G. E. E. F. S. M.
Groupe d'Etudes sur l'Eco-pathologie de la Faune Sauvage de Montagne

Herramientas y oportunidades para **controlar la PPA** en jabalíes

Christian Gortázar, IREC
@ChristianGortaz

SABIO
Health and Biotechnology

Instituto de Investigación en Recursos Cinegéticos
CSIC - UCLM - JCCM
IREC

CSIC
UCLM
UNIVERSIDAD DE CASTILLA-LA MANCHA

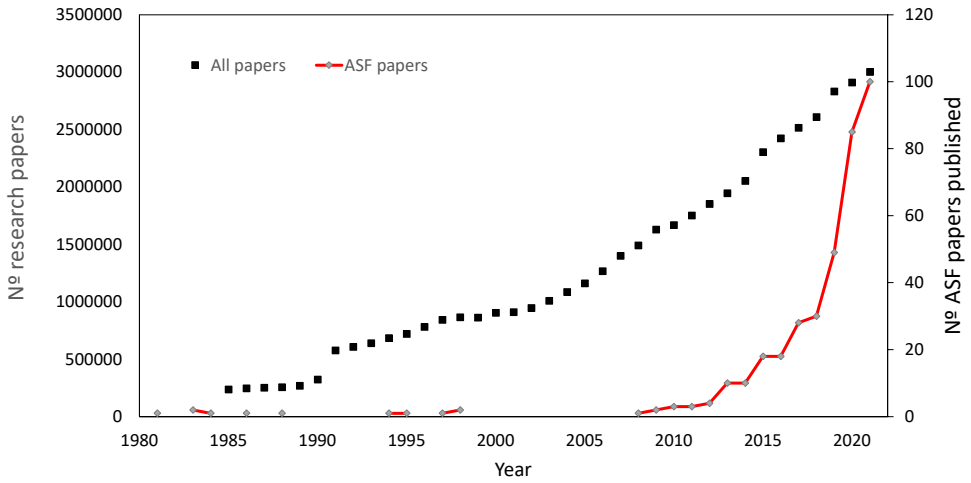
2

Acknowledgements

- GEEFSM 2022 organizers
- IPVS 2022 organizers & Brazil
- Many colleagues at IREC & partner institutions
- EFSA AHAW panel & ASF Working Group

3

Wild boar & ASF



4

Presentation structure

- Intro
  - Wild boar and feral pig ecology
  - ASF epidemiology
  - ASF control tools
- Disease control by scenario
  - Endemic regions
  - Point introductions
  - Epidemic fronts
- Preventing ASF during peacetime
  - Pig farm biosafety
  - Population monitoring
  - Hunters & WB control
- Conclusions

5

Presentation structure

- **Intro**
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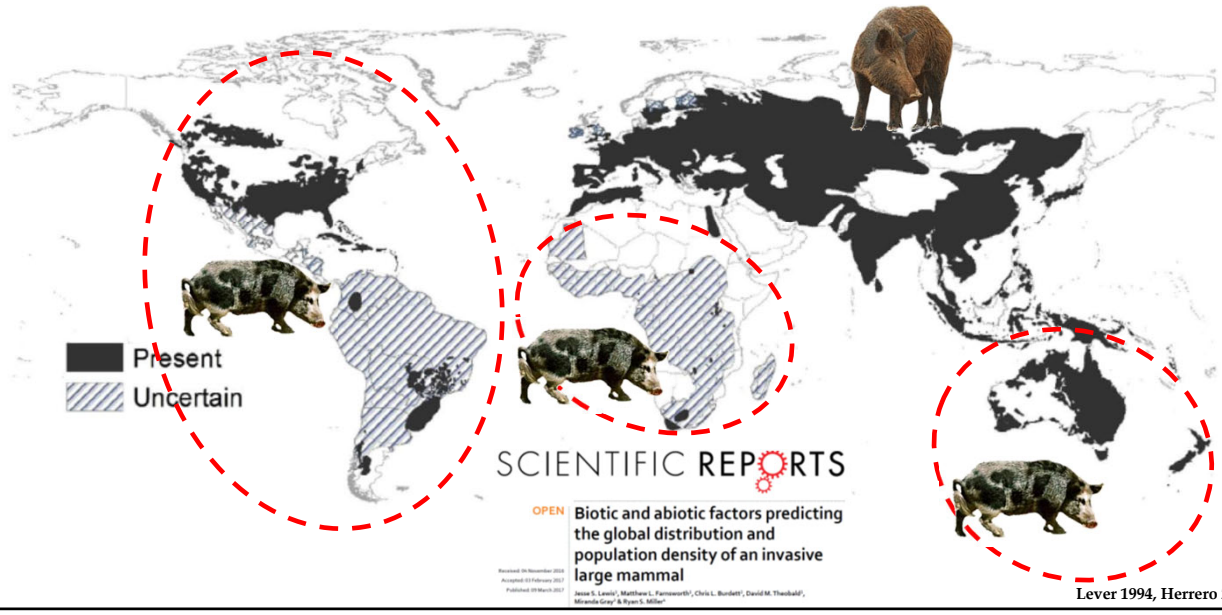
- Conclusions

