiles and replacement components— can limit their routine use in large-scale wildlife control programs involving overabundant species such as wild boar, particularly when multiple individuals within a sounder must be captured during a single capture session. Additional unexpected challenges, including unsuccessful shots, broken needles, lost darts or components, and the occasional need for multiple dart administrations per individual, further increase operational costs and logistical difficulties. These limitations are especially relevant in developing countries and regions with limited financial resources, where the routine use of such devices may become impractical. In response to these challenges, Astrovet Solutions SL has developed a new remote drug delivery device that combines the versatility of a blowpipe with the power and range of a compressed-air anesthetic rifle. Currently in the testing phase, the device has been designed for field-based live-capture operations with the aim of maximizing efficiency and safety while preserving animal welfare during capture procedures.



The wild boar (*Sus scrofa*) in Bosnia and Herzegovina

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Keywords: wild boar, *Sus scrofa*, game management, hunting, overview

The wild boar (*Sus scrofa* L.) represents one of the most widespread and economically important species of large game in Europe. Over the past forty years, this species has undergone a wide territorial and numerical expansion, even in habitats that, according to current knowledge, are not suited to it (Kunovac et al., 2003). In Bosnia and Herzegovina, the wild boar also spread to new areas, increasing in numbers despite the events of the period 1992-1995. year, which resulted in habitat degradation and contamination as well as uncontrolled hunting (Kunovac, 2004). In today's conditions, in Bosnia and Herzegovina, the wild boar has taken precedence over all other types of game in Bosnia and Herzegovina, and has become the most important "hunting interest". In this paper, we provide an overview of the expansion and increase in the number of wild boar populations in Bosnia and Herzegovina, from the 1970s to the present day, with a review of trophy value, legal status, conflicts with humans, as well as the consequences of forcing the breeding and hunting of wild boars on other game species in Bosnia and Herzegovina.



First wild boar hunting survey in Bosnia and Herzegovina: preliminary results

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Keywords: hunting management, questionnaire, game meat, hygiene

There are no literature sources on wild boar hunting, meat harvest, or methods of byproducts disposal in Bosnia and Herzegovina (BaH). Therefore, we conducted an on-site survey as part of a Short-Term Scientific Mission (STSM) within the COST Action 'SafeGameMeat' to address these knowledge gaps. The collaboration with the Association of Hunting Organizations in BaH (Sarajevo) facilitated site visits and the administration of surveys across 12 municipal hunting societies. These societies manage a collective hunting area of 237,777 hectares and comprise a total of 6,656 registered hunters. Based on Statistic office of Federation of BaH entity (FBaH), in the hunting sector for 2024 there were 38.794 hunters on 2.405.000 ha of hunting grounds that harvested 3.903. wild boars. According to Official Statistics of Republic of Srpska entity (RS), in the hunting sector for 2024, there were: 23.317 hunters on 2.050.000 ha of hunting grounds that harvested 2000 wild boars. There are no official statistics of the quantity of processed venison in the whole BaH. An exception is information of Hunting Association RS which processed 5.095 kg of wild boar meat in 2024. Surveys of 12 leading municipal hunting societies underscore the necessity for improved sectoral practices. While approximately 90% of surveyed societies in the FBaH have established cooling chambers and primary processing areas, the whole BaH lacks a standardized national system for marking game. It was found that hunters are resorting to various improvisations for traceability, ranging from printing their own stamps to purchasing them from neighboring countries like Serbia to meet basic safety expectations. Also, while a minority of societies contract professional waste disposal services, many still follow the tradition of leaving offal in forests to feed predators, which poses different biosecurity risks. Future efforts should prioritize education on meat safety standards and the systematic treatment of animal by-products to ensure comprehensive hygiene compliance.



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Study of the impact of environmental changes on the wild boar microbiome involving health risks

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Keywords: *Sus scrofa*, bacterial microbiome, environmental change, zoonotic pathogens, wildlife health

European wild boar populations have increased markedly in recent decades, driven by climate change and inadequate hunting management. This demographic expansion has forced the species to colonise newly and highly anthropised areas, resulting in much more frequent contact with domestic animals and humans. Yet ungulates, including wild boar, harbour the highest number of pathogens transmissible to humans. Wild boar can host or be affected by numerous zoonotic diseases (brucellosis, tuberculosis, salmonellosis, yersiniosis, etc.). Improving our understanding of pathogen circulation within wild boar populations (*Sus scrofa*) is therefore essential to anticipate emerging threats to public health and livestock. Very little is also known about how the prevalence of these pathogens may increase in response to the environmental changes affecting wild boar, such as habitat shifts (and consequent dietary changes), rising population densities, and increased contact with humans and domestic animals. Furthermore, no information is currently available regarding how these factors interact with the diversity of the wild boar bacterial microbiome, despite its importance for individual health. The objectives of our study are therefore to improve knowledge of the circulation of bacterial communities (both commensal and pathogenic) across ten selected sites in Belgium that differ markedly in ecological characteristics (wild boar population densities, proximity to livestock, habitat types, etc.). Specifically, this study aims to: (1) develop a non-invasive method for detecting bacterial pathogens, and (2) investigate the impact of environmental changes on the bacterial diversity of wild boar.



Ecology and behavioural ecology



Do wild boar impact mammal communities? A behavioural analysis

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Keywords: ecosystem engineers, population density, rooting behaviour, trampling, wild boar impact

Wild boar *Sus scrofa* are widespread ecosystem engineers whose foraging activities can affect habitats and modify ecological communities. Although substantial research on wild boar has shown both positive and negative impacts on plant and animal communities, potential effects on medium-to-large-sized mammals (body mass >1 kg) remain poorly understood. Moreover, disentangling the relative contribution of behavioural mechanisms underlying these possible effects has been lacking. During five years, using motion-sensitive cameras (>8500 trapping days; >140 sites) coupled with behavioural analysis (>6000 individuals), we investigated how wild boar behaviour, particularly rooting activity but also the potential for trampling intensity, influenced the diversity of mammal communities across six protected areas in central Italy spanning a gradient of wild boar densities (~2-20 ind./km²). Contrary to expectations, wild boar trampling was positively associated with herbivore and overall mammal richness, although its correlation with sniffing behaviour suggests it may reflect local availability of vegetal resources rather than actual trampling impact. Increased time allocated to rooting activity did not affect overall mammal or herbivore richness but showed a population density-dependent relationship with mesocarnivore richness, positively affecting mesocarnivores at lower-moderate wild boar densities (<9 ind./km²) but negatively affecting them at higher densities (>10 ind./km²). This pattern may reflect indirect trophic pathways, where intense rooting reduces the availability of mesocarnivores' prey (e.g., invertebrates and small vertebrates) at high wild boar densities, but benefits them at low densities. Overall, findings highlight (1) the importance of incorporating behavioural metrics to identify mechanisms of wild boar impacts; (2) the role of rooting as a critical process shaping mammalian community dynamics; (2) the density-dependent nature of wild boar impacts on biodiversity, suggesting specific threshold-densities at which wild boar impacts may switch from positive to negative, which also emphasizes the importance of monitoring population abundance and leads to management and conservation implications.



Seasonal and ontogenetic variation in the dietary niche of wild boar: a stable isotope approach

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Keywords: *Sus scrofa*, stable isotopes, dietary niche, SIBER, seasonal variation, ontogeny, Slovenia

Wild boar (*Sus scrofa*) is one of the most ecologically successful large omnivores in Europe, with a highly flexible diet encompassing mast (acorns, chestnuts), roots, bulbs, agricultural crops, and animal matter including insects and earthworms. Stable isotope analysis of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) have become an increasingly important tool in wildlife ecology, as it provides a time-integrated view of dietary niche width and trophic position, reflecting what an organism actually assimilates rather than what it recently consumed. We analysed stable isotope ratios in muscle tissue from 86 wild boar culled in central Slovenia between 2020 and 2024, grouped into two seasons (spring–summer; autumn–winter) and two age classes (juvenile, adult). Both $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ratios differed significantly among groups (Kruskal–Wallis, $p \leq 0.0003$), confirming that season and age class jointly shape dietary composition. Isotopic niche width was quantified using Stable Isotope Bayesian Ellipses in R (SIBER). In adults, we observed pronounced seasonal reduction in niche width, with Bayesian standard ellipse areas (SEA_B) of 1.31 ‰² in autumn–winter versus 4.58 ‰² in spring–summer ($P = 0.9995$), consistent with dietary specialization on mast. Juveniles maintained wider isotopic niches across both seasons (SEA_B: 4.73 vs. 6.14 ‰²), which likely reflects their higher nutritional demands (more protein) during growth. Niche overlap ranged from 0.626 to 0.775 across all comparisons, indicating substantial but incomplete dietary separation between groups. The partial overlap observed across all group pairs suggests that while adults and juveniles share the same broad resource base, age-specific foraging behaviour reflects in dietary partitioning, particularly in autumn–winter season. These results reveal clear ontogenetic differences in foraging strategy, with adults exploiting seasonally abundant energy-rich resources while juveniles forage more opportunistically year-round. This is important for understanding intraspecific resource competition and the ecological impact of wild boar on agricultural and forest ecosystems.



Do wild boar visit the dead? Behavioural responses to conspecific carcasses

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Keywords: GPS telemetry, carrion ecology, pathogen exposure, disease transmission, movement ecology

Carcasses represent a biologically ambiguous resource for wild boar (*Sus scrofa*): they may provide foraging opportunities, but also pose elevated infection risk, including exposure to pathogens of wildlife and livestock concern such as African swine fever virus. This creates a risk-reward trade-off in which attraction to nutrient-rich remains may conflict with pathogen avoidance. Although camera-trap studies have documented direct interactions between wild boar and carcasses, these observations alone cannot determine whether carcass use reflects active selection, incidental encounters or avoidance relative to available feeding opportunities. We address this gap by analysing individual level-responses of wild boar to conspecific carcasses using GPS telemetry data from the Kostelec nad Černými lesy area, Czech Republic. Twenty-nine carcasses of legally harvested wild boar were deployed across four seasons between late August 2019 and early March 2020. Movement data from 35-GPS collared individuals are used to quantify visitation probability, revisitation frequency and persistence of site use after carcass depletion. A visit is defined as a GPS fix within 50 m of a carcass. Visitation to carcass sites is compared with ten paired control points per carcass located within a 500 m buffer. At a subset of sites, camera traps provide complementary information on direct behavioural interactions with carcass material. We predict that wild boar responses to conspecific carcasses will vary seasonally according to the balance between food reward and infection risk. Attraction may increase when i) alternative food is scarce, particularly in winter, ii) when decomposition processes are at their peak and resulting invertebrate abundance at the carcass at its highest. We therefore expect carcass use to reflect a context-dependent trade-off rather than a uniform attraction or avoidance response. By combining telemetry and behavioural evidence, this study tests whether conspecific carcasses act as non-random risk-reward sites with implications for disease transmission.



Spatiotemporal responses of wild boar (*Sus scrofa*) to human activity in two South Korean national parks

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Keywords: wild boar (*Sus scrofa*), human activity, national parks, spatiotemporal avoidance, camera trapping

Human activity within national parks can strongly influence wildlife behaviour, yet such responses are expected to vary with disturbance intensity. Here, we compared the spatiotemporal behavioural responses of wild boar (*Sus scrofa*) between two South Korean national parks with contrasting levels of human activity, Gyeryongsan and Juwangsan. Using camera-trap data, we quantified temporal overlap between wild boar and humans, evaluated habitat use with single-species occupancy models and spatial predictions, and used multi-species occupancy models to assess how wild boar responses differed under human presence and absence. In Gyeryongsan, where human activity was frequent, wild boar were predominantly nocturnal and used habitats associated with greater cover or reduced disturbance, such as forests and military-protected areas. In contrast, in Juwangsan, where human activity was lower, wild boar remained primarily diurnal and showed greater use of open, resource-rich habitats. Spatial predictions showed that areas with high predicted habitat use were broadly distributed in Gyeryongsan, whereas they were more spatially restricted and patchy in Juwangsan. Multi-species occupancy models further indicated that human presence was associated with reduced variability in wild boar occupancy responses across environmental gradients in Gyeryongsan, whereas greater response flexibility was retained in Juwangsan. Overall, these results indicate that wild boar flexibly reorganize temporal activity and habitat use in response to human disturbance. Our findings suggest that intense human use can promote temporal avoidance and more constrained, risk-averse habitat-use responses under human presence, highlighting the importance of incorporating spatiotemporal dynamics into park management.



Sexual segregation in resource selection: how baiting shapes sex-specific movement of wild boar

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Keywords: iSSF, RSS, supplementary feeding, *Sus scrofa*, telemetry

Sexual segregation in resource selection is frequently reported among ungulates, primarily explained by the body-size and predation hypotheses. However, these have rarely been tested regarding human-provided food sources and in non-ruminants. Baiting is a widely used management tool for wild boar (*Sus scrofa*), yet its influence on the fine-scale movement ecology of males and females remains poorly understood. We investigated sexual segregation in the use of 43 automatic feeding stations in central Croatia using GPS telemetry data from 24 individuals monitored for a mean duration of 167 days. The sample included 17 females (aged 2-5 years) and 7 males (aged 2-4 years); notably, body mass was similar between sexes across overlapping age classes (males: 67.3-101.0 kg; females: 66.6-112.0 kg). Based on the predation hypothesis, we predicted that males would tolerate higher risk and visit baiting stations more frequently than females. To test this, we used integrated Step Selection Functions (iSSF) to evaluate the Relative Selection Strength (RSS) across four seasons and three distinct light periods, alongside analysing daily visitation patterns. Both sexes were strongly attracted to feeders, but males consistently displayed higher selection strength. This selection peaked sharply during the sunset period across all seasons, coinciding with the timing of food availability, and decayed non-linear with distance, with the most intense attraction occurring within 50 meters of the stations. Daily visitation patterns revealed distinct behavioural strategies: females demonstrated high site fidelity, typically visiting a single feeding station per day (median = 1), whereas males exhibited an exploratory "feeder-hopping" behaviour, particularly during spring and winter, frequently visiting multiple unique stations within 24 hours. Because body mass was similar between sexes, these behavioural differences support the predation hypothesis rather than body-size dimorphism. The higher mobility of males between feeding hotspots may alter contact rates compared to more sedentary female groups, offering critical insights for disease management and population control.



Effect of landscape structure and hunting on the spatial behaviour of wild boar in human-dominated areas

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Keywords: wild boar, integrated step selection, hunting, landscape structure, animal movement

Understanding how animals adjust their movement behaviour in response to human disturbance is a central question in animal ecology and management. The wild boar (*Sus scrofa*) is a widespread and abundant species across Europe and frequently interacts with human activities, causing crop damage and public health concerns. This makes it an ideal model for studying movement under anthropogenic pressure. Wild boar respond to hunting by increasing their use of cover, shifting towards nocturnal activity, and altering their home ranges. These behavioural adjustments are shaped by landscape structure, particularly the availability and spatial configuration of forest and scrub patches. Fragmented agro-forested landscapes can provide numerous refuges and edge habitats, potentially facilitating both avoidance of hunters and access to crops. However, it remains unclear how landscape structure and hunting pressure interact to influence movement behaviour. In this study, we investigate how hunting pressure and landscape structure jointly shape the spatio-temporal dynamics of wild boar movement. We use GPS tracking data from individuals monitored in two contrasting landscapes on the Swiss Plateau with different hunting methods, combined with high-resolution habitat and land-use maps. We apply an integrated step selection framework to quantify the relationships between movement and landscape structure metrics with hunting pressure. By linking individual movement decisions to landscape context, this study will clarify how environmental structure shapes behavioural responses to anthropogenic disturbance. Our findings will improve understanding of risk-driven movement and inform landscape management strategies aimed at mitigating human–wildlife conflict.