6

Wild boar & feral pigs, a global concern

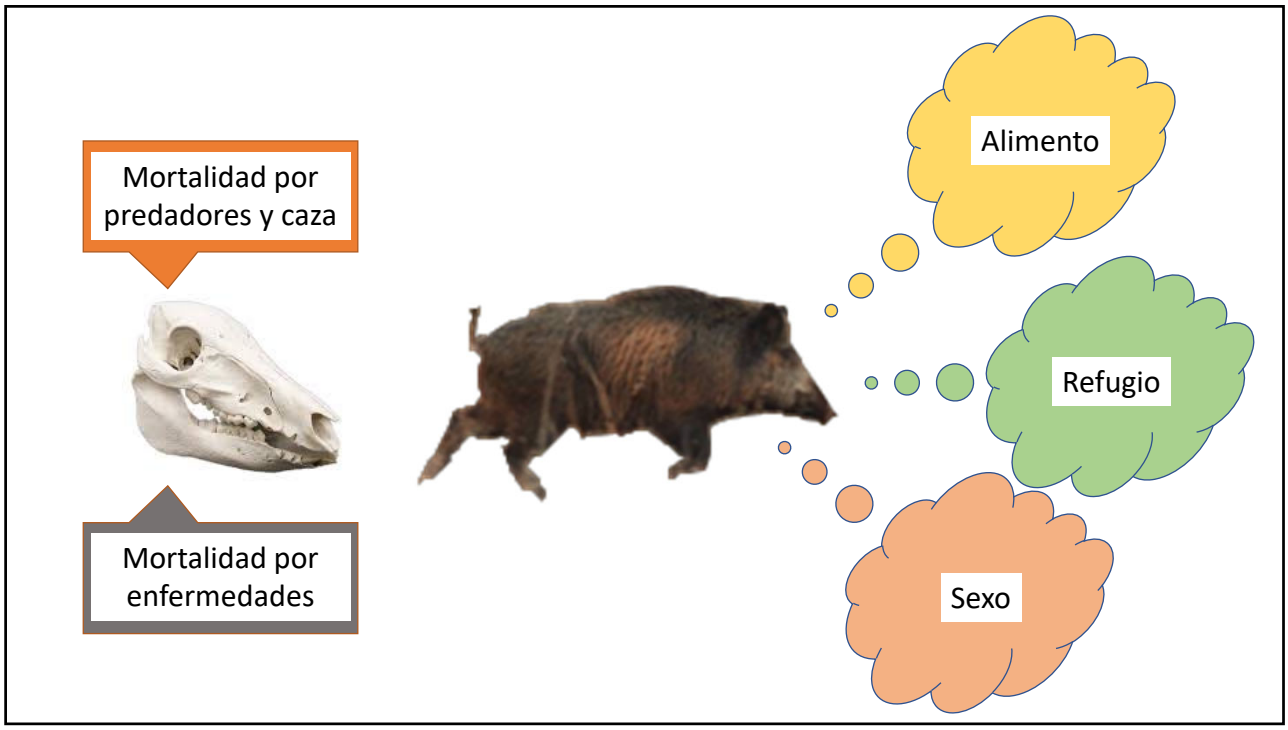


Lever 1994, Herrero 2002

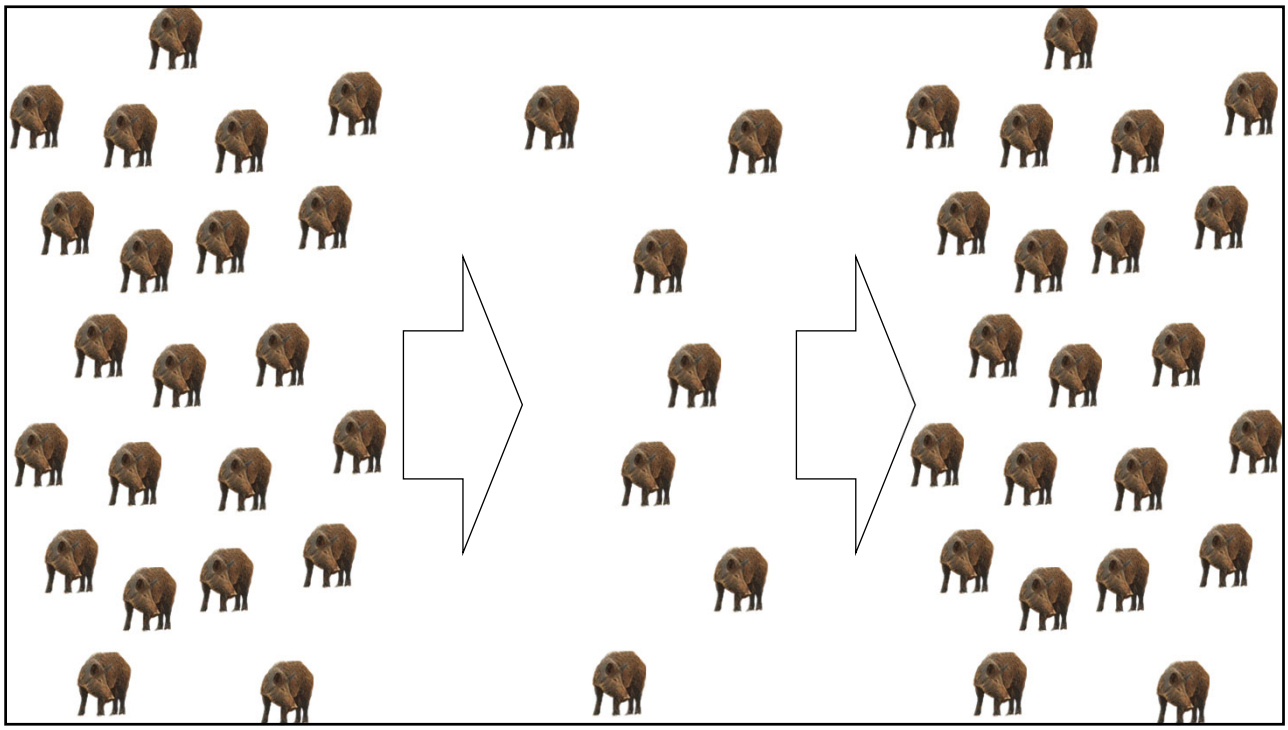
7


Effective management strategies for wildlife pest species depend on a solid understanding of their biology and ecology (e.g., behavior, diet, productivity patterns)

8

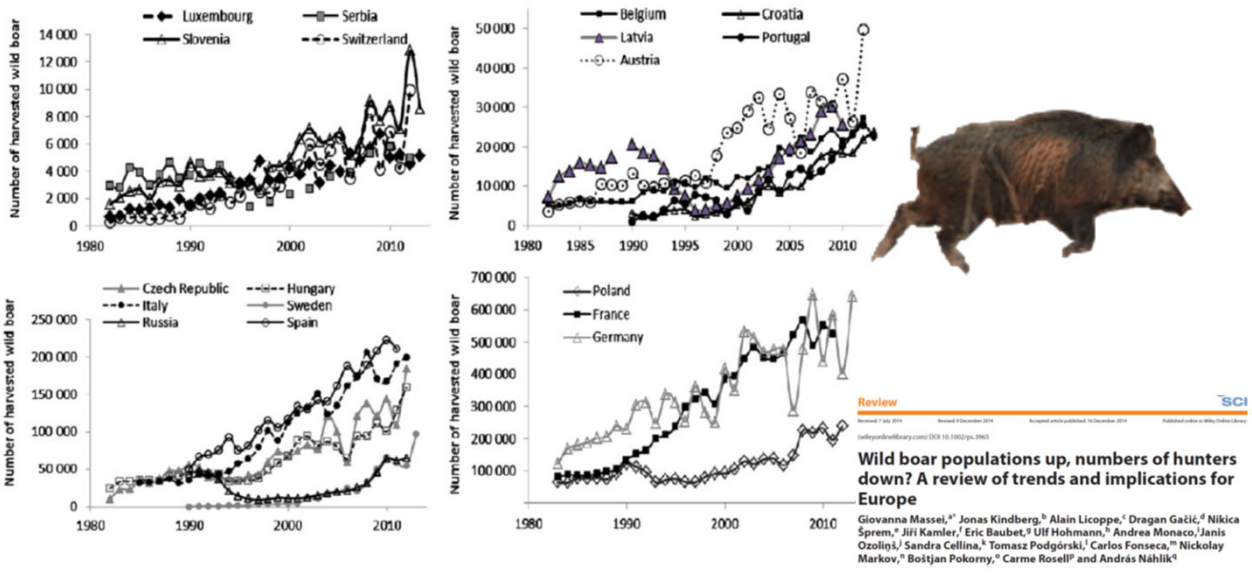

Mortalidad por predadores y caza
Mortalidad por enfermedades
Alimento
Refugio
Sexo