Assessing age- and sex-specific contributions to density dependence in wild boar

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Keywords: density-dependence, integrated population model, piglet survival, acorns, fecundity

Density dependence is a key regulation mechanism in wildlife populations. Studies of density dependence typically consider that all individuals contribute equally to density dependence, regardless of their age and sex. Yet, recent work suggests that some individuals disproportionately contribute to density dependence in accordance with the concept of critical age class, introduced by Charlesworth in 1972. Hence, understanding how density dependence operates requires considering not only total abundance, but also the age and sex structure of the population. This may be particularly relevant in species where food intake and competitive ability differ greatly between different age and sex classes, which could lead to marked differences in contribution to density dependence between classes. Here we develop a two-sex Integrated Population Model for wild boars - a strongly sexually dimorphic species - to analyse 30 years of data from the Castelporziano reserve (Italy). We estimate age- and sex-specific abundances and assess age and sex-specific contribution to density dependence in fecundity and piglet survival, while accounting for stochastic environmental variation in availability of acorns, a key food resource for wild boars. Preliminary results indicate that survival of piglets over their first 6 months is strongly regulated by population density. They further suggests that adults disproportionately contribute to density regulation, potentially due to their ability to displace younger individuals. This works showcases the importance of accounting for stage-structure when investigating density-dependence. Doing so has the potential to improve our understanding of the responses of wild population to variations in natural and anthropogenic factors and the prediction of their future dynamics.



Spatiotemporal interactions between wild boar and roe deer in Slovenia

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Keywords: *Sus scrofa*, *Capreolus capreolus*, competition, activity patterns, ungulates

Interspecific interactions are key drivers of ecosystem dynamics, shaping species distribution, behaviour, and community structure through both negative interactions (for one or both species), such as competition and predation, and positive, such as mutualism and facilitation. In Europe, the wild boar (*Sus scrofa*) is a widely distributed omnivorous ungulate that may interact with smaller sympatric ungulates, such as the European roe deer (*Capreolus capreolus*), potentially influencing its behaviour, habitat use, or spatiotemporal activity, with possible implications for fawn vulnerability. Using camera trap data from seven study areas in Slovenia, located in three biogeographical regions (sub-Alpine: Gornji Grad, Oljka; Dinaric Mountains: Sinji Vrh; sub-Mediterranean: Žabnik-Obrov, Rižana, VrheVrabče, Strunjan), we investigated the seasonal and diel activity patterns of these two ungulates. We hypothesized that roe deer would avoid sites with recent wild boar presence, especially during the fawning season. Camera trapping was conducted between 2022 and 2026, using 453 deployments. We estimated activity patterns using kernel density curves and assessed temporal overlap using the coefficient $\Delta 4$. Fine-scale spatiotemporal interactions were examined by measuring the temporal distance between each wild boar detection and the nearest subsequent roe deer detection, and vice versa. We recorded 3,261 independent events for wild boar and 11,680 for roe deer. Wild boar showed mainly nocturnal activity throughout the year, whereas temporal overlap between the two species was generally intermediate in both seasons ($0.50 < \Delta 4 < 0.75$), with the lowest overlap during the cold period, suggesting limited temporal segregation. The spatiotemporal analysis revealed no statistically significant evidence that roe deer avoided recent wild boar presence. Our results provide novel insights into interactions between these two ungulates and although we found no evidence of spatiotemporal avoidance, further research across the sympatric range of the two species could help clarify whether other factors, such as habitat and resource availability, or local population densities, shape their interactions.



Scavenger behaviour at wild boar carcasses and implications for disease management

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Keywords: african swine fever, scavenging, disease ecology, wild boar, behaviour ecology

Scavengers play a key role in ecosystem functioning through carrion consumption, influencing nutrient cycling and pathogen dynamics. They can both reduce pathogen pressure via physiological and microbiome-mediated processes and facilitate pathogen spread through carcass manipulation and environmental contamination. However, the role of scavengers in the transmission dynamics of African swine fever (ASF) remains poorly understood. We investigated scavenger communities and behaviour at wild boar carcasses in a temperate mountainous ecosystem in southeastern Germany over the course of one year using camera traps at 64 carcass sites, recording 5,015 events across 45 bird and mammal species, and analysing how scavenger behaviour was related to carcass characteristics and environmental variables. Scavenging behaviours including feeding, bone consumption, and carcass or tissue displacement were observed across multiple species. Red fox was the dominant scavenger, followed by Carrion crow, Common buzzard, and Eurasian lynx. Wild boar frequently interacted with carcasses, particularly through bone chewing, while foxes were the main drivers of carcass and tissue removal. Decomposition stage was the strongest predictor of activity, with peak feeding occurring during the active decay stage. Scavenger activity exhibited pronounced seasonal variation, with higher bird scavenging probability during colder months, while mammal scavengers showed species-specific seasonal patterns. For example, Common raven activity increased in spring, whereas wild boar activity peaked in autumn. Our findings demonstrate that scavenger-mediated carcass interactions are structured by decomposition stage, seasonality, and species identity. These patterns are relevant for ASF management, as scavengers did not fully consume carcasses on site but rather contributed to the spatial redistribution of infected material. Understanding these pathways can improve carcass removal strategies and help clarify the epidemiological role of scavengers in wildlife disease systems.



Wild boar in Norway: monitoring and management of an invasive species

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Keywords: distribution, management, monitoring, movement patterns, survival

The wild boar (*Sus scrofa*) has recently reestablished itself in Norway, originating from Sweden's reintroduced population. Unlike in Sweden, where the species is now considered native, wild boar in Norway are classified as invasive - an important distinction that underpins the national goal of eradication. The species remains controversial: it can cause significant crop damage, act as a vector for parasites, and spread serious diseases such as African swine fever (ASF), while also being a valued hunting resource. Effective management relies on comprehensive monitoring to improve understanding of distribution, population density, movement patterns and more. To address this, Norwegian Institute for Nature Research has developed a national monitoring system that integrates multiple data sources, including wildlife camera traps, hunting statistics, records of dead individuals, and public observations to assess distribution. These data are used to assess distribution at the national scale, while in the core area population density is estimated using an intensive camera trap network. Monitoring is complemented by GPS data from tagged individuals, enabling detailed analyses of movement, reproduction, and survival. Recent results show no clear evidence of range expansion. Observations have declined at the northern edges of the distribution but remain stable in the core area, suggesting a contraction or reduced presence outside this zone. Within the core area, population size appears relatively stable. GPS tracking reveals extensive movement, with high use of agricultural land in late summer and autumn. Most females reproduce as yearlings, and survival among tagged individuals is low, consistent with the ongoing eradication strategy. Although both the wild boar population and monitoring efforts in Norway are still in an early phase, these studies significantly strengthen the empirical foundation for management. They provide essential ecological knowledge to support ASF prevention and preparedness, and to guide long-term, evidence-based management of wild boar in Norway.



Movement ecology of wild boar post human abandonment of the Fukushima Nuclear Exclusion Zone, Japan

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Keywords: movement behaviour, spatiotemporal ecology, human-wildlife conflict, behavioural adaptations, resource selection

The Fukushima Dai-ichi nuclear power plant disaster in the Tōhoku region of Japan resulted in the release of a large quantity of radionuclides into the environment; while humans were quickly evacuated from the contaminated area, wildlife remained. Changes in human activity and presence can impact habitat use and movement patterns of wild animals across demographic levels, including shifts in resource selection such as incursions into human-abandoned areas. Thus, understanding changes in spatiotemporal patterns of wildlife within human-abandoned landscapes can help mitigate human-wildlife conflict in preparation for anthropogenic resettlement. In this study, we investigated spatial utilisation and temporal behaviours of Japanese wild boar (*Sus scrofa leucomystax*) in and around the Fukushima Exclusion Zone (FEZ). We used GPS data from 34 wild boar within the FEZ to conduct second- and third-order resource selection and movement path analyses. We also included GPS data from seven additional wild boar collared surrounding the FEZ to generate hidden Markov models to compare the temporal trends of wild boar inside the FEZ to wild boar outside the FEZ across three behavioural states (e.g., resting, foraging, travelling). We found that wild boar within the FEZ shifted their activity patterns to be more diurnal than those outside the zone where humans continue to reside. Additionally, while wild boar within the FEZ used natural spaces like forests, individuals also selected for human-abandoned areas such as rice paddy fields and urban areas. Our results provide insights into the adaptability of wildlife following human abandonment following large-scale human displacement events.



Uncovering the world of the warty pig: identify the social dynamics of the elusive Visayan warty pig (*Sus cebifrons*)

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Keywords: endemic, critically endangered, ecology, social, reintroduction

The Visayan warty pig (*Sus cebifrons*) is a critically endangered endemic wild pig to the Visayan Islands of the Philippines. This species, once abundant across the Visayan region, has been reduced to fragmented populations on only two islands. This species is threatened by poaching, persecution, habitat loss, hybridization, and more recently disease (ASFv). Within these pockets of populations, the species has been able to adapt to suboptimal habitats, and shown remarkable dexterity in its ecology and habitat use. To learn more about this species social dynamics, this study used camera traps to record footage of two known warty pig populations; one group founded from captive bred individuals and reintroduced into a small protected secondary forest reserve with zero human threats, and the second a wild population within a larger nationally protected area with minimal known threats or human engagement. These footages across several years identify trends in group size and group demographics, as well as variable factors influencing the social structures and interactive behaviours observed between the populations. Although there are some species-wide trends in social structure, dynamics and interactive behaviour; the intelligence and adaptability of the species enable populations to utilise various ecological roles and social constructs to survive their surroundings.



Space use and behavioral similarity as drivers of dyadic GPS-based interactions in free-ranging wild boar (*Sus scrofa*)

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Keywords: GPS telemetry, dyadic interactions, home-range overlap, behavioral traits, wild boar

Who meets whom and why? In social mammals, the answer to this question can shape information transfer, group cohesion and disease spread. Yet sorting out spatial from behavioral drivers of contact remains challenging. We tracked 96 free-ranging wild boar (*Sus scrofa*) in the Czech Republic over three years (2019–2022, GPS fixes every ~30 min) and quantified dyadic contacts as co-occurrences within 30 m and 7 min, building a contact network of 677 dyads. From the GPS trajectories, we extracted three individual behavioral traits: movement rate, diurnality, and intensity of space use, estimated as BLUPs from mixed models, capturing each individual's consistent behavioral tendencies across time. These traits were then compared between paired individuals to quantify dyadic behavioral similarity. The network was sparse and zero-dominated: only 21 % of dyads made contact, which is consistent with fission-fusion dynamics. Kernel-estimated home-range overlap (VI, 95% UD) was by far the strongest predictor of contact probability (OR ~16 per SD, $p < 0.001$). Individuals sharing similar movement rates (activity) also interacted more, but this effect vanished once spatial overlap was accounted for. This suggests that behavioral similarity increases the chance of individuals using the same places, rather than reflecting temporal coordination of their activity. Notably, an important fraction of high-overlap dyads recorded zero contacts, suggesting possible avoidance within shared space rather than simple spatial segregation. These findings reframe how we think about wild boar sociality: space sharing is necessary but not sufficient for contact, and behavioral traits matter primarily through their effect on space use. The prevalence of avoidance within shared ranges opens new questions about dominance and competition. This has direct implications for how we model movement patterns and potential disease transmission in wild boar.



A decade of wild boar population monitoring in Spain: integrating camera trapping, hunting data, control effort and modelling for long-term assessment

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Keywords: long-term, monitoring, wild boar, hunting, camera trapping, modelling

Long-term monitoring of wild boar (*Sus scrofa*) populations is essential for understanding population dynamics and improving management in the context of emerging risks such as African swine fever. In Spain, more than a decade of data from diverse sources by FAUNET project. including camera trap density estimation, hunting statistics, and detailed records of population control effort), provide a unique opportunity to assess trends across contrasting management and ecological systems. Camera-trapping data, based on harmonised Random Encounter Model (REM) protocols, deliver robust density estimates, while hunting and control effort data (e.g. modality, intensity, and spatial allocation of removal) allow quantifying management pressure. Medium- and long-term analyses reveal high variability but overall demographic stability. Modelling of density-dependent frameworks, show that population control effort is often reactive to abundance, increasing where densities are higher rather than consistently reducing them. However, context-dependent effects emerge: sustained and intensive control (particularly combining collective hunting) can reduce population growth in less productive systems, whereas in highly productive environments populations remain resilient despite high removal rates. The combination of multiple data sources is enabling the development of robust spatial distribution and density models, providing high-value outputs for evidence-based wildlife management and their interfaces with domestics. Overall, wild boar population monitoring in Spain by integrating camera trapping, hunting data, control effort, and modelling can support adaptive management and evidence-based decision-making for wild boar.



Wild boar in Lennebergwald: a unique case study of a fenced wild boar population

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Keywords: african swine fever, culling, fencing, management, population biology

The Lennebergwald is a forest of approx. 700 ha in Germany characterised by its dry and sandy soil, growing mainly pine and oak trees and supporting a large population of wild boar. The wild boar spend winter and early spring in the forest, while large parts move to the neighbouring Rhine meadows in summer and autumn. Although the Lennebergwald remains free of African swine fever (ASF) up to this date, there have been documented cases of ASF in the Rhine meadows in 2025. To prevent further spreading of ASF, in winter and early spring 2024/2025 a fence was built around this forest, with just one road crossing it remaining open. While the goal of these measures was epidemic control, it provided us with the unique opportunity to study the dynamics in an artificially closed, hunted and monitored population of wild boar. During the leafless period drones featuring infrared cameras are used to regularly count wild boar at night for epidemic control. Additional data was available from regular hunting bags prior to the nearby ASF outbreak and from a recorded culling program set up after the ASF outbreak. In winter 2024/2025 the population was counted in five separate nights, resulting in a mean minimum population of 25.2 individuals per 100 ha. The census one year later showed a mean minimum population of 30.9 individuals per 100 ha counted in three nights. This indicates an increase in population size despite a 3.4-fold increase in culled wild boar (13.4 individuals per 100 ha to 45.9 individuals per 100 ha), focussing on killings of sows. While 2024 and 2025 being oak mast years might explain some of the high reproduction rates, these unique data of an enclosed wild boar population highlight the difficulties in managing wild boar even when hunting mortality is significantly increased.



Multi scale environmental drivers of wild boar activity in Europe

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Keywords: wild boar, camera trapping, lunar activity, environmental drivers

Wild boar (*Sus scrofa*) is one of the most widespread and adaptable ungulates in Europe, occupying habitats from Mediterranean to boreal landscapes. Its increasing abundance and behavioural plasticity have important implications for wildlife management, agriculture, disease transmission, and human wildlife conflict. Although wild boar activity is generally considered nocturnal and influenced by food availability, disturbance, and seasonality, the role of broad scale environmental drivers remains less understood. This study investigates how lunar conditions, solar and geomagnetic activity, and weather variables influence wild boar presence and activity intensity across European landscapes. Camera trap detections were filtered to retain independent events and organised into continuous daily time series, including both detection and zero detection days. Activity was analysed as daily presence or absence and as daily detection counts. Predictor variables included moon illumination, moon altitude, effective moonlight, solar radio flux, geomagnetic indices, temperature, precipitation, humidity, pressure, and cloud cover. Logistic regression and negative binomial generalized linear models were used to evaluate their effects. Results indicate that wild boar activity is shaped by multiple interacting environmental cues rather than by a single dominant factor. Activity was predominantly nocturnal, with clear evening and night peaks, while seasonal patterns showed increased detections during warmer periods. Lunar variables influenced activity, with brighter moon conditions generally associated with reduced presence, suggesting behavioural adjustment to nocturnal visibility and perceived risk. Solar activity, particularly F10.7 solar flux, emerged as a consistent predictor of both presence and activity intensity, indicating a potential large scale environmental influence that remains poorly explored in ungulates. Weather variables, especially temperature and precipitation, further contributed to activity variation. These findings highlight the importance of integrating local weather, astronomical, and large scale environmental processes when interpreting wild boar behaviour across Europe and developing adaptive wildlife management strategies.