9



10

Wild boar populations are growing



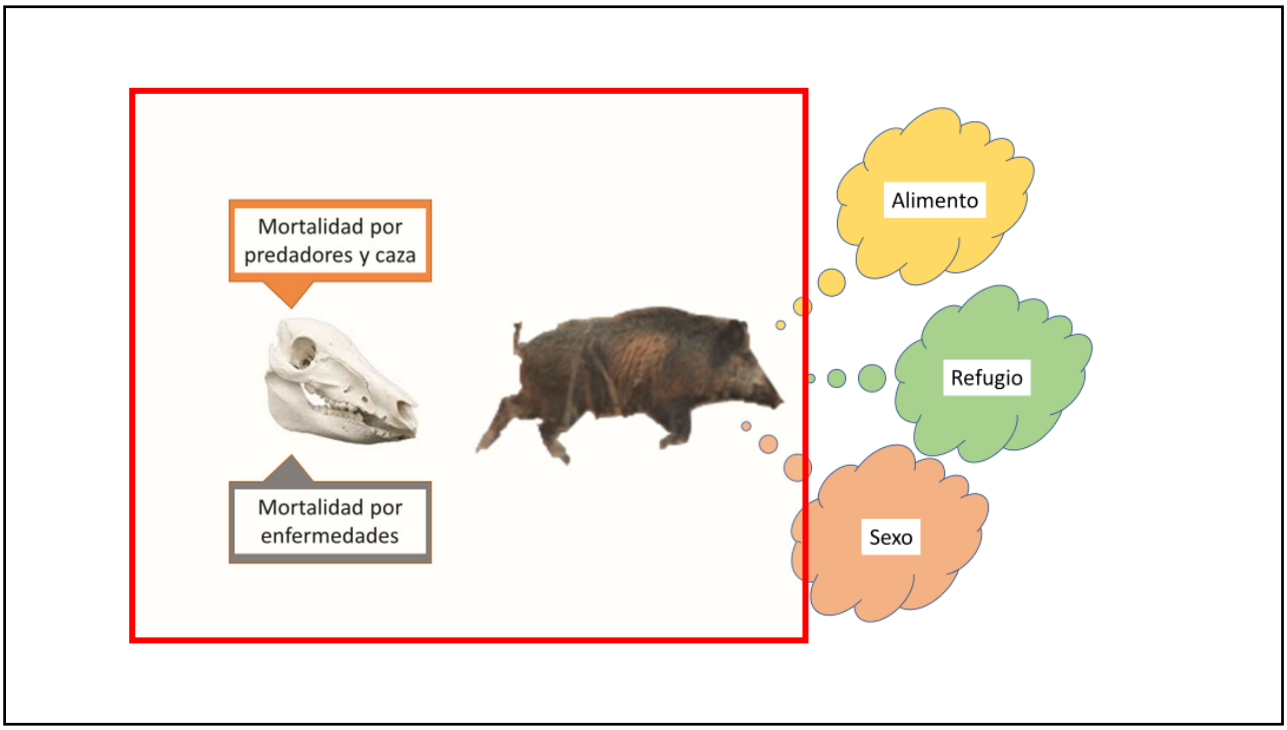
Review

SCI

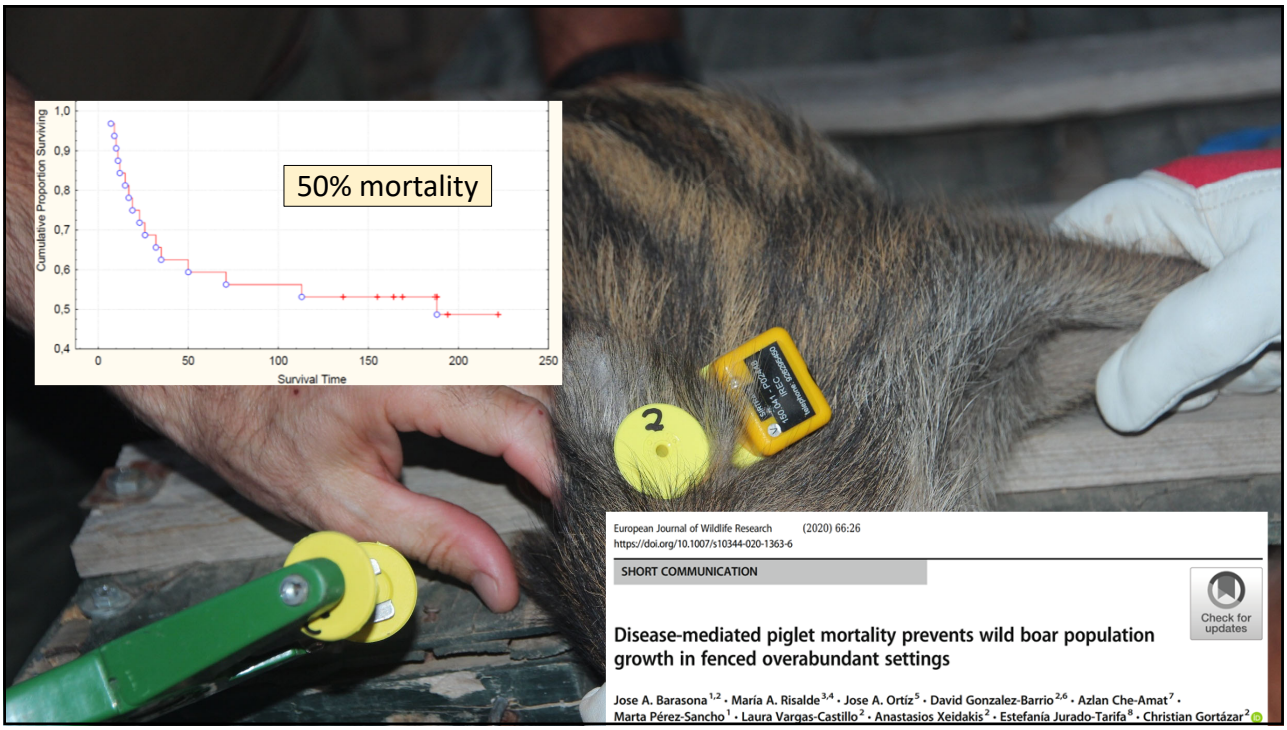
Wild boar populations up, numbers of hunters down? A review of trends and implications for Europe

Giovanna Massei,[a*] Jonas Kindberg,[b] Alain Licoppe,[c] Dragan Gačić,[d] Nikica Šprem,[e] Jiří Kamler,[f] Eric Baubet,[g] Ulf Hohmann,[h] Andrea Monaco,[i] Janis Ozoliņš,[j] Sandra Cellina,[k] Tomasz Podgórski,[l] Carlos Fonseca,[m] Nickolay Markov,[n] Boštjan Pokorny,[o] Carme Rosell[p] and András Náhlik[q]

11


Mortalidad por predadores y caza
Mortalidad por enfermedades
Alimento
Refugio
Sexo

12


50% mortality
Cumulative Proportion Surviving
Survival Time
European Journal of Wildlife Research (2020) 66:26
https://doi.org/10.1007/s10344-020-1363-6
SHORT COMMUNICATION
Disease-mediated piglet mortality prevents wild boar population growth in fenced overabundant settings
Jose A. Barasona · María A. Risalde · Jose A. Ortíz · David Gonzalez-Barrio · Azlan Che-Amat · Marta Pérez-Sancho · Laura Vargas-Castillo · Anastasios Xeidakis · Estefanía Jurado-Tarifa · Christian Gortázar

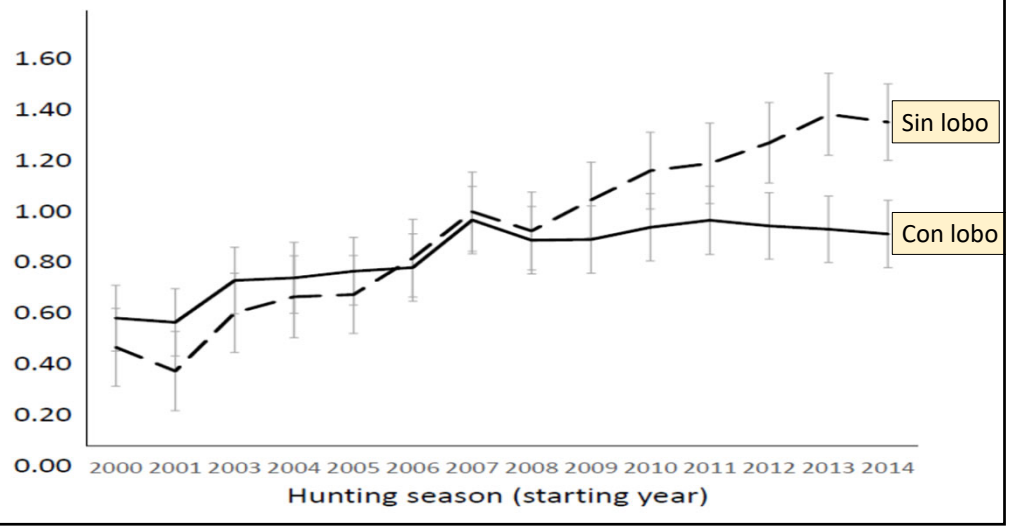
13

SCIENTIFIC REPORTS

OPEN

Wolves contribute to disease control in a multi-host system

E. Tanner[1], A. White[1], P. Acevedo[2], A. Balseiro[3,4], J. Marcos[5] & C. Gortázar[2]



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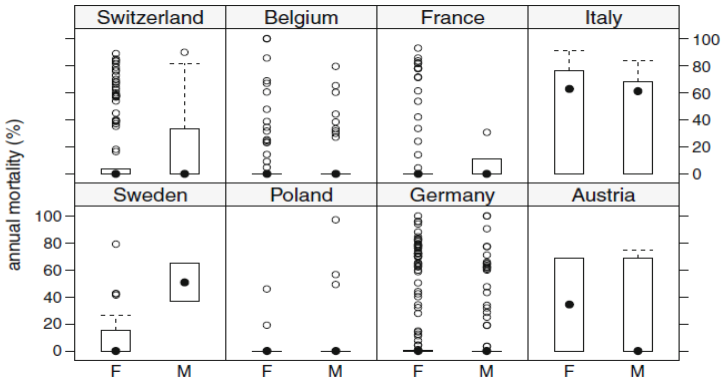
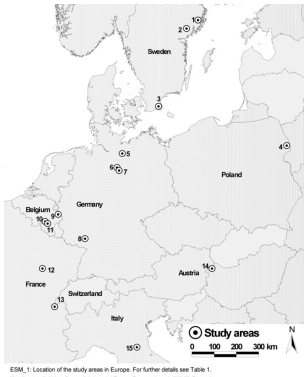
Wild boar mortality





- Mortality is always lower than the reproduction rate
- Need >65% anual harvest

Eur J Wildl Res
DOI 10.1007/s10344-013-0733-8

ORIGINAL PAPER

Mortality rates of wild boar *Sus scrofa* L. in central Europe

Oliver Keuling · Eric Baubet · Andreas Duscher · Cornelia Ebert · Claude Fischer · Andrea Monaco · Tomasz Podgórski · Céline Prevot · Katrin Ronnenberg · Gunter Sodeikat · Norman Stier · Henrik Thurfjell

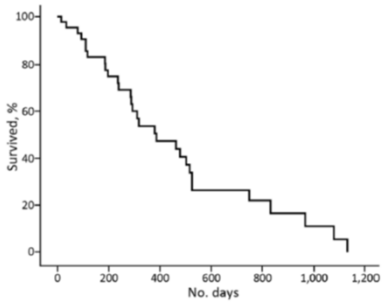
15

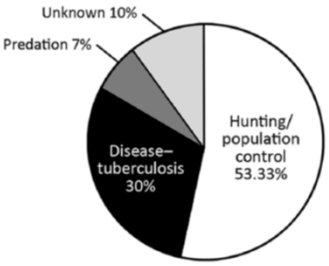
DISPATCHES

Tuberculosis-Associated Death among Adult Wild Boars, Spain, 2009–2014

Jose A. Barasona, Pelayo Acevedo, Iratxe Diez-Delgado, Joao Queiros, Ricardo Carrasco-García, Christian Gortazar, Joaquín Vicente

juveniles (12–24 months of age). In adults (>2 yea
observed proportion of wild boars with generalized
creases, suggesting some degree of TB-driven death
juveniles (6,8). TB is a sporadic cause of death amon





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Wild boar mortality: ASF

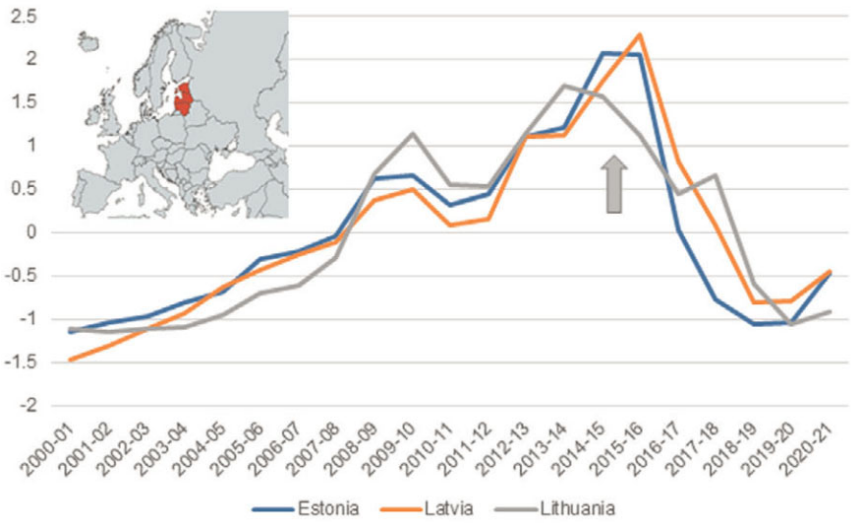
SCIENTIFIC REPORT

EFSA Journal

APPROVED: 30 March 2022
doi: 10.2903/j.efsa.2022.7290

Epidemiological analyses of African swine fever in the European Union

(September 2020 to August 2021)