Habitat-contingent behavioural flexibility in wild boar at the human–wildlife interface

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Keywords: behavioural flexibility, game species management, human-wildlife interactions, reproductive output, *Sus scrofa*

The wild boar (*Sus scrofa*) is a globally distributed generalist whose behavioural flexibility underlies both ecological success and substantial damage potential. Although many studies examine responses to hunting, broader insight into how behaviour, space use, and reproductive output (indexed by piglet counts) shift across contrasting habitat contexts remains limited. This gap matters because human–wildlife conflicts, now widely framed as conservation conflicts shaped by ecological and social conditions, continue to intensify despite widespread behavioural adjustments by wildlife. We analysed wild boar behaviour and habitat use across 181 camera-trap sites in South Korea (June 2022–November 2023) spanning four habitat types: urban areas, national parks, stand-replacing logged areas (SRLAs), and partially harvested forests (PHFs). We quantified diel overlap with humans, estimated occupancy probability using a single-species occupancy model, and indexed reproductive output using piglet counts. Diel overlap was greatest in national parks (0.69) and lowest in urban areas (0.21). Occupancy probability was higher in SRLAs and urban areas, and it increased with broadleaf forest cover specifically in urban landscapes. Reproductive output showed strong habitat dependence: piglet numbers increased with broadleaf cover in urban areas and SRLAs but declined with broadleaf cover in PHFs. Piglet numbers also increased with distance to urban areas, with the strongest positive association in SRLAs and positive associations in national parks and PHFs, whereas the urban-specific distance term was weak. Together, these habitat-contingent patterns indicate that exposure at the human–wildlife interface is structured by interacting gradients of disturbance, resources, and demography, rather than by a single avoidance response to humans. Accordingly, effective mitigation should be context-specific, targeting habitat-specific combinations of resource concentration and disturbance that generate high exposure at the human–wildlife interface.



Improving wild boar relative abundance models by combining environmental and hunting data: insights from municipality-scale landscape analysis

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Keywords: wild boar, hunting pressure, relative abundance modelling, anthropogenic factors, generalized linear mixed models (GLMM)

Background: Understanding and quantifying the anthropogenic factors that influence the abundance of rapidly expanding species, such as the wild boar (*Sus scrofa*), is essential for effective regulation, targeted control measures, and sustainable population management. Aim: This study aimed to assess whether incorporating hunting-related variables alongside environmental factors improves the predictive performance of wild boar relative abundance models at the municipality scale. Material and Methods: Hunting statistics were analysed using generalized linear mixed models (GLMM) based on data from 838 municipalities across five Moroccan regions between 2015 and 2019, with the maximum number of wild boar shots (MWBS) used as a proxy for relative abundance, and both environmental and hunting-related variables included as predictors. Results: The inclusion of hunting variables substantially improved model performance, reducing the mean absolute error by 2.9 and the root mean square error by 6.4, while increasing the marginal R^2 by 34.8%. Higher MWBS values were observed in anthropized municipalities, particularly those characterized by extensive agricultural land, built-up areas, and high human population density. Elevated MWBS was also associated with extensive holm oak cover and a higher number of hunters. Furthermore, MWBS showed a positive relationship with the extent of hunting society areas and a negative association with the proportion of open forest land. Conclusions: These findings highlight the importance of integrating anthropogenic and environmental variables to enhance the predictive accuracy of wild boar relative abundance models and support targeted monitoring and management strategies in human-dominated landscapes, contributing to a better understanding of species abundance dynamics in rapidly expanding wildlife populations.



"Wild" experiments reveal behavioural mechanisms of wild boar success in human-dominated landscapes

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Keywords: human, interaction, risk, test, urbanization

Wild boar are among the mammals best able to navigate anthropogenic risks and opportunities in human-dominated landscapes, yet the behavioural mechanisms supporting this success remain poorly understood. Indeed, despite extensive research on wild boar ecology and behaviour, experimental tests of their responses to anthropogenic risk and opportunity remain scarce. We addressed this gap using camera-trap-based field experiments across an urbanization gradient in central Italy. We exposed free-ranging wild boar and other mammals to human voice playbacks, a novel artificial object, and a food-filled refuse bin, in a total of 69 locations. We quantified fear- and attraction-related responses in wild boar across 1258 video-documented events, and used generalized linear mixed models to compare them along the urbanization gradient and against a mammal assemblage ranging from European hare, through mesomammals, to the grey wolf. Species differed significantly in all responses, with wild boar showing one of the strongest fear responses to both human voices and the novel object, but also one of the highest attraction to the novel object and to the food-filled bin. Wild boar inhabiting more urbanized areas exhibited significantly reduced fear of human voices and greater attraction to the novel object, whereas attraction to the food-filled bin did not vary along the gradient. These findings suggest that wild boar behavioural flexibility, combining high fearfulness with strong attraction to human-associated cues, both modulated along the urbanization gradient, may be a key mechanism favouring their success in anthropized landscapes. We are further examining the spatial consequences of these behavioural patterns through an ongoing movement-ecology analysis of 16 GPS-tracked wild boar in the metropolitan area of Rome, in central Italy. Specifically, we assess selection or avoidance of anthropogenic features and known food-waste foraging sites, testing whether experimentally detected responses to risk, novelty, and anthropogenic resources are reflected in wild boar space use.



Muddy business: seasonal use of wallows by wild boar recorded by camera traps

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Keywords: wallowing, behaviour, activity pattern, *Sus scrofa*, comfort behaviour

Mud wallowing is an important comfort behaviour in wild boar (*Sus scrofa*), but seasonal changes in the use of wallows and associated tree rubbing remain insufficiently understood. This study aimed to determine seasonal variation in wild boar abundance and age-sex categories recorded at the wallows, and behaviour and activity patterns at wallows, rubbing trees and random locations in central Croatia. Camera traps were placed at ten natural wallows, eight nearby rubbing trees and 40 random locations over a one-year period. Wild boar used wallows throughout the year, with the highest number of animals recorded in spring and the lowest in winter. However, relative abundance at wallows did not differ significantly among seasons. The abundance of females and males at wallows did not differ significantly in spring or autumn. Females visited wallows significantly more often than males in summer, whereas males visited wallows significantly more often than sows in winter. Behavioural analysis revealed that rooting was most frequent at wallows in spring, wallowing dominated in summer and autumn, and locomotion was predominant in winter. Wild boar selected coniferous trees for rubbing more frequently than deciduous trees in all seasons. Activity patterns were mostly nocturnal, with the main peak of activity around sunset. However, in summer, wallows were used more often during daylight, resulting in lower overlap between activity patterns at wallows and random locations. These findings show that wallows and rubbing trees are used year-round and could have multiple functions, including foraging, thermoregulation, ectoparasite defence, scent communication and mating-related behaviour. Because wild boar repeatedly visit these sites, wallows and rubbing trees can provide valuable locations for camera-trap monitoring, ecological research and population management, particularly in relation to disease surveillance and control.



Wild boar abundance fluctuations and reserve effect: implications for predation risk on wetland birds

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Keywords: camera trapping, density estimation, reserve effect, nest predation, wetland conservation

The ecological effects of wild boar (*Sus scrofa*) overabundance on sensitive wetland fauna remain poorly documented, particularly within highly protected bird conservation areas. The Aiguamolls de l'Empordà Natural Park, one of the most important wetlands ecosystems for breeding and migratory birds in northeastern Spain, includes Natural Reserve Areas (NRA) where human activities are restricted, surrounded by croplands and hunting grounds, where hunting extends from September to March. Under these conditions, increasing wild boar presence may represent an impact due to nest predation risk for vulnerable bird communities. Monitoring wild boar densities and its drivers in NRAs is therefore crucial to understand wild boar impact on wetland fauna conservation. During six consecutive years (2020–2025), we monitored wild boar density in an NRA of the Natural Park using camera-traps and adapted Random Encounter Model (REM). Given the small study area (331 ha), six camera traps were deployed simultaneously at random locations (~1 km apart), periodically rotated, and operated from July to December. Wild boar density estimates showed marked seasonal variation, with lower densities during summer (July; 18.5 wild boar/km², SD 5.7) and maximum in autumn (November; 33.1 wild boar/km², SD 4.6). Interannual variation was moderate, but the overall seasonal pattern remained consistent throughout the years, with densities gradually increasing throughout autumn. These results suggest that wild boar density within protected wetlands is strongly influenced by external landscape dynamics, particularly food availability and hunting pressure in surrounding areas, reflecting a reserve effect during the hunting season. NRA management actions, including culling conducted by rangers, also appeared to contribute to temporary density reductions. The high wild boar abundance detected may increase disturbance and predation risk for vulnerable bird communities, particularly ground-nesting species and late-winter breeders. Previous studies in the area documented consumption of several wetland bird groups, particularly ducks and rails, with bird consumption peaking between March–April and September–October. The adapted REM approach proved to be a useful and cost-effective method for long-term monitoring of wild boar populations in small, protected wetlands, providing robust information for adaptive management and conservation planning.



Wild boar (*Sus scrofa*) under fire: spatial responses and resource selection in a highly managed area

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Keywords: spatial ecology, population control, social disruption, resource selection functions, hidden markov models

The rapid expansion of wild boar (*Sus scrofa*) populations increase the risk of disease and human wildlife conflict, necessitating population control. However, management interventions can fracture social structures, triggering compensatory spatial behaviors that may inadvertently exacerbate these issues. This project investigates movement behavior of female wild boar following the total or partial removal of their social groups. Baseline movement analysis reveals a circadian dichotomy in movement intensity: median step length (4-hour) significantly increases from 23.32m during the day to 262.82m at night. Interestingly, movement tortuosity remains high, with median turning angles of 180°. Surprisingly, female step length is on average 65m more than males. We hypothesize that movement responses diverge based on the social disruption's nature. Specifically, we expect that: (1) total group removal via trapping leads to space use contraction and reduced movement, as ceased lactation and group-level foraging lower energetic requirements; whereas (2) partial group loss following hunting induces a risk-driven response, characterized by temporary home range expansion and increased movement speeds as survivors prioritize vigilance and predator avoidance. We also monitored males to account for sex-specific movement patterns, expecting larger movements than females. Removal operations were carried out with Pig Brig® traps and night stalks (hunting) in Parco Regionale Colli Euganei, Italy. The experimental trapping phase resulted in the deployment of 32 GPS collars (19 females, 13 males) across different experimental groups: Control groups (females released with no removal), Treatments 1 (females released with the entire sounder culled inside the trap), Treatments 2 (females released with sounders removed approximately 30 days after release), and males. The expected output will be the evaluation of different movement behavior across experimental groups as a result of experimental interventions. Evaluating these behavioral shifts will help elucidate how management-induced social fracturing influences wild boar spatial ecology and disease transmission risk.



Spatio-seasonal shifts in wild boar (*Sus scrofa* L.) rooting intensity in Mediterranean agroforestry systems: evidence and implications for management

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Keywords: *Sus scrofa*, rooting surface area, agroforestry, GAMMs, management, Morocco

Understanding spatio-temporal variation in Rooting Surface Area (RSA) is crucial for improving the management of wild boar (*Sus scrofa*) populations, an opportunistic species that poses important ecological and agricultural challenges. Monthly RSA surveys were conducted in a Mediterranean agroforestry landscape using ten permanent transects between February 2024 and January 2025. We investigated the influence of seasonal dynamics, micro-habitat and landscape composition on RSA through Generalised Additive Mixed Models (GAMMs). The inclusion of spatial components substantially enhanced model performance, increasing the explained deviance from 46.4% to 80.1% and the adjusted R^2 from -0.106 to 0.478. Results further revealed that elevated RSA values were associated with extensive farmland cover during winter, whereas areas dominated by *Cistus* spp. were preferentially used during the remainder of the year, with a marked peak in autumn. Based on seasonal RSA prediction maps, we propose a spatially explicit decision-support framework for adaptive wild boar management, integrating targeted hunting strategies and mitigation of agricultural damage.



Defensive behaviour of wild boar in Lithuania

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Keywords: wild boar, recovering, sounder, defence, moving

After drastic decline due to ASF outbreaks, the obvious recovery of wild boar population was evident that coincides with recovering of wolf populations across Europe. We aimed to reveal changes in wild boar number and defensive behaviour in response to increasing number of predators. We use: annual census including FPG, tracks in snow; signs of living activities; direct observation in the baiting points and camera trapping. Study was performed on the model area in North Western Lithuania in 2022-2025. Static „personal bubbles“ are not characteristic, and personal distance is dynamic zone of risk assessment, reacting with flight, alarm calls, or aggression based on wolf presence, pack strength, terrain and personal features (age, sex) of wild boar. They display strong anti-predator responses, using senses to detect wolves in advance and flee or defend aggressively, relying on tough skin and tusks to deter single wolves. A sounder, moreover with piglets, becomes formidable, forcing wolves to be cautious and hunt cooperatively. Adult boars possess tusks and thick hides, making them dangerous prey (n=8,93% of cases of aggression or mobbing), which deters wolves. A wild boar sounder moving in line often seen as a matriarch-led group of sows and young, travels in a distinct, straight path, leaving clear, parallel tracks as they forage or move to water/feeding points, forming a certain 'conga line' for safety, with adults shielding the vulnerable piglets, and they use grunts/squeals to communicate, showing social cohesion. The number of moving in line rather increased from 2022 (1 sound, n=0%) to 2025 (9 sounds, n= 11%) and shows prey comprehension of predator and adaptation.



The population density and net annual growth rate of wild boar (*Sus scrofa*) in Poland

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Keywords: direct count, forest fragmentation, hunting bag, increase rate, population census

In March 2019, wild boar population densities in the forests of eastern Poland were estimated using 68 sampling plots. The average plot area comprised 4.8 km² of 20 forest compartments. Teams of 30 (20 mobile and 10 stationary observers), conducted fieldwork for four hours throughout each plot. They recorded solitary individuals, group sizes and age structures. In total, 510 foresters and local club hunters participated. The average wild boar population density was 1.09/km² of forest; 0-11.9/km² per plot. Forests in Poland cover 94675 km². Therefore, the likely countrywide population reached 103.2 thousand in 2019, considerably more than 71.8 thousand reported by Statistics Poland. To calculate net annual population growth rate (NR), the pre-hunting-season number of wild boar of one year (N_t) and the following year (N_{t+1}) as well as hunting bag (HB) between N_t and N_{t+1} were used; $NR = [(N_{t+1} - N_t) + HB] / N_t$. The NR index was 0.675, i.e. 67.5%, in southwestern Poland for a compact forest complex (69.0 thousand ha), where N_t, N_{t+1} and HB were 1439, 1600 and 811 animals, respectively. In the fragmented forest complexes of northeastern Poland (90.9 thousand ha of forested area), where N_t, N_{t+1} and HB reached 5900, 6798 and 6108 animals respectively, NR equalled 1.187, i.e. 118.7%. The NR index was thus a function of N_t and N_{t+1} affected by mortality and piglet births between N_t and N_{t+1}. The NR value can be used in wild boar harvest management to stabilise (HB = NR), enlarge (HB < NR) or reduce (HB > NR) the population. In conclusion, wild boar population densities estimated from sampling plots and NR can help regulate population sizes given that these calculations cover the year-round range of the local species.