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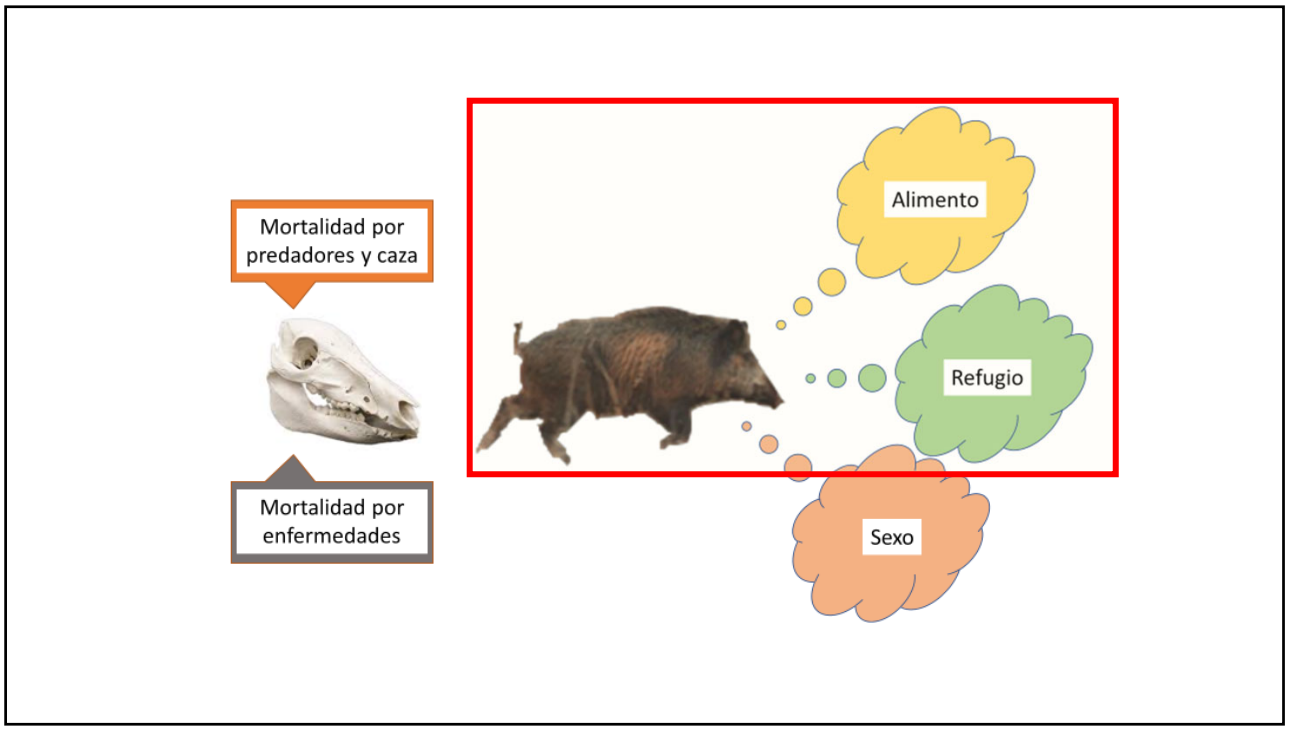
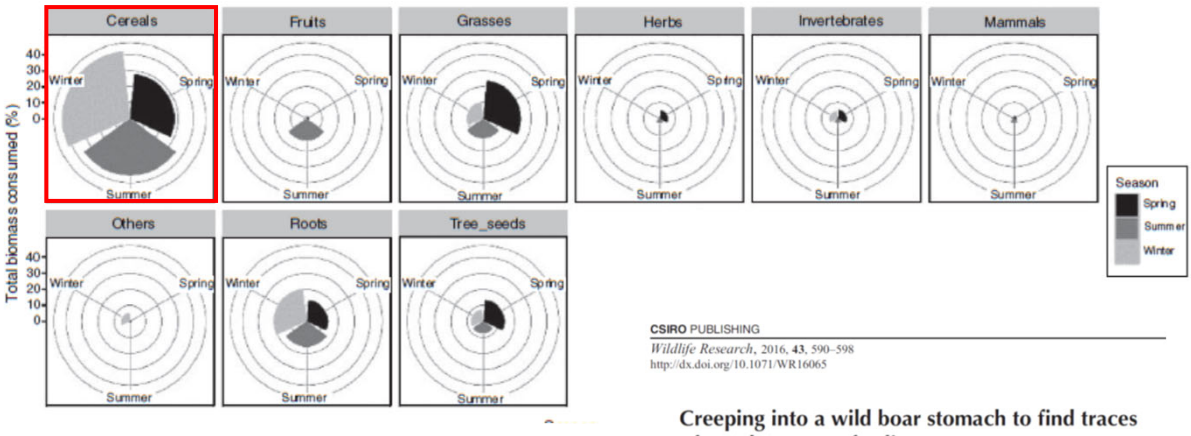

Mortalidad por predadores y caza
Mortalidad por enfermedades
Alimento
Refugio
Sexo