Time and landscape characteristics as drivers of wild hog activity under baited conditions

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Keywords: space use, bait, time

Wild hog (*Sus scrofa*) population assessments, management, and research commonly use bait to increase observation and capture rates. Understanding how anthropogenic food sources alter wild hog space use and resource selection is critical for effective bait deployment and management planning. This study evaluates how wild hog space use changes through time following bait deployment and how landscape characteristics influence these responses. We deployed a camera trap array consisting of 20 baited cameras, each paired with 2–8 unbaited cameras within the expected bait attraction range (1.5 km). All camera sites underwent a 20-day unbaited monitoring period to establish baseline wild hog space use across the study area. Following baseline monitoring, baited sites received 40 lbs of whole-kernel deer corn within the camera detection area and an additional 40 lbs seven days later. Cameras then continued monitoring for 60 days following bait deployment. Pre- and post-bait observations will be incorporated into N-mixture models to evaluate the effects of time since bait deployment and surrounding landscape characteristics on wild hog space use. Preliminary results indicate that wild hog observation rates remain elevated for up to 30 days following bait depletion at a camera site and suggest that informed bait site selection may strongly influence observation increases. This work aims to identify landscape features associated with increased wild hog activity around bait sites and assess how these relationships change over time following bait deployment. Findings from this study will provide a framework for selecting effective bait locations and improving future wild hog monitoring and management efforts.



Drivers of wild boar rooting: insights from Mediterranean protected areas

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Keywords: behaviour, conservation, protected grasslands, *Sus scrofa*, ungulate

The wild boar *Sus scrofa* is a globally influential ungulate whose foraging activity, particularly rooting, may affect ecosystems. The magnitude of its effects is strictly context-dependent, with impacts varying with rooting intensity, season, and the presence of vulnerable features like endangered plant/animal species or human activities. Understanding the drivers of rooting is essential to effectively mitigate negative impacts and to clarify the contradictory relationship with population density. A critical condition for habitat conservation may emerge in Mediterranean ecosystems, where summer drought imposes seasonal bottlenecks. We performed seasonal surveys from three Mediterranean protected areas (2019–2021; 126 plots; 1,224 estimates) focused on EU-protected grasslands (Habitat codes: 6210–6220) and intensive summer surveys across heterogeneous habitats in six additional areas (2019–2024; 863 plots; 3,451 estimates), with a gradient of densities (3.5–22.2 individuals/km²). We performed GLMMs to test the effects of environmental variables and density (estimated via faecal pellet group counts) on rooting activity. Results indicate a positive relationship between rooting and population density at all scales, supporting (i) rooting as a cost-effective indicator of density variations, (ii) the limitation of density as a measure to mitigate negative impacts. Rooting peaked in autumn/winter and was strongly influenced by landscape structure. It increased with cumulative rainfall, grassland patch perimeter, and forest cover, highlighting the exploitation of ecotonal areas where security and food availability are maximized. Rooting decreased with higher landscape diversity and was constrained by steepness and rock cover. Model predictions were used to generate high-resolution (10×10 m) predictive maps of rooting impact. While wild boar should not be considered inherently detrimental to biodiversity in their native range, our findings suggest that combining population control with the maintenance of landscape diversity and targeted protection (e.g., fencing) of vulnerable patches allows for precise spatial prioritization to mitigate impacts on habitats of high conservation concern.



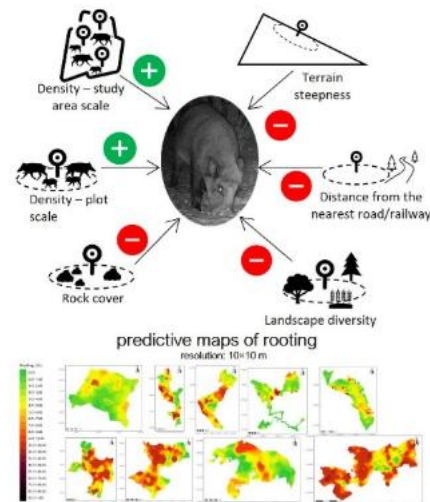
Priority protected grasslands

Period: **seasonal** surveys **2019-2021**
 Study areas: **3** mediterranean protected areas
 Sampling units: **126 plots/season/year**
 Dataset: **1,224 rooting estimates** in **EU-priority grasslands** (Habitat directive codes: 6210 and 6220)



Heterogeneous habitats

Period: **Summer** surveys **2019-2024**
 Study areas: **9** mediterranean protected areas
 Sampling units: **863 plots/year**
 Dataset: **3,451 rooting estimates** in **heterogeneous habitats**



The results support rooting as a cost-effective indicator of density variations, while both the limitation of density and the improvement of landscape diversity could be effective measures to mitigate negative impacts on habitats.



Integrating camera traps and environmental DNA to improve wild boar monitoring

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Keywords: camera trapping, density estimation, environmental DNA, water, pathogens

Accurate density estimation of wild boar (*Sus scrofa*) is necessary for managing populations of this species and assessing risks related to pathogen transmission. Although camera traps are currently widely used for wild boar density estimation, this methodology does not provide any information on the presence of pathogens and estimates can in some cases be biased due to limited spatial coverage and placement constraints that cannot capture the full extent of species occupancy. To address these limitations, we combine camera trapping with environmental DNA (eDNA) analysis of water samples, aiming not only to improve the accuracy of wild boar density estimation but also to assess species diversity within areas of wild boar presence. This multimodal approach allows us to explore whether wild boar abundance is associated with higher biodiversity and food resource availability. Using eDNA in aquatic environments allows monitoring the presence of pathogen DNA, even when direct sampling of animals poses logistical or ethical difficulties. To optimise eDNA detection, we will compare several aspects of sampling design, including sampling during dry periods versus after rain, active versus passive filtration, and repeated sampling across seasons. These comparisons will help determine how environmental factors and sampling strategies influence detection success in different water bodies. By linking wild boar density estimates from camera traps with eDNA-based information on species diversity and community composition, this study aims to improve wild boar monitoring and provide a broader ecological framework applicable across different environments, with potential relevance for the study and management of other ungulate species as well.



Drivers of seasonal activity patterns and spatial use in juvenile wild boar (*Sus scrofa*) in Japan

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Keywords: juvenile wild boar, GSP ear-tag, home range, activity patterns, resource selection

Effective wildlife management strategies require a comprehensive understanding of the behavioural ecology of the target species. In the case of wild boar (*Sus scrofa*), elucidating their behavioural ecology in relation to both intrinsic and extrinsic factors within specific regions is essential, given their high adaptability to diverse environments. However, few studies have examined the behavioural changes, activity patterns, and resource selection tendencies of juvenile wild boars. To address this gap, this study investigated the seasonal behavioural patterns of juvenile wild boars in Japan using ear-tag GPS telemetry. Twenty-three juvenile wild boars (12 females, 11 males) were captured during the survey period. The total number of tracking days for the juvenile wild boars was 812, with 8,773 GPS locations. Autocorrelated kernel density estimation indicated that juvenile males tended to expand their home ranges during the autumn–winter period. Daily activity patterns estimated using GPS location data showed nocturnal peaks during spring–summer and increased diurnal activity during autumn–winter. Seasonal resource selection by juvenile wild boars was evaluated using generalised linear mixed models within a Bayesian framework. The results revealed that forest areas were consistently selected across seasons, whereas wetlands and water bodies were preferred in spring–summer, and bamboo forests in autumn–winter. These findings indicate that both internal and external factors influence juvenile wild boar behaviour. Considering the role of juveniles in population growth and disease transmission, such as classical swine fever, these findings provide important insights for developing appropriate management strategies. Incorporating seasonal variations in juvenile wild boar behaviour into control strategies may enhance management effectiveness. This study was conducted under the Regulatory Research Projects for Food Safety, Animal Health and Plant Protection (25133213), funded by the Ministry of Agriculture, Forestry and Fisheries of Japan.



Seasonal variation in physicochemical and textural properties of wild boar meat

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Keywords: meat, seasonality, meat quality, physicochemical properties

Meat quality is determined by physicochemical and sensory traits such as pH, water-holding capacity, tenderness, and colour, all of which are influenced by intrinsic and environmental factors. In wild game species, seasonal changes in habitat, feeding conditions, and climate may drive variability in these traits. This study aimed to evaluate the effect of seasonality on selected meat quality parameters in wild boar (*Sus scrofa*). A total of 368 samples were collected across four seasons (spring, summer, autumn, and winter). A sub-analysis was conducted on 151 adult boars (>2 years) available only during autumn and winter. Data normality was assessed using the Shapiro–Wilk test, while differences between groups were analysed using one-way ANOVA or the Kruskal–Wallis test with appropriate post-hoc comparisons. In the adult sub-group, seasonality showed a limited effect. No significant differences were observed for thawing loss, cooking loss, Warner–Bratzler shear force, or colour parameters, though muscle pH differed significantly between autumn and winter. However, in the complete dataset, seasonality significantly affected cooking loss, tenderness, and muscle pH. Colour parameters also varied by season, with significant differences detected for lightness, redness, and yellowness. Thawing loss remained unaffected across all seasons. These findings suggest that seasonal effects are less pronounced in fully grown wild boar during autumn and winter. However, inclusion of all age categories indicates (limited sample size) potential variation in key meat quality traits, but this is mainly due to the influence of age, rather than season. Consequently, seasonality (which dictates inclusion of younger animals) should be considered a critical factor in the assessment of wild game meat quality.



Movement responses to urbanisation are distinct between two major cities – the case of wild boar in Berlin and Barcelona

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Keywords: wild boar, urbanisation, movement behaviour, human-dominated landscapes

Urbanisation is one of the most pervasive stressors for wildlife. Yet, many species, including wild boar (*Sus scrofa*), persist close to large cities or even enter urban environments, likely facilitated by access to anthropogenic resources and reduced hunting pressures. Living in these human-modified landscapes can shape many aspects of animal behaviour, and these responses are best observed by studying individual movement behaviour. However, apparently similar urbanisation conditions, as indicated by common human footprint and urbanisation indices, may still produce substantial differences in movement routines, habitat selection, and activity patterns. Here, we analyse wild boar movement data from Berlin, Germany, and Barcelona, Spain. Although both cities represent major urban systems in which wild boar occupy seemingly similar habitats, their movement behaviour may reflect finer-scale differences in disturbance regimes, hunting pressure, and resource availability. This comparison allows us to investigate how animals respond to urbanisation in ways that are not fully captured by broad urban metrics. We expect that movement behaviour will be key to understanding why wild boar respond differently to urbanisation and to revealing the processes that mediate adaptation to human-dominated environments.



Investigating the spatial distribution and population parameters of feral pigs in Scotland

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Keywords: *Sus scrofa*, ecology, camera trapping, population parameters, Scotland

Historically wild boar populations were present across the UK but became extinct from over-hunting and habitat loss. In Scotland, after an absence of several hundred years, wild boar populations have recently become re-established in some areas due to escapes from farms and illegal releases. The nature of their reintroduction means they are classed as feral pigs in Scotland with their management left to individual landowners. Not much is known about Scottish boar populations or how they may differ from boar populations across Europe. Without robust population information, it is difficult to implement effective management strategies. This research aims to address this data gap by (i) collating existing data on Scottish feral pigs from sources such as culling data, road traffic accident data and sightings information; and (ii) collecting population parameter information through camera trapping to inform modelling studies. Stakeholders were contacted to identify relevant datasets. Camera traps were deployed with one camera placed per 1km² within study areas in the North of Scotland. Overnight images were gathered to gain population level information including sounder size, group composition and numbers of piglets. Existing datasets collated so far include citizen science sightings reports and cull data. Populations have been established for several years now in Dumfries and in the Great Glen area near Loch Ness, with indications the population may also be expanding to new areas. Preliminary results from initial camera trapping on sounder sizes and composition will be presented along with distribution maps of the Scottish feral pig population. These findings will be used to better understand the population, particularly where population parameters might differ from European populations, to inform future management strategies.



Spatio - temporal characteristics of resting site usage by wild boar (*Sus scrofa*) in the proximity of urban areas

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Keywords: anthropogenic disturbance, GPS telemetry, human-wildlife conflict, locomotor activity, microhabitat selection

The occurrence of wild boar in residential areas is an increasingly frequent phenomenon across Europe, with resulting human-wildlife conflicts being equally prevalent in Hungary. Wild boar inhabiting areas near settlements frequently select daytime resting sites near private properties and the urban fringe. This study, based on GPS telemetry, aimed to investigate the daytime activity patterns and habitat use of wild boar occurring within residential environments. For this purpose, hourly location data from three adult sows fitted with Vectronic GmbH GPS collars were analysed. Tracking was conducted on the northern shore of Lake Balaton, in areas directly adjacent to the settlements of Balatonfüred and Örvényes. The available datasets comprised 12 months for two individuals and 9 months for the third. During the analysis, two-hour locomotor activity was determined based on hourly displacement, and its seasonal variations were examined. Furthermore, resting site selection and its seasonal dynamics were analysed using the Hungarian Ecosystem Base Map. Microhabitat characteristics influencing resting site selection were identified using a 20x20-metre land-cover database and buffer zones around the 12:00 positions. Additionally, the distance of detection points from residential areas was analysed using 100-metre classification intervals. The results identified specific local characteristics of resting site usage, indicating that the marked individuals exhibited remarkably low local daytime activity. Resting sites were established in areas providing high thermal and visual cover, directly bordering residential zones, and were subject to significant anthropogenic disturbance and urbanisation effects. These findings contribute to the development of more effective management strategies for mitigating wild boar-related conflicts in peri-urban environments.



A framework to quantify fine-scale activity metrics from accelerometer data in wild boar

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Keywords: wild boar, accelerometer, activity patterns, chronobiology

Activity patterns arise from the interplay between endogenous circadian rhythms and behavioural adjustments to environmental conditions. In chronobiological studies, often conducted in captive/experimental settings, onset/offset time, bout length, and periodicity are used to describe activity rhythms in detail. In contrast, in wild boar (*Sus scrofa*), activity rhythms are often described using coarser metrics (e.g. total activity, diurnality / nocturnality index) due to the limitations entailed by field conditions. This may overlook fine-scale temporal organisation and behavioural flexibility, yet chronobiological metrics would be particularly relevant to study in species exposed to heterogeneous and human-influenced environments such as the wild boar. Here, we present a methodological framework based on high-resolution accelerometer data to quantify wild boar chronobiology. Using accelerometer records from 171 individuals monitored across multiple European populations, we estimated activity bouts and ancillary metrics (e.g. onset relative to sunset, duration of activity bout) using a standardised procedure. We first classified accelerometer records into binary activity states according to individual and seasonal thresholds and then smoothed the resulting sequences with a moving average filter. From the filtered signals, we identified activity onsets as the first active record after inactivity and activity bout duration as the time elapsed between onset and offset. This approach enables the characterisation of activity patterns beyond traditional classifications, capturing continuous variation in the temporal organisation of behaviour. This framework provides a robust tool to investigate fine-scale activity dynamics in wild boar under natural conditions. More broadly, this method offers a transferable approach for using chronobiological methods in free-ranging populations, facilitating a deeper understanding of behavioural responses to complex and changing environments.