18


Bellota
Proteinas 8%
7%
Grasas 31%
Carbohidratos 54%

19

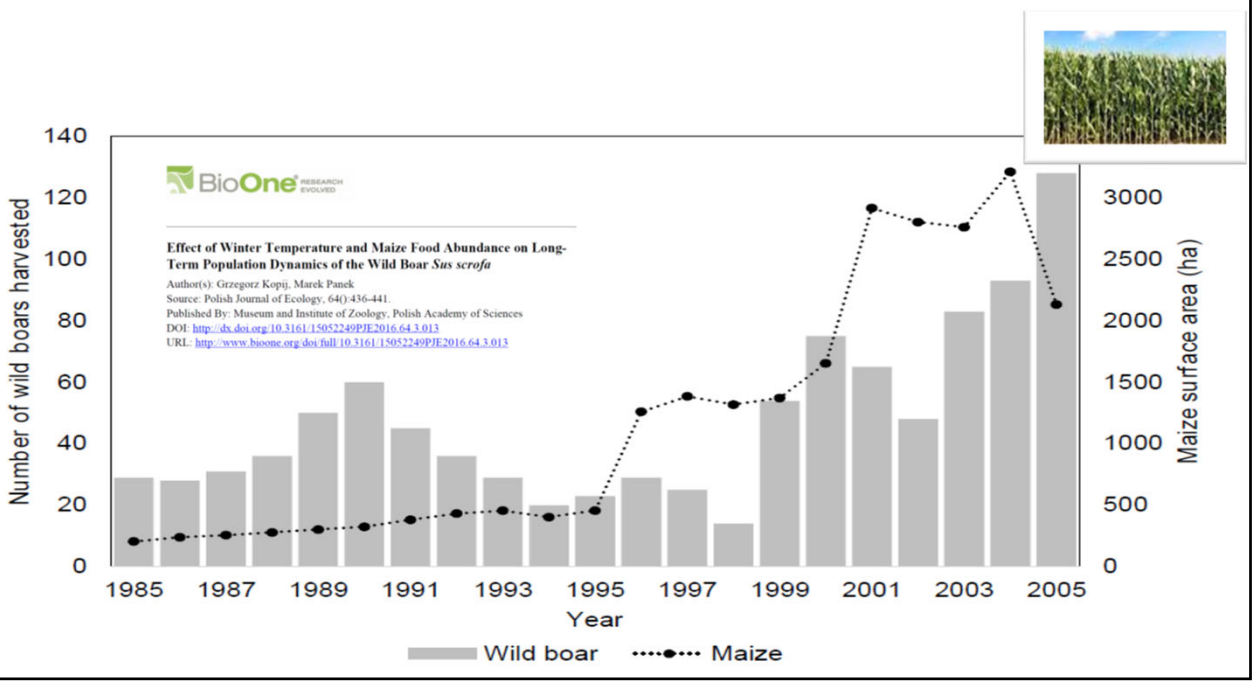


CSIRO PUBLISHING
Wildlife Research, 2016, **43**, 590–598
http://dx.doi.org/10.1071/WR16065

Creeping into a wild boar stomach to find traces of supplementary feeding

Ježek Miloš[A], *Holá Michaela*[A,B], *Kušta Tomáš*[A] *and Červený Jaroslav*[A]

20



Effect of Winter Temperature and Maize Food Abundance on Long-Term Population Dynamics of the Wild Boar *Sus scrofa*

Author(s): Grzegorz Kopij, Marek Panek
Source: Polish Journal of Ecology, 64(): 436-441.
Published By: Museum and Institute of Zoology, Polish Academy of Sciences
DOI: http://dx.doi.org/10.3161/15052249PJE2016.64.3.013
URL: http://www.bioone.org/doi/full/10.3161/15052249PJE2016.64.3.013

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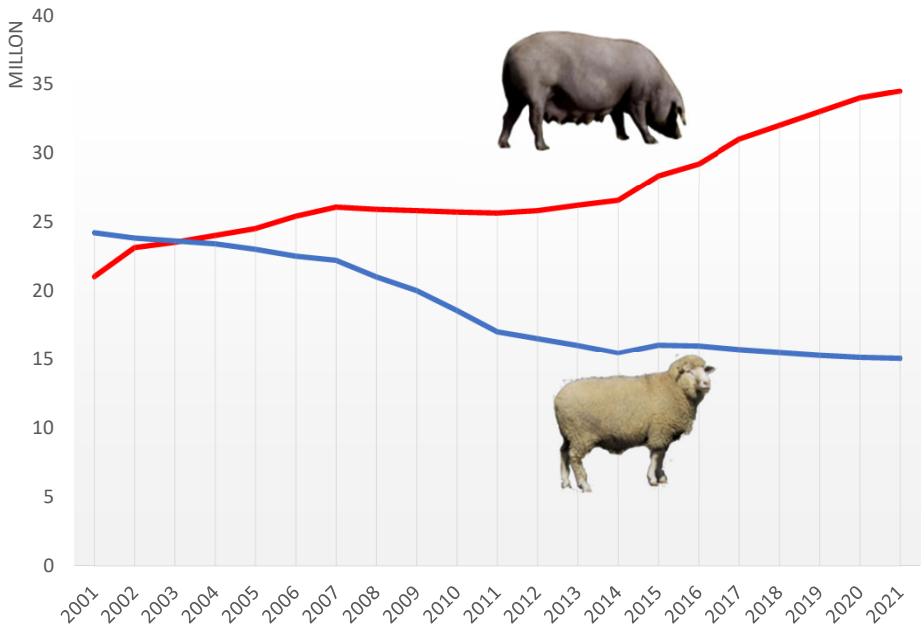
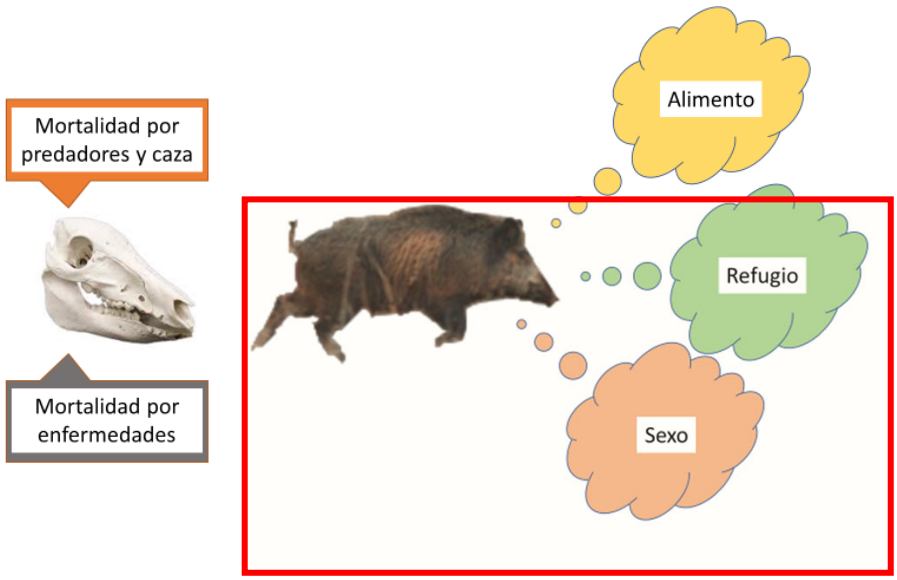