A study on habitat selection by wild boars in the Watarase floodplain

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Keywords: habitat selection, floodplain, embankment, vegetation management, crop damage

The Watarase Floodplain, established for flood control and water resource management, includes a large wetland designated under the Ramsar Convention and supports diverse wildlife. In recent years, wild boar *Sus scrofa* have been increasingly observed in the floodplain, causing crop damage and excavation of embankment slopes. However, basic information on their habitat preferences in this area remains limited. In this study, wild boars were equipped with ear-tag GPS transmitters, and habitat selection was analyzed using location data combined with vegetation data. Locations points were defined as used points (use = 1), while randomly generated points within a 5.5 km radius covering the entire floodplain were defined as available points (use = 0). Habitat selection was modeled using a machine learning-based regression approach, with vegetation type included as an explanatory variable. The results showed that all individuals strongly preferred reed beds and sedge communities. Agricultural fields and paddy fields were also selected by most individuals, except for one. In contrast, residential areas with abundant greenery were consistently avoided. Preferences for willow shrub communities, urban areas, roadside weed communities, and open water varied among individuals depending on capture location, suggesting spatial heterogeneity in habitat use. These findings suggest that vegetation management outside levee areas, particularly reducing suitable habitats such as overgrown farmland and establishing buffer zones, may help mitigate crop damage in the surrounding area. This study was conducted as part of the Watarase Floodplain Wild Boar Behavior Survey in 2025 by Tochigi Prefecture and under the research projects for food safety, animal health and plant protection (25133213) funded by the Ministry of Agriculture, Forestry and Fisheries of Japan.



Population level implications of the avoidance of wild pigs by eastern wild turkeys

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Keywords: Alabama, avoidance, competition, wild pigs, wild turkey

Wild turkeys are an economically and recreationally important gamebird in the United States. Until recently, the postulated interspecific effects of wild pigs (*Sus scrofa*) on wild turkeys (*Meleagris gallopavo*) were largely limited to the use of anecdotal or simulative research. Wild pigs have been thought to compete with and predate wild turkeys and their nests, however the possibility exists for wild pigs to exhibit indirect effects as well. Using camera surveys, we examined population level demographic changes in response to the removal of wild pigs in central Alabama, USA. We found that when the number of wild pigs removed was equal to the estimated baseline population, there was a 50% increase in wild turkeys, and they were twice as detectable when compared to when no wild pigs were removed. However, during this study the greatest increase in the wild turkey population occurred prior to any measurable increase in reproduction. We hypothesized that active management of wild pigs led to immigration of wild turkeys from surrounding areas. To investigate this hypothesis, we captured 22 wild turkeys at a nearby site in central Alabama, USA, and fitted them with GPS-transmitters during spring reproduction. We then actively removed wild pigs from portions of the site, while keeping others as a control. We estimated the relative abundance of wild pigs across the study areas during spring via camera survey. We found that densities of wild pigs were negatively associated with daytime use, roost site selection, and nest site selection of wild turkeys, and that step length was positively associated with wild pig density. We believe that wild turkeys avoided areas of high wild pig density due to a heightened risk of disturbance and that the increases in wild turkeys in the initial study were due to that perceived risk of disturbance.



Who Is the troublemaker? The resident wild boar or the newly arrived red deer?

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Keywords: activity pattern, camera traps, Cervidae, interspecific interaction, Suidae

Interspecific competition is a fundamental ecological process that shapes species coexistence, resource use, habitat selection, and population dynamics. When resources are spatially concentrated, competition may intensify, leading to agonistic encounters that determine access to food and establish dominance relationships among species. Such interactions are particularly relevant at supplementary feeding sites, where artificial food concentration increases encounter rates among sympatric ungulates. The aim of this study was to quantify agonistic interactions between wild boar (*Sus scrofa*) and two cervid species, roe deer (*Capreolus capreolus*) and, red deer (*Cervus elaphus*) at supplementary feeding sites in Central Croatia, and to compare their diel activity patterns in order to assess temporal overlap and competitive dominance. Wild boar is a well-established resident species in the study area, whereas the red deer population is currently becoming established following a reintroduction programme initiated in 2017. Estimated population densities, obtained during 2025 using the Random Encounter Model, were 15.3 indiv/km² for wild boar, 8.2 indiv/km² for roe deer and 1.1 indiv/km² for red deer. Camera traps were deployed at six ad libitum supplementary feeding sites in the Prolom study area during spring 2026. During the study period, 46 agonistic encounters were recorded. Wild boar dominated these encounters, displacing red deer in 30 cases (65.2%), roe deer in three cases (6.5%) and conspecifics in seven cases (15.2%). In contrast, red deer displaced wild boar in only three cases (6.5%) and conspecifics in three cases (6.5%). Wild boar and roe deer exhibited a unimodal activity pattern with a pronounced peak during the early night, whereas red deer showed a bimodal activity pattern with peaks around sunrise and sunset. Despite these differences, species exhibited substantial temporal overlaps during the evening hours, coinciding with the period when most agonistic encounters occurred. These findings indicate that wild boar is the dominant competitor at supplementary feeding sites and may reduce access to food resources for the newly established red deer population.



Biology and genetics



What's beneath the surface? Wild boar diet across seasons and land use

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Keywords: wild boar, diet composition, rooting, metabarcoding, habitat type

Rooting of wild boar (*Sus scrofa*) is strongly linked to seasonal and spatial availability of food resources and represents a major source of human–wildlife conflict. However, dietary preferences of wild boar in Subalpine-Dinaric region remain poorly known, particularly about cryptic taxa such as soft-bodied invertebrates and fungi. Moreover, the influence of season and land use on diet composition is still insufficiently understood. Therefore, we investigated dietary preferences across seasons (winter, spring, summer) and two contrasting habitat types: a mosaic agricultural-forest landscape in central Slovenia (hunting ground Oljka), characterised by ongoing anthropogenic nutrient inputs, and a continuous forest habitat in central Croatia (Prolom research station) with a three decade long absence of nutrient inputs. We analysed >50 faecal samples, using a high-throughput DNA metabarcoding approach targeting fungi (ITS1), invertebrates (COI), plants (trnL, P6 loop), and vertebrates (12S rRNA), enabling both qualitative and quantitative assessment of diet. Results revealed high taxonomic diversity of DNA in faeces (>170 fungal, >140 invertebrate, >16 plant, and >7 vertebrate genera were found), confirming wild boar as a highly opportunistic omnivore. The results reveal the importance of fungi (e.g. genera *Elaphomyces*, *Schizophyllum*, *Leucogaster*, and others) in all studied seasons, and invertebrates (ground beetles belonging to genera *Carabus*, *Abax*, *Harpalus*; insects, earthworms, flatworms, snails), especially in winter. Additionally, we observed higher frequency and diversity of detected plants (with genera *Avena*, *Castanea* and *Fagus* contributing to >90% of ASVs) in a nutrient-rich agricultural-forest landscape (Slovenia) than in forest habitats without direct anthropogenic inputs (Croatia). Season strongly influences diet composition as high frequencies and diversity of invertebrates were found in winter, various fungi genera (especially *Elaphomyces*) in summer, and higher plant diversity (*Castanea*, *Picea*, *Fagus*, *Avena* and others) in spring. Results confirm that wild boar exhibit a complex feeding strategy, fulfilling diverse trophic functions as frugivore, predator, plant and spore disperser, and highlight importance of this species as a key ecosystem engineer.



Genomic analysis of hybridization between domestic pigs and *Potamochoerus* spp. from sympatric areas of Benin and Madagascar

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Keywords: hybridization, *Potamochoerus* spp, *Sus scrofa domesticus*, introgression, genomics

In many rural areas of sub-Saharan Africa and Madagascar, domestic pigs (DP) coexist in sympatry, with species of the genus *Potamochoerus* spp. (*P. larvatus* or *P. porcus*). Reports of hybridization between domestic pigs and these two wild suid species are common in these areas. However, the existence and level of genetic introgression of those hybrids has not been sufficiently investigated to date. The aim of our research was to study the genomic introgression of suspected hybrids following reported cross breeding events between DPs and *P. porcus* or *P. larvatus* in Benin and Madagascar, respectively. A total of 75 samples of individuals representing DP (n = 32), *P. larvatus* (n = 7), *P. porcus* (n = 17) and putative hybrids (n = 19) were collected from the field and from European zoos. After filtering, 55 samples were retained for subsequent genotype analysis using 70K SNPs chip. The resulting genomic data was compared by principal component and admixture analysis. Our results revealed the absence of genetic introgression of *Potamochoerus* spp. in the selected putative hybrids. To further investigate these findings, we expanded our analyses to a global population of *Sus scrofa domesticus*, with the aim of identifying variations in their ancestral origins (Asian or European). These analyses revealed that our suspected hybrids were derived from crosses between European and Asian DP populations, with proportions of 34% and 66%, respectively.



In contrast, Beninese hybrids derived exclusively from European suids. This study provides the most comprehensive assessment to date of potential hybridization between DP and *Potamochoerus* spp. in sub-Saharan Africa. The great variability of local DP populations (European and Asian) may explain the presence of unique phenotypes when these distinct lineages are crossed, which may be falsely identified as hybrids between DP and *Potamochoerus* spp., if based on phenotypic data alone.



Genomic footprints of wild boar parallel evolution on two Mediterranean islands

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Keywords: *Sus scrofa*, WGS, inbreeding, introgression, positive selection

Islands provide natural settings to investigate how demographic history and selection interact to shape genomes. The wild boars inhabiting Corsica and Sardinia (*Sus scrofa meridionalis*) represent an intriguing case, as their present-day diversity reflects long-term isolation from mainland populations intertwined with recurrent gene flow from domestic pigs. Although these insular animals are taxonomically recognized as distinct from continental European wild boars (*S. s. scrofa*) and display clear morphological differences, the extent to which they share adaptive genomic features remains unclear. In this study, we compared whole genome sequences of Corsican (N = 7) and Sardinian (N = 10) wild boars to quantify domestic pig introgression and identify candidate loci potentially influenced by insular selective pressures. We included wild boars from other European countries (N = 29) and domestic pigs (N = 17) as a comparison, analysing 1.3M single nucleotide polymorphisms. Patterns of homozygosity and inbreeding differed markedly between the two populations, consistent with distinct demographic histories. Introgression from domestic pigs was evident in both islands but was more pronounced in Corsica than in Sardinia. Genome-wide scans for selection highlighted signals affecting pathways related to neural development and synaptic regulation in both populations. Additional signals were associated with genes related to skeletal development and growth regulation, although the specific genes under selection were not shared between islands (PAPPA and IGFALS in the Sardinian population and GHSR in the Corsican population). Overall, these results indicate that Corsican and Sardinian wild boars followed partially independent evolutionary routes. Despite their shared ancestry and similar environments, insularity appears to have shaped their genomes through different combinations of demographic processes, introgression, and selection acting on traits plausibly linked to island life, including body size variation.



Leveraging genetic analyses to inform disease preparedness for feral swine in the United States

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Keywords: african swine fever, disease preparedness, genetic assignment, single nucleotide polymorphism, translocation

Over the past 40 years, the rapid expansion of feral swine (*Sus scrofa* × *domesticus*) within the contiguous United States (US) has been driven by unlawful anthropogenic translocation. Beyond simply expanding the spatial extent and damage caused by this species, such translocations increase the risks and consequences of disease spillover should pathogens of concern (e.g., African Swine Fever or Foot-and-mouth Disease) become established among invasive populations. We leveraged an extensive genetic database, with >23,000 feral swine samples genotyped with a high-resolution single nucleotide polymorphism (SNPs) array, and machine learning approaches to describe translocation patterns and relative movement rates across the US. With a robust dataset to describe allele frequencies among established populations, we attained high precision in our ability to predict the spatial origin of samples, producing a validation error of approximately 19 km at the scale of the contiguous US. By systematically evaluating sampling locations versus predicted origins for all genotyped samples, we classified individual feral swine as either residents (sampled in the same genetic population in which they were born) or translocated (sampled >200 km from the populations in which they were born). Collectively, our results demonstrate that high rates of long-distance translocation continue to challenge population control efforts while also amplifying the risk of disease spread. Recognizing that the consequences of disease emergence in highly connected populations is greater than among more isolated populations, areas that serve as frequent sources for translocated individuals are now being prioritized for active disease surveillance. Further, these analyses illustrate that machine learning approaches to describe natural and anthropogenic patterns of genetic exchange can be used to elucidate likely patterns of disease spread among wild populations and the associated risk of disease spillover to domestic herds.



Island life: decoding the environmental influences on wild boar genomics

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Keywords: *Sus scrofa*, local adaptation, landscape genomics, SNPs, population structure

Adaptation to local conditions can result in genetically structured metapopulations, however, a similar pattern can also result from neutral demographic processes. It is thus important to characterize the underlying processes of population structure. Here we investigate the population structure in the Sardinian wild boar (WB, *Sus scrofa mediterraneus*) using single nucleotide polymorphisms (SNPs). We expect to: confirm the population structure reported with microsatellites, and to highlight a moderate but significant contribution of environmental variables. Finally, we explore genomic regions potentially involved in local adaptation and their possible functions. After filtering our dataset consisted of 83 WB and 13,917 autosomal SNPs. Population structure was investigated using principal component analysis (PCA) and Admixture. We identified SNPs under putative diversifying selection in Pcadapt and used two landscape genomics analyses: latent factor mixed models (LFMM) testing for correlation one SNP and one environmental variable at a time, and redundancy analysis (RDA) as a multivariate analysis. Environmental variables were Bioclimatic (from Worldclim2), elevation (from the Shuttle Radar Topography Mission), and land use (from photointerpretation). Gene Ontology (GO) enrichment analysis was performed with g:Profiler. Population structure was detected with both methods. Pcadapt found 113, LFMM 134, and RDA 1289 SNP outliers, 49 of which were detected by at least two methods and led to the identification of 61 genes within a 100kbp window around each SNP. GO enrichment analysis revealed over-representation of terms related to cell localization, motility, and adhesion, but also related to anatomical development and immunity. Adaptive variation contribution to the genetic structure of the population appears minor with respect to the landscape, however, we detected signals suggestive of an ongoing selection in response to environmental gradients on the island. Further investigations on these genes role and potential implications on morphology and fitness are needed, especially to forecast the impact of climate change on this species.



Reproductive character of wild boar on the Yamizo population in Tochigi Prefecture, eastern Japan

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Keywords: reproduction, puberty, fertility rate, intrauterine mortality rate, Japan

Since the 1970s, wild boars have expanded in Japan, causing agricultural damage and spreading CSF since 2018. Effective management requires balancing population reduction with persistence, guided by demographic data. While population dynamics depend on several factors, reproductive data from female carcasses is particularly essential for refining management models. Leveraging national culling intensifications, a processing facility in Tochigi Prefecture, had been collecting specimens from the Yamizo Mountains until the initial spread of CSF. This provides an efficient platform for large-scale sampling to improve evidence-based strategies through a deeper understanding of reproductive ecology. This study investigated the reproductive characteristics of female wild boars in the Yamizo Mountain range. We examined 395 females collected at a meat processing facility between 2011 and 2016. The results revealed that puberty is reached as early as 0.5 years of age, with full reproductive maturity and higher pregnancy rates occurring at 1.5 years. Among pregnant individuals, the mean number of corpora lutea was 5.4 ± 1.35 , and the average litter size was 4.5 ± 1.49 . Machine learning analysis using Lasso regression and decision trees indicated that gonadal activity was elevated from January to June, peaking in March. Pregnancy rates were highest between March and July, specifically peaking in March and April. Both reproductive activity and pregnancy rates were positively influenced by increases in body weight and the Back Fat Index, which served as an indicator of nutritional status. Female productivity ranged from 1.08 to 1.77, consistently exceeding 1.00 throughout the study period, indicating a continuous upward trend in the population. These findings suggest that the Yamizo population maintains high reproductive potential. To effectively reduce population density, management strategies should focus on applying sustained, high hunting pressure to reduce the proportion of adult females and implementing habitat management to suppress body weight gain by limiting food availability.



Reproduction of wild boar (*Sus scrofa*) females in Europe southernmost alpine mountain range

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Keywords: breeding, foetus, litter size, ovary, piglets

Wild boar (*Sus scrofa*) populations are expanding and colonizing new habitats. The population dynamics of the species is determined by the balance between reproduction resulting from bottom-up regulation and mortality produced by top-down mechanisms. Knowledge of reproduction and productivity is therefore essential for monitoring, modelling, and managing wild boar populations. After being absent for at least 150 years, in the 1970s wild boar colonized Sierra Nevada in Southern Spain, the southernmost European alpine mountain massif. This study aims to describe the reproductive biology of female wild boars in Sierra Nevada. From 2003 to 2007, the reproductive status of 648 female wild boars was assessed in three different ways: 1) the ovaries were measured and histologically analysed; 2) gestation and the number of foetuses were determined by uterus inspection; and 3) the number of piglets accompanying individual adult wild boar females was determined through field observations. Weight and ovary development allowing reproduction was found only in females older than 24 months. Accordingly, no pregnant females under this age were identified. Pregnancy rate of the adult females was 15.5% (71/457, CI95 12.2 % - 18.9 %), significantly increasing throughout the breeding season from 0% in October to 75.7% (CI95 61.9 % - 89.5 %) in February. Foetal litter size was 4.20 ± 1.37 (mean $\pm$ standard deviation, range 1 – 7). Above 80% of the births occurred within a six-week period from mid-February to the end of March. The number of piglets accompanying solitary adult females significantly decreased throughout the year. The overall female reproductive performance of the Sierra Nevada wild boar population falls within the lower range of the values reported for the species, probably driven by the slow growth of females to reach reproductive maturity determined by the harsh mountain conditions.



Study of the impact of environmental changes on the wild boar and raccoons microbiome involving health risks

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Keywords: microbiome, urban colonisation, ecological changes

Urban expansion is driving profound ecological and biological changes in wildlife. Opportunistic and generalist species, such as the wild boar (*Sus scrofa*) and raccoon (*Procyon lotor*), are particularly successful in colonizing anthropized environments, where shifts in resource availability, population density, and interspecific interactions may influence their intestinal microbiome and associated health risks. Within a One Health framework, understanding the impact of recent colonization on host-associated microbial communities is essential to assess potential implications for pathogen transmission at the wildlife–livestock–human interface. This study investigates the impact of environmental gradients—from forest to urban habitats—on the gut microbiome composition and diversity of these species in Belgium. Using non-invasive fecal sampling ($n = 564$ for wild boars and $n = 226$ for raccoons) across multiple sites representing contrasting habitats (forested, agricultural, and peri-urban), we apply high-throughput sequencing approaches to characterize bacterial communities and detect potential pathogens. Microbiome diversity (α - and β -diversity metrics) is analyzed in relation to habitat type, host ecology, and inferred dietary shifts derived from metabarcoding data. Preliminary results suggest that urban populations exhibit increased dietary diversity and access to anthropogenic food resources, which may be associated with distinct microbial signatures compared to forest populations. These changes could reflect both ecological plasticity and altered exposure to environmental microbes and pathogens. Ongoing analyses aim to determine whether urbanization is linked to increased pathogen prevalence and to identify key microbial taxa driving community shifts. By integrating ecological, dietary, and microbiome data, this work provides novel insights into how urban colonization shapes host–microbiome interactions in adaptable wildlife species. Ultimately, it contributes to a better understanding of the ecological and sanitary consequences of wildlife urbanization, informing management strategies in a context of increasing human–wildlife interactions.



African swine fever and other diseases



BCNWB-ASFV: A spatially explicit agent-based model to evaluate African swine fever spread and management strategies in urban-habituated wild boar in Barcelona

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Keywords: african swine fever, urban-habituated wild boar, *Sus scrofa*, agent-based modelling, spatially explicit simulation, outbreak management, Barcelona

Urban-habituated wildlife populations are increasingly colonizing cities and exploiting urban resources, creating socio-ecological conditions that intensify human–wildlife interactions. In wild boar (*Sus scrofa*), access to anthropogenic food resources, habitat modification, and reduced avoidance of humans can increase conflicts such as property damage, traffic accidents, aggressive encounters, and disease transmission. The current African swine fever (ASF) outbreak in the Barcelona area illustrates how pathogen emergence at the wildlife–urban interface can alter population dynamics, increase public and private costs, and require rapid, spatially targeted management responses. The aim of this study was to describe the BCNWB-ASFV model, a spatially explicit, incremental agentbased simulation model developed to evaluate ASF spread and management strategies in urbanhabituated wild boar populations in Barcelona, Spain. The model was implemented in GAMA and represents interactions among wild boar agents, citizens, and fine-scale GIS-based urban and periurban landscapes. Model outputs were processed and visualized using QGIS and R. The simulated system incorporates key ecological and social drivers of wild boar use of urban environments, including movement, habitat use, access to anthropogenic resources, and interactions with people. Management interventions were parameterized from current strategies applied to reduce conflicts with urbanhabituated wild boar and to support ASF outbreak control. One year of simulation showed that the BCNWB-ASFV model can reproduce spatially heterogeneous patterns of wild boar movement, ASF transmission risk, and management impact across the Barcelona landscape. Scenario analyses identified the management strategies that were most effective and efficient in reducing outbreak spread, limiting high-risk contact areas, and prioritizing zones for intervention. These results highlight the value of the model as a decision-support prototype for detecting priority areas during ASF outbreaks and for comparing the cost-effectiveness of alternative control strategies.



ASF impact on the endemic pig species of Indonesia

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Keywords: african swine fever, babirusa, north Sulawesi, population crash

African Swine Fever (ASF), which first reached Indonesia in 2019, arrived in North Sulawesi in late 2023, triggering a mass decline of endemic suid species. This study assessed the ecological and social impacts of the outbreak within Bogani Nani Wartabone National Park (BNWNP) through camera trap monitoring, carcass surveillance, and social surveys of 135 residents in forest-edge communities. Ecological data revealed a devastating population crash. In October 2023, the first laboratory-confirmed case of ASF in a Sulawesi babirusa (*Babirusa celebensis*) was recorded within BNWNP. By 2024, camera trapping across 50 grids in a 45,000 Ha annual monitoring area recorded zero babirusa sightings, a total collapse from the 40.2% average detection rate observed between 2020 and 2023. Confirmed mortality also significantly impacted the Sulawesi warty pig (*Sus celebensis*). Consequently, IUCN Red List reassessments conducted in 2025 uplisted the Sulawesi and Hairy babirusa to Critically Endangered and the Sulawesi warty pig to Endangered. Social surveys identified unregulated livestock trade and weak biosecurity as the primary drivers of pathogen spillover. Alarming, 79% of surveyed farmers reported selling sick pigs to collectors immediately, while 38% would dispose carcasses into the environment, contaminating at least 12 local rivers. These unregulated networks facilitate the mechanical spread of the virus between domestic farms and wildlife habitats. ASF has proven to be an "extinction-level threat" to the wild pig populations. Indonesia has 8 wild pig species across its archipelago and 6 are endemic, 3 of which are isolated in small islands. Urgent interventions are required, including strengthening cross-sectoral biosecurity, regulating meat trade, and establishing conservation breeding programs to prevent the imminent loss of these unique ecosystem engineers.



African swine fever re-emergence in Spain: early outbreak dynamics in wild boar

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Keywords: african swine fever, outbreak, epidemiology, surveillance, emerging infectious diseases

After more than 30 years since its eradication in Spain, African swine fever virus (ASFV, genotype II) was confirmed in two wild boars on 28 November 2025 near Barcelona, in a densely populated area with extensive human infrastructure. This communication describes the early spatiotemporal dynamics of the outbreak and the main control measures implemented during the initial response. Control measures included enhanced passive surveillance through systematic carcass searches using trained detection dogs, rapid carcass removal, targeted wild boar population reduction, and installation of movement barriers. Surveillance data were analysed using reconstructed carcass mortality dates and epidemic front analyses to assess early outbreak spread. Emergency zoning established a 20 km infected area with a 6 km high-risk zone, later complemented by restricted zones I and II. By May 2026, 320 of 4,121 analysed wild boars or bone remains tested PCR-positive for ASFV. Most positives originated from enhanced passive surveillance (96.6%), while only 3.4% were detected through active surveillance. Cases remained confined to three sectors isolated by physical barriers. Retrospective analyses suggested ASFV circulation began in early September 2025, months before first detection. Median carcass detection delay was 4 days, although some carcasses remained undetected for up to 82 days. The epidemic front expanded ~12 km over 225 days, with a mean radial spread of ~2.27 km/month. Spread dynamics were non-linear, accelerating after late December, and showed marked directional anisotropy. The prolonged undetected circulation highlights the importance of robust passive surveillance for early ASF detection. Rapid carcass removal, adaptive zoning, movement barriers, and wild boar population management were critical to containment. The outbreak also suggests that urban wild boar populations may facilitate long-distance ASFV spread.



Rethinking Mediterranean ASF threat: scavengers and missing cannibalism redefine transmission risk

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Keywords: ASF, scavenging, cannibalism, disease management

The ongoing European African Swine Fever (ASF) epidemic, originating in 2007 and reaching Italy in 2022, causes substantial wild boar mortality. Although infectious carcasses can persist for months, posing a transmission risk to conspecifics, current epidemiological insights derive almost exclusively from Central and Northern Europe. However, climates and scavenger communities there differ markedly from Mediterranean ecosystems. To address this geographical knowledge gap, an experimental study was conducted at the Presidential Estate of Castelporziano (Rome, Italy) during Autumn-Winter 2025. Twenty trial sites, equally divided between simulated ASF "deathbeds" and random locations, were monitored using three camera traps recording 20-second videos. Twenty wild boar carcasses, originating from the population control plan carried out in the area, were deployed within 18 hours post-mortem. Carcass degradation was quantified daily via video analysis and tri-daily field surveys until complete skeletonization. More than 80,000 individual video recordings were gathered. Scavengers entirely consumed or dismembered all carcasses prior to reaching full skeletonization. No empirical evidence indicated wild boar cannibalism. Furthermore, wild boars were infrequently captured on camera, demonstrating no observable interaction with either the carcasses or the immediate deathbed. In contrast to observations from northern and central Europe, scavenger activity within the Mediterranean study area substantially diminished carcass persistence. This accelerated depletion, combined with the lack of post-mortem intraspecific scavenging or contact, indicates that carcasses might represent a less significant driver of ASF transmission in equivalent ecosystems. Although requiring further experimental confirmation, these findings suggest that such results could prompt a re-evaluation of carcass-centered management priorities regarding Mediterranean ASF control strategies.



Drone-assisted wild boar hunting and ASF control: the ambivalent role of recreational hunters

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Keywords: african swine fever (ASF), drone-assisted hunting, wild boar, population density, recreational hunters

African swine fever (ASF) prevention and control in wild boar populations requires management strategies adapted to the epidemiological situation. In buffer zones surrounding infected areas, substantial population reduction is considered a key preventive measure. Although hunting remains the most widely accepted and operationally feasible population control method in Europe, conventional hunting practices are often insufficient to reduce wild boar densities below epidemiologically relevant thresholds. Compliance of recreational hunters with intensive population reduction strategies therefore represents a critical factor for successful ASF prevention. This study evaluated the effectiveness and acceptance of drone-assisted thermal imaging technology for targeted wild boar hunting in 16 representative hunting grounds in southwestern Germany between 2021 and 2025. Operational hunting data were combined with standardized face-to-face interviews using a structured questionnaire addressing hunting practices, population management, drone deployment, and ASF prevention. Drone-assisted hunting operations were conducted in small, coordinated hunter groups, primarily in forest habitats and supported by radio communication following thermal detection of wild boar. The approach increased the achievable hunting bag by at least 16% compared with conventional hunting efforts. Participants evaluated the method as effective, safe, animal-welfare compliant, and operationally advantageous. Acceptance of drone-assisted hunting (100%) and legal night-vision technology (88%) was high, whereas trapping was largely rejected. Despite broad support for hunting as an ASF management tool, most respondents opposed reducing wild boar densities in their own hunting grounds below comparatively high threshold levels. The accepted lower limit for wild boar reduction in respondents' hunting grounds ranged from 5.0 to 37.9 huntable wild boar/km²/year. These findings reveal a fundamental contradiction between support for technologically enhanced hunting and reluctance to achieve substantial local population reduction. The study highlights the importance of integrating hunter motivation and acceptance more realistically into ASF management and wildlife health policies.



A serological survey of porcine pathogens in bushpigs living in sympatry with domestic pig populations in rural areas of Madagascar

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Keywords: suidae, interaction, bovine tuberculosis, toxoplasmosis, african swine fever

Bushpig (*Potamochoerus larvatus*) is a wild pig species widespread in Sub-Saharan Africa and Madagascar. Despite being common in anthropized habitats, little is known about the pathogens it may share with domestic animals, especially domestic pigs. This study investigated the circulation of several porcine pathogens including African swine fever virus (ASFV), classical swine fever virus (CSFV), Hepatitis E virus (HEV), *Toxoplasma gondii*, *Trichinella* spp., *Cysticercus cellulosae*, *Mycobacterium bovis* and *Brucella suis* in bushpig populations living in proximity to rural villages and sharing habitats with free-ranging domestic pigs in two regions of Western Madagascar. A total of 659 samples of bushpigs (n=154) and domestic pigs (n=505) were collected and analysed using serological ELISA test, occasionally combined with polymerase chain reaction methods. We did not find any evidence of circulation of antibodies against CSFV, HEV, *Trichinella* spp., *C. cellulosae*, or *B. suis* in either population. However, both suid species showed antibodies against *T. gondii*, with seroprevalences of 7.1% in bushpigs and 9.7% in domestic pigs. Similarly, antibodies against *M. bovis* were identified in both sympatric populations, at rates of 2.6% and 1.2% respectively. Conversely, ASFV antibodies were detected only in domestic pigs, with a prevalence of 2.0%, and viral DNA was confirmed in 0.8% of tissue samples. Nevertheless, sympatric bushpig samples showed no evidence of ASFV exposure. Our results suggest that sympatry between *P. larvatus* and domestic pigs could facilitate interspecific pathogen transmission through a shared contaminated environment. However, we could not demonstrate any potential role of bushpigs as reservoirs or carriers of ASF virus. Our study highlights the relevance of implementing further epidemiological investigations on bushpig populations living the wildlife-livestock human interface in many rural areas of Madagascar and Sub-Saharan Africa.