Spain: fewer sheep & goats → more resources for wild boar

22



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Reproduction

- Matriarchial social groups, joined by males in mating season
- Sows can get pregnant as early as 7 months old
- Average litter size 4.4 piglets/female
- “r strategist” with potentially rapid population growth rates
- Reproduction is slightly seasonal (parturition peak in February)

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The social wild boar

- Inter-group contacts and aggressive behaviour can occur…
- At feeding sites
- At waterholes
- During the mating season

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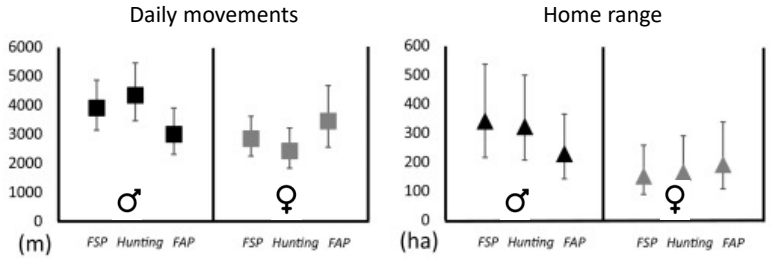
Wild boar spatial behavior

Science of The Total Environment
Volume 796, 20 November 2021, 148966

Differences in wild boar spatial behaviour among land uses and management scenarios in Mediterranean ecosystems

Eduardo Laguna [a], José A. Barasona [b], Joaquín Vicente [a] ✉, Oliver Keuling [c], Pelayo Acevedo [a]



- Daily movements: 257-12,900 m (mean ≈ **4,000 m**)
- Home range: 32-5,139 ha (mean ≈ **400 ha**)

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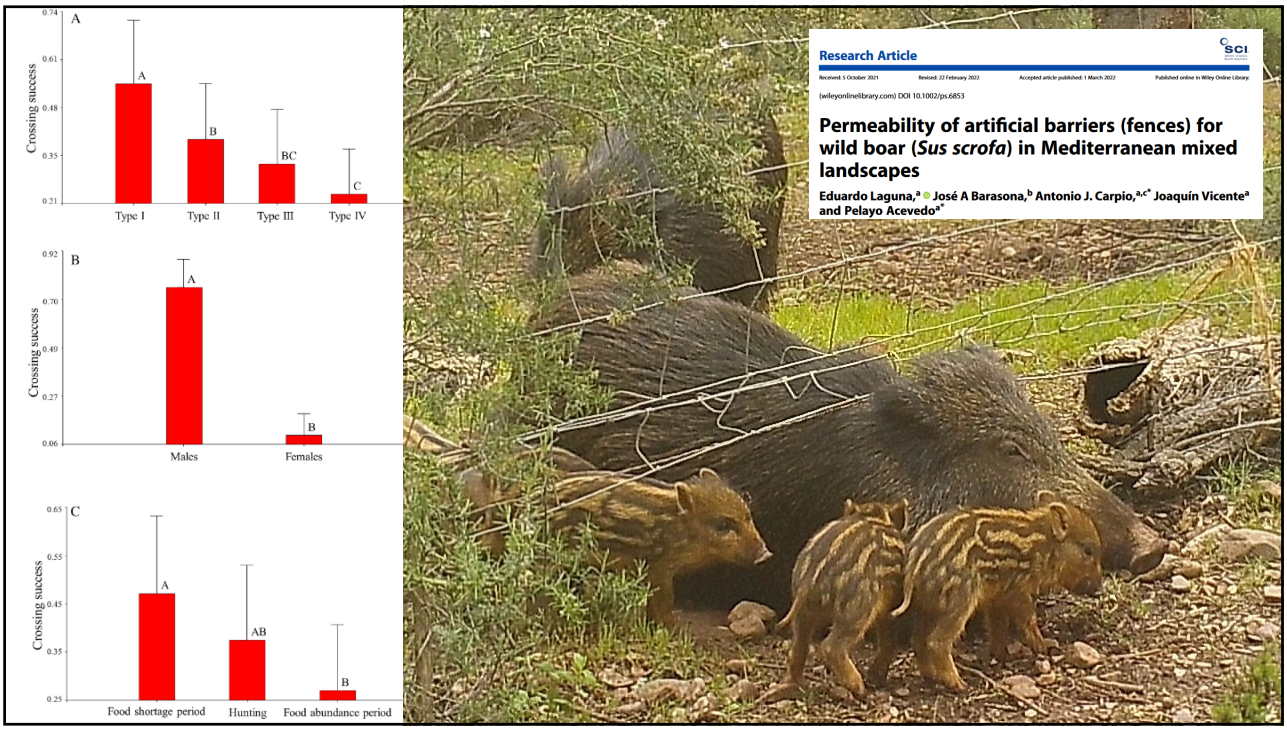