Rethinking African swine fever surveillance in wild boar: non-invasive approaches

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Keywords: african swine fever, wild boar, non-invasive sampling, environmental contamination, surveillance

African swine fever (ASF) continues to represent a major challenge for wildlife disease surveillance in Europe, where wild boar (*Sus scrofa*) act as the main reservoir. Current surveillance strategies rely largely on passive detection of infected animals, limiting early detection and spatial coverage. In this context, non-invasive approaches offer a promising alternative to improve surveillance capacity. In this study, we explored the potential of non-invasive sampling approaches to improve ASF surveillance in wild boar populations. Under experimental conditions, we investigated environmental contamination dynamics in facilities housing wild boar experimentally infected with ASF virus using three non-invasive methods: sponge-based sampling, water filtration, and oral fluid collection. Environmental samples were collected from multiple surfaces, including animal skin, and analysed by real-time PCR for ASF virus DNA detection. The virulent isolate (Arm07) induced rapid and intense contamination, with detection as early as 2–3 days post-infection, coinciding with the onset of viremia. This pattern reflects the rapid systemic replication of highly virulent isolates and their ability to contaminate the environment within a short time frame. In contrast, low-virulence isolates exhibited a distinctive contamination peak around 21 days post-infection, associated with prolonged subclinical manifestation and extended environmental contamination. In parallel, non-invasive sampling approaches were tested under field conditions, allowing the simultaneous detection of *S. scrofa* DNA, confirming sample origin. A field protocol for oral fluid collection was developed and tested as a first step towards ASF surveillance in wild boar populations. This protocol, based on ropes baited with corn powder and deployed at feeding or aggregation points, achieved biting rates of up to 56% in high-density areas. Sampling success was influenced by ecological conditions, with higher efficiency observed during summer. Overall, our findings support the integration of non-invasive sampling approaches into ASF surveillance frameworks, offering improved spatial coverage, reduced logistical constraints, and enhanced early detection in wild boar populations.



Predictive Bayesian models for the impact of African swine fever in rare wild pig populations in Asia

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Keywords: warty pig, *Sus celebensis*, population availability, bayesian model, East Asian

Asiatic wild pigs populations are potentially at risk of extinction due to the spread of African swine fever (ASF) in small islands of Indonesia and Philippines. Population viability models are difficult to use in this context because of the lack of appropriate parametrization, caused by logistic and financial constraints. In order to use in the modelling process indigenous and local knowledge we adopt a Bayesian framework (according to Boersch-Supan et al. 2017) able to include informative priors. To investigate the potential of this approach, we take, as an example, the Worthy pig (*Sus coelebensis*) in Sulawesi (Indonesia) for which some consistent semi-quantitative information is available. We developed an ordinary equation model with logistic density-dependence. Important priors to be included are mortality rates and the carrying capacity; the Bayesian model is computed via Markov Chain Monte Carlo. Simulations shall be performed with different scenarios of ASF outbreak. For such scenarios we will try to compute population extinction probability in the short-term and expected loss of genetic variability in the medium and long-term, which might jeopardize the population fitness towards factors such as climate change and human increased pressures. Since the model we used is based on availability of time series of animal abundance, the specific purpose of this presentation is to draw attention of the colleagues from East Asia on the need to collect quantitative and qualitative information on small populations of different suid species. To this aim we developed a simple database which has to be populated with demographic information. Such data will be connected to the Bayesian model to generate appropriate simulations. This tool can be used by population managers to predict the evolution of outbreaks in their specific study site and the population fate and to plan the appropriate conservation measures.



Strategies to improve bait uptake in low-density wild boar populations

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Keywords: wild boar, *Sus scrofa*, oral vaccination, bait deployment, low-density populations

Oral vaccination is one of the few available tools for controlling diseases in wildlife, and doses are typically delivered through baits. Previous studies on wild boar baiting successfully delivered baits after combining random points and feeding or watering points. This strategy was effective in medium-to-high wild boar density sites (8 to 50 individuals/km²). However, it performed poorly in low density sites (≤ 7 individuals/km²). Low density sites are frequent, especially in African swine fever endemic regions. To address this limitation, we evaluated two alternative bait deployment strategies in two 1.5 km² study sites with low wild boar densities. The first one simulated aerial bait deployment, with 40 bait deployment points uniformly distributed across each study area, each point containing two baits. The second method consisted of establishing two feeding points per study area, where 15 kg of corn was supplied weekly for one month as an attractant, followed by the deployment of 40 baits per feeding point. In the aerial deployment simulation, 79% of baits were consumed, of which only 6.3% were taken by wild boar. In the feeding point strategy, 89% of baits were consumed, with 53% attributed to wild boar. Significant differences between sites were observed in the speed of bait consumption, but not between deployment strategies. The time of the day at which baits were consumed did not differ by site or strategy. These results suggest that bait delivery through feeding points may represent an effective strategy to enhance bait uptake in typical low-density wild boar scenarios. Cost calculations suggest that the feeding point strategy is the most expensive method.



Innovations in pathogen surveillance for invasive wild boars

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Keywords: bloodmeal analysis, *Sus scrofa*, Torque teno virus, xenosurveillance

Invasive wild boars pose a significant environmental and economic threat globally, and in the United States of America they increase the risk of a foreign animal disease such as African Swine Fever to emerge and become established. Innovations in pathogen surveillance can aid in the early and rapid detection of a disease outbreak and help determine when a region is considered free of disease. Here we present a surveillance system for detecting invasive wild boars and the pathogens that they carry in a Florida agroecosystem. Our surveillance design used mosquitoes as “flying syringes” to collect blood from wild boars. Over 53 sample days we collected 3,564 blood-engorged mosquitoes. Genetic barcode analysis of the bloodmeals revealed that 314 (9%) of the sampled mosquitoes had fed on wild boar and the success of capturing wild boar-fed mosquitoes varied by season and by habitat. To determine if the samples could be used to detect blood-borne pathogens, we randomly subsampled 110 wild boar bloodmeals to determine if we could detect a ubiquitous, non-pathogenic, suid DNA virus, Torque teno Sus Virus-1. We used a previously published molecular assay to screen samples and found that 38 of 110 bloodmeals had viral DNA from TTSuV1, resulting in an overall apparent prevalence of 34.5% (26.3–43.8%). To determine if we could identify individual boars in the bloodmeals using genetic markers, we used a 50,000 SNP array to determine the identity and relatedness of wild boars represented in 6 mosquito bloodmeals. We successfully genotyped 4 of 6 samples and determined that each meal contained the blood of a unique boar, 2 of which were second order relatives. This surveillance system has seasonal and regional limitations, yet holds promise for rapidly detecting invasive wild boars and the pathogens that they carry under certain conditions.



Challenges for ASFV control in the peri-urban wild boar population of Barcelona, Spain

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Keywords: african swine fever, epidemiology, modelling, peri-urban, *Sus scrofa*

In November 2025, a novel genotype II African swine fever virus (ASFV) variant emerged in wild boars in the Metropolitan Area of Barcelona (MAB), northeastern Spain. Data from official reports, the wild boar population in the MAB, and the management measures implemented were analysed to assess the evolution of the outbreak and the efficacy of these measures. The peri-urban setting, wild boar population characteristics, and epidemiological features of the new ASFV variant challenge current eradication strategies, namely wild boar depopulation, fencing, carcass search and retrieval, and limiting human activities. The high-density peri-urban wild boar population in the MAB makes peripheral depopulation to contain ASFV difficult. Wild boar-proof fencing to contain populations that are habituated to navigate among infrastructures is almost impossible, particularly as it must be compatible with access for the 5 million people inhabiting the area. The epidemiological features of the new ASFV strain remain unknown. However, while no antibody-positive uninfected individuals have been identified, suggesting a lethality approaching 100%, a higher proportion of antibody-positive ASFV-infected wild boars have been detected compared to other outbreaks, indicating a longer infectious survival time. Models suggest that, under these conditions, the infection and mortality initial peak should be lower and delayed, with a longer epidemic course potentially increasing the risk of ASFV spread. To date, the ASFV-affected area has increased linearly since the beginning of the outbreak, with management measures showing only limited impact. Models suggest the MAB outbreak requires a more intense and longer application of eradication measures, thus requiring the adaptation of current strategies developed for highly pathogenic ASFV-strains in lower-density, non-urban wild boar populations. The main recommended adaptation is increasing culling intensity to reach depopulation, which is required to compensate for the higher population density and slower disease-related mortality.



Fine-scale connectivity modelling for identifying strategic crossing points though barriers during an African swine fever outbreak

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Keywords: ecological connectivity index (ECI), landscape permeability, disease management, Catalonia

Wild boar movement is strongly shaped by fine-scale landscape features. They can use rivers, streams, and a high diversity of ecological corridors to move through fragmented landscapes. Where these elements intersect road and railway barriers, functional crossing points such as drainages, under and overpasses or fauna passages can facilitate dispersal across otherwise impermeable infrastructure. During disease outbreaks, these crossings may become critical pathways for pathogen spread. Rapid identification of movement bottlenecks is therefore essential for emergency disease management. However, most connectivity models operate at regional scales and overlook the fine-scale structures that guide animal movement locally. Here, we applied an Ecological Connectivity Index (ECI) approach to identify strategic wild boar crossing structures in roads and railways during the recent African swine fever (ASF) outbreak in Catalonia, Spain. Originally developed for landscape and urban planning, the model integrates landscape permeability, anthropogenic barriers, and ecological functional areas to detect highly connected crossings associated with roads and railways, many of them linked to drainage systems and river networks. The model identified a limited number of strategic crossing locations that may play a critical role in wild boar dispersal across fragmented landscapes. These sites represent priority targets for surveillance, fencing, and emergency control during ASF outbreaks. We also compared model predictions with crossing infrastructures independently identified by wildlife managers, providing an assessment of the model's practical relevance. Our results show that fine-scale connectivity models can support rapid and spatially targeted decision making in wildlife disease management.



African swine fever: a global crisis for Asian wild pig diversity

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Keywords: african swine fever, Asia, conservation, one health, crisis

Asia is home to 13 of the world's 18 wild pig species. Most are already listed as threatened on the IUCN Red List due to habitat loss, hunting, and restricted ranges. African swine fever (ASF) reached Asia in 2018. While the economic losses were immediately recognised, the consequences for wild pig diversity, ecosystem functioning, and human communities were largely overlooked. ASF represents an additional severe threat to all Asian wild pig species. Up to mid-2026, mass die-offs in at least four wild pig species have already been documented. We aim to (1) review current conservation activities and challenges in Asia and (2) propose the development of a new action plan to respond to the crisis. The IUCN SSC Wild Pig Specialist Group (WPSG) has already initiated several emergency and support measures. Examples include (i) the reassessment of all wild pig species on the IUCN Red List, (ii) cooperating with zoos for their contribution to vaccine development, (iii) the development of biosecurity guidelines for breeding facilities or (iv) the initiation of new breeding programmes for insurance population. However, the challenges of this crisis are immense and require a substantial amount of international funds and cross-country cooperation in research and conservation. Priority interventions include expanded surveillance, strengthened in situ protection, risk reduction at wildlife–livestock interfaces by awareness campaigns for different groups, strategic ex situ safeguarding, and targeted investment in vaccine research applicable to wild pigs. The recent adoption of IUCN Resolution 110, calling on governments, intergovernmental and non-governmental organisations, zoos, research institutions, and the private sector to support Asian wild pig conservation, underscores the urgency and lays the basis for multi-stakeholder effort and fundraising. We propose to address this multi-dimensional emergency with an integrated One Health response, using a new action plan to prevent ASF-driven extinctions and enable species recovery.



Coordinated management of African swine fever in Sweden, from the hunter's perspective: Lessons from the Fagersta outbreak 2023–2024

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Keywords: african swine fever, wild boar, disease control, hunter engagement, biosecurity

The first confirmed outbreak of African swine fever (ASF) in Sweden was detected in wild boar (*Sus scrofa*) in early September 2023. In line with EU legislation, immediate actions were taken to contain and eradicate the outbreak that stemmed from a single-point introduction. The coordinated response was a multi-stakeholder collaboration led by the Swedish Board of Agriculture as the competent authority. Also prominent in this work was the Swedish Veterinary Agency as expert authority, and an NGO, the Swedish Association for Hunting and Wildlife Management (SAHWM). SAHWM planned and coordinated all practical actions carried out in the field. More than 900 hunters participated in organized search operations following mandatory biosecurity training. After initial searches for wild boar carcasses in a 1000 km² area to delimit the virus distribution, searches continued in the resulting restriction zone (618 km²) and core area (148 km²). Carcasses were systematically collected, tested, transported and destroyed to prevent further disease spread. The involvement of local hunters guaranteed the best available knowledge on wild boar habitat use, and the search approach aimed to minimize disturbance and movement of potentially infected boar. Feeding management was also used to reduce boar movements. Wildlife cameras and digital tracking tools were used to monitor remaining wild boar. After fencing of the core area, remaining boars were subjected to targeted disease-control culling to eradicate the outbreak. Epidemiological assessments indicated that the last ASF-related mortality occurred in late September 2023 and the outbreak area was officially declared free from ASF in September 2024. The Swedish outbreak demonstrates that early large-scale intervention, strong collaboration between authorities and hunter organisations, transparent communication, and high voluntary engagement are critical for successful ASF eradication. The experience provides practical insights for managing future wildlife disease outbreaks in similar socioecological contexts.



African swine fever in India and integrated efforts to mitigate ASF risk to endangered Pygmy hog (*Porcula salvinia*)

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Keywords: ASF, India, Pygmy hog, biosecurity, transmission

African Swine Fever (ASF) arrived in India through the Northeast region in January 2020 and was confirmed in May 2020. ASF initially affected domestic pigs in the region and despite government-imposed transportation restrictions, subsequently spread to entire Indian states by 2025, eventually affecting wild boar populations also. The pygmy hog found only in two protected areas of Assam, a North-Eastern state of India, is susceptible to diseases of domestic pigs. The emergence of ASF in Assam poses a threat to the wild pygmy hog population of around 350 individuals and an immediate threat to the 80 captive pygmy hogs. In response, biosecurity measures at two captive centres were immediately assessed to evaluate the risk of ASF. Based on this assessment, enhanced biosecurity protocols were designed and implemented. Since then, the captive population has been managed as two separate sub-populations, forming distinct epidemiological units in line with the World Organization for Animal Health (OIE) compartmentalisation recommendations. Field studies conducted in tribal communities in fringe areas of one captive centre (n=249 households) and in Manas National Park (n=604 households) showed that backyard pig rearing is commonly practiced without any barriers. In Manas, where wild pygmy hogs and wild boars are present, 256 suspected ASF cases were recorded across 90 households. Additionally, eight suspected ASF cases were reported in wild boars found dead in these fringe villages. The absence of barriers in traditional pig rearing systems allows direct contact between domestic and wild pigs, facilitating disease transmission. This further elevates the risk to captive pygmy hogs as infections are spreading nearby domestic pig populations. To address this, a low-cost biosecurity pig rearing model has been designed and is being implemented, combined with a behaviour change approach to improve pig rearing practices and reduce disease transmission among wild boars, community pigs and pygmy hogs.



Advances in oral African swine fever vaccination in wild boar: improved safety and DIVA-compatible protection using Lv17/WB/RieCD candidate

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Keywords: african swine fever virus (ASFV), wild boar, oral vaccination, live attenuated vaccine, DIVA, wildlife disease management

African swine fever (ASF) remains one of the greatest sanitary threats for wild boar and domestic pig populations worldwide, with recent re-emergence in Spain reinforcing the urgent need for effective wildlife-targeted control tools. Given the central epidemiological role of wild boar in ASF persistence and spread, oral vaccination represents one of the most promising complementary strategies for disease management under field conditions. We evaluated recent advances in oral vaccination using live attenuated genotype II ASF virus vaccine candidates derived from the naturally attenuated isolate Lv17/WB/Rie1. Previous studies demonstrated that oral administration of the parental strain induced strong protection against virulent challenge in wild boar, although residual safety concerns remained. To improve biosafety and field applicability, a dual-gene-deleted derivative, Lv17/WB/Rie1-ΔCD, was developed by deleting EP402R (CD2v) and EP153R, eliminating haemadsorption and enabling DIVA-compatible serological differentiation. Eighteen 3-month-old wild boar were included: 12 vaccinated and 6 unvaccinated controls. Animals received either a single oral dose (10^4 TCID₅₀) or a prime–re-exposure regimen ($10^2 + 10^4$ TCID₅₀), followed by intramuscular challenge with virulent Armenia07 genotype II strain (10^2 HAD₅₀). Vaccination was well tolerated, with only transient mild fever and no local lesions. Prime–re-exposure induced earlier seroconversion (mean 12 ± 4 dpv), and overall protection reached 90%, with complete mortality in controls. Viral genome loads in blood and tissues were reduced by $>10^3$ -fold compared with controls ($p < 0.01$), and sterilising immunity was observed in most vaccinated animals. DIVA ELISA successfully differentiated vaccinated from infected animals. These results



confirm the potential of oral live attenuated vaccination for ASF control in wild boar and identify Lv17/WB/Rie1- Δ CD as a safer second-generation candidate with improved attenuation and surveillance compatibility. Such advances are highly relevant for wildlife managers and disease control authorities aiming to integrate vaccination into long-term ASF management strategies.



Video-based disease warning system - new way for the early detection of African swine fever in the field

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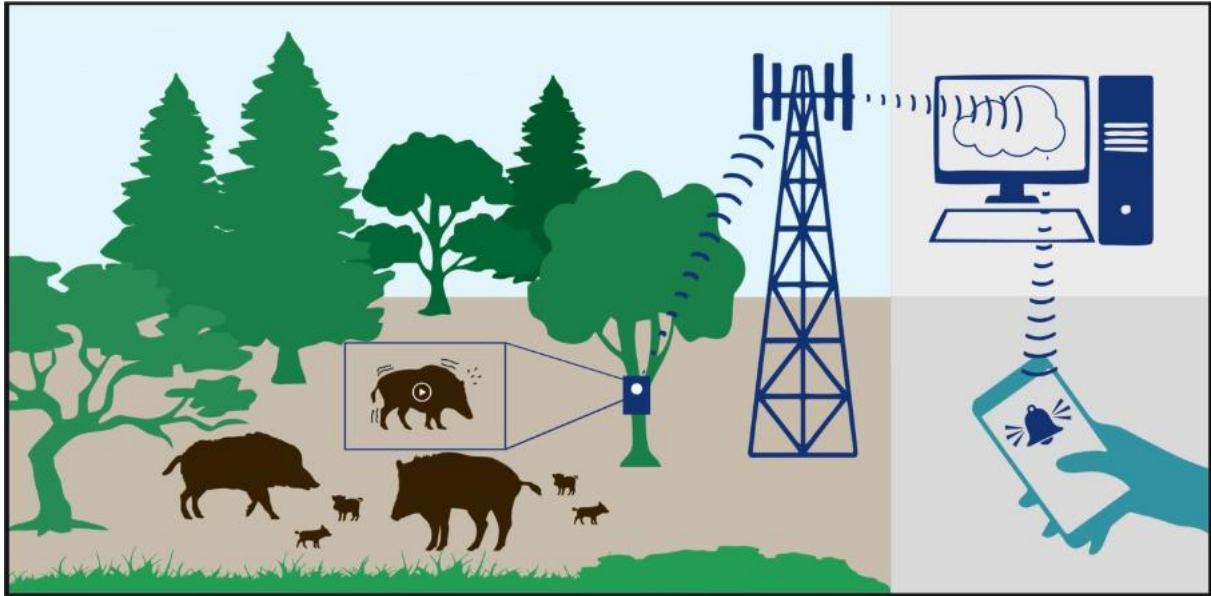
Keywords: african swine fever, KI based detection

The spread of infectious diseases remains a major global challenge, driven by high host densities and increasing international connectivity that enable rapid pathogen transmission. Wildlife diseases, in particular, pose significant risks to biodiversity, food security, and public health. Early detection in free-ranging wildlife populations is therefore critical. This project aims to develop a non-invasive early warning system for African swine fever (ASF) in wild boar by combining advanced sensor technologies with AI-based movement analysis. Continuous spatio-temporal tracking enables the assessment of both population-level dynamics and individual health status. The key innovation lies in detecting subtle, subclinical motor changes during the earliest stages of infection—without the need for capture or biological sampling. AI algorithms analyze movement patterns to identify statistically significant deviations from baseline behavior, such as reduced activity, altered gait, or atypical habitat use, which may serve as early indicators of disease.

Compared to traditional surveillance approaches, this system offers several advantages:

- Early detection: Identifies infections prior to the onset of clinical symptoms, enabling faster response and containment.
- Non-invasive monitoring: Eliminates the need for capture or sedation, reducing animal stress and logistical constraints.
- Operational efficiency: Reduces dependence on post-mortem analysis and laboratory diagnostics, accelerating decision-making and intervention.

Timely detection is essential for effective outbreak control—even in contexts where vaccines or treatments are available.



Overview of the overall system (wild boars are recorded at prominent locations in their habitat - the data is then uploaded to a cloud and automatically analyzed - if there are any anomalies a reporting chain is set in motion).



Wild boar (*Sus scrofa*) as a key host of ectoparasites in Croatian habitats

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Keywords: wild boar, ectoparasites, ticks, Croatia

Wild boar (*Sus scrofa*) plays an important ecological role as a reservoir and dispersal host for ectoparasites of veterinary and epidemiological significance. This study aimed to evaluate ectoparasite diversity and distribution in wild boar across different Croatian habitats associated with wild boar. Sampling was carried out at four locations, three in the Continental region (Posavske šume, Sveta Jana and Garjevica) and one in the Mediterranean region (Punta Križa). A total of 1043 wild boar individuals were examined, of which 12.36% were infested. Altogether, 262 ectoparasites were collected, including 203 ticks, 56 insects and 3 leeches. Following morphological identification, selected samples were analysed using 16S rRNA and COI gene sequencing. Four tick species were identified, with *Dermacentor reticulatus* dominating (83.25%), followed by *Ixodes ricinus* (12.80%), *Ixodes gibbosus* (2.95%) and *Dermacentor marginatus* (0.98%). The louse *Haematopinus suis* was recorded in five cases (52 specimens), while *Lipoptena cervi* was found in two cases (4 specimens). The leech *Haemopsis sanguisuga* was recorded in three cases, representing a rare finding. Seasonal patterns showed the highest activity of *D. reticulatus* in December (42.60%) and November (23.66%), while *I. ricinus* and *I. gibbosus* were most frequent in November. Ectoparasites were most commonly located in the axillary region (43.19%), followed by the neck, abdomen and head. The results confirm that wild boar plays a significant role in maintaining and spreading ectoparasite populations, particularly in continental habitats. The detection of *H. sanguisuga* represents the first record of this species on wild boar, confirming its role as a non-specific host, while the presence of *I. gibbosus* at the Sveta Jana site is the first record for the Continental region of Croatia. These findings highlight the importance of wild boar in the epidemiology of vector-borne diseases and emphasise the need for continuous monitoring at national and European levels.



African swine fever in the Republic of Srpska (B&H): impact on wild boar population dynamics and public risk perception

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Keywords: wild boar, management, population, hunting ground, virus

Wild boar in the Republic of Srpska is one of the most important species of large game. The ASF virus was first identified on 22 June, 2023 in domestic pig (Municipality of Bijeljina), while the first cases in wild boar appeared a month later. The aim of this paper is to analyze the spatial distribution and abundance dynamics of wild boar at the level of this entity and individual hunting grounds in the period 2007-2024. Prior to the outbreak of ASF, we conducted a survey among responsible persons in 20 selected (11 mountain and 9 lowland) hunting grounds managed by hunting associations. Their familiarity with ASF and activities for its prevention were determined, as well as the level of communication and exchange of data among the neighboring hunting grounds and with competent institutions. After the outbreak of ASF, we collected texts from various media in the Republic of Srpska: RTRS, ATV Banja Luka, Srpskainfo, Semberija INFO, Agroportal.ba, Blic, Nezavisne novine, Glas Srpske and SRNA news agency. Reporting on the outbreak and spread of ASF was analyzed, e.g. text topics, sources of information, and narratives. In addition, we used the database of the competent ministry, which includes the estimated hunting-productive area, hunting ground quality class, spring count, culling plan and implemented culling for wild boar. Maps of the spatial distribution of wild boar were created using the ArcGIS 10.3 software package (ArcMap), while 18 hunting grounds with ASF outbreaks were selected for statistical analysis in the period 2023-2024. The predominant type of ASF reporting was informational-institutional (14 articles), followed by cautionary and educational reporting (6 and 5 articles, respectively). It is concluded that the problems and damages caused by ASF go beyond forestry, hunting, sanitary and veterinary frameworks, and that they adversely affect the activities of preserving cultural heritage and economic stability in the Republic of Srpska.



Wild boar hunters' attitudes towards ASF risk, veterinary cooperation, and resource adequacy in Croatia

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Keywords: african swine fever, wild boar hunters, risk perception, veterinary cooperation, resource constraints

Wild boar hunters are central to early detection and adherence to biosecurity protocols in African swine fever (ASF) management. While previous research has examined general awareness and attitudes, two dimensions remain underexplored: whether general disease concern translates into accurate local risk perception, and whether hunters consider current resources and institutional support adequate for effective action. This study aimed to quantify these gaps and examine their sociodemographic determinants. An online survey was administered to 276 wild boar hunters in Osijek-Baranja County, Croatia (October–December 2024). Three five-point Likert-scale items assessed perceived local ASF transmission risk, the importance of cooperation with veterinary experts, and perceived resource limitations of hunting associations. Group differences by age, education level, and ASF concern were examined using independent-samples t-tests. Despite 72.8% of respondents expressing general concern about ASF, only 31.2% rated the risk of spread in their local area as high ($M = 2.83$, $SD = 1.30$), revealing a substantial optimism bias. Concerned hunters rated local risk significantly higher than unconcerned counterparts ($M = 3.01$ vs. $M = 2.36$; $t = 3.79$; $p = 0.000$). Cooperation with veterinary experts was considered highly important by 88.8% of respondents ($M = 4.36$, $SD = 0.94$); concerned hunters valued veterinary cooperation more than unconcerned hunters ($M = 4.43$ vs. $M = 4.15$; $t = 2.27$; $p = 0.024$). Middle-aged hunters (35–54) also valued veterinary cooperation more than younger hunters (18–34) ($M = 4.50$ vs. $M = 4.25$; $t = -2.22$; $p = 0.028$), as did university-educated hunters compared to those with secondary education ($M = 4.52$ vs. $M = 4.28$; $t = -2.21$; $p = 0.028$). Resource limitations were universally recognised regardless of age, education, or concern level (all comparisons $p > 0.05$). ASF concern is the key driver of both risk awareness and attitudes towards institutional cooperation, while age and education differentiate support for veterinary collaboration. Universal recognition of resource constraints, irrespective of age, education level, and ASF concern, highlights the need for targeted institutional investment and formalised veterinary-hunter collaboration frameworks within national ASF control programmes.



Drivers of soil-transmitted helminth (STH) infections at the interface of wildlife and livestock

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Keywords: soil-transmitted helminths, *Ascaris suum*, one-health, wildlife-livestock interface, *Sus scrofa*

Soil-transmitted helminths (STH) are one of the most common and globally widespread parasites, with negative effects on wildlife, livestock, and humans. Especially ascariasis in swine, caused by the parasite *Ascaris suum*, is of great concern for animal health. Despite its importance, it is not well understood how the changing husbandry practices in livestock, especially the increase of organic farming systems, can influence the transmission dynamics of *Ascaris suum* between pigs and their wild counterpart, the wild boar *Sus scrofa*. We hypothesise that organic farming practices, due to increased environmental exposure, may facilitate transmission between livestock and wildlife.

We aim to combine field sampling, parasitological and molecular analyses, with spatial modelling to comprehend the effects of environmental conditions, wild boar host density, and farming practices on parasite prevalence and transmission risk from livestock to wildlife. Commercial pig farms with either conventional or certified organic farming practices as well as game reserves will be sampled along an environmental gradient in Germany. We aim to develop a large-scale study, where we will collect samples of intestines and faeces from mature wild boar in the vicinity of these farms. To ensure broad geographic coverage, we actively seek collaboration with researchers involved in ongoing wild boar projects, hunters and wildlife managers. We are especially looking for wild boar faecal samples in case of live animals and intestinal samples of dead individuals including associated metadata (location, date, host information). We would like to discuss with you the practical and scientific feasibility of this integrated project and provide an opportunity to participate in a large-scale One-Health study to help improve our understanding in parasite dynamics at the wildlife-livestock interface.



The impact of ASFV on the wild pigs of the Philippines

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Keywords: african swine fever virus, disease, critically endangered, endemic, crisis

The African Swine Fever virus (ASFv) has been impacting wild and domestic pigs across Asia and Europe for over a decade, causing billions of dollars in damages to national pork industries, and costing the lives of hundreds of millions of pigs (domestic and wild) across these two continents. Across Southeast Asia the threat of ASFv is a major concern. The impacts on local industry and household food availability are significant enough to declare a national crisis in many ASEAN countries; and the region possesses more than 12 endemic pig species vulnerable to the disease across the islands of Malaysia, Indonesia, and the Philippines. The Philippines currently boasts 5 recorded species of wild pig, 4 of which endemic to specific islands within the archipelago, but there are numerous accounts of undescribed pigs still to be verified in remote forests and landscapes. ASFv has proven a significant threat to Philippine pigs with multiple documented accounts of mass mortalities leading from ASFv in 2 of the 4 endemic species, and many more unconfirmed mass mortality events or population declines observed across the country. The wild pigs of the Philippines are already threatened by a multitude of anthropogenic led persecution, poaching, and habitat loss impacts, and the ASFv may be the final nail in the coffin for some of these species. This presentation will illustrate the challenges, activities, and burgeoning successes arising from the coordinated efforts to combat ASFv in the Philippines from local and international government and non-government organisations. There is hope for some of the Philippines wild pig species, but they balance delicately as ASFv continues to pressure their populations, and the required coordination for mitigating the virus strains relations between stakeholders and organisations.



The European observatory of wildlife: advancing harmonised wild boar density monitoring in Europe

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Keywords: harmonized protocol, camera trapping, density estimation, random encounter model, wildlife monitoring

The need to harmonize wild mammal population monitoring at the international level to assess risks linked to emerging diseases such as African Swine Fever (ASF) and support science-based management policies led to the creation of the European Observatory of Wildlife (EOW), a transnational wildlife monitoring framework. As part of the ENETWILD consortium supported by the European Food Safety Authority, the EOW operates through a network of monitoring sites that collect harmonised wildlife data across Europe. Since 2021 the EOW has been applying the Random Encounter Model (REM) in a total of 103 study sites encompassing 32 countries to estimate local mammal densities. The EOW protocol combines standardized study design and photogrammetry with a semi-automated AI-empowered data processing in Agouti, enabling calculation of REM parameters then used with predefined R scripts to estimate densities. In line with open science principles, all estimates are made openly accessible online. The wild boar (*Sus scrofa*), one of Europe's most widespread and impactful species, has been a major focus of EOW activities. Between 2021 and 2024 the EOW produced as many as 124 annual density estimates (> 82,000 observations) across 70 study sites (17 monitored for ≥3 years). Since 2024, areas of interest for ASF were prioritized: among 59 sites monitored in 2024 in 23 countries, 10 fell in infected areas and 8 at <100km from the ASF frontline. The data generated within the EOW have already contributed to refine continental-scale modelling of wild boar abundance (Smith et al. 2026) and represent a solid foundation for long-term data series which, together with other ecological and management variables, are essential for assessing the demographic impact of ASF and for predicting the spread of the virus following an outbreak. This will be a key priority for the adoption of data-driven wildlife and disease management strategies in Europe.



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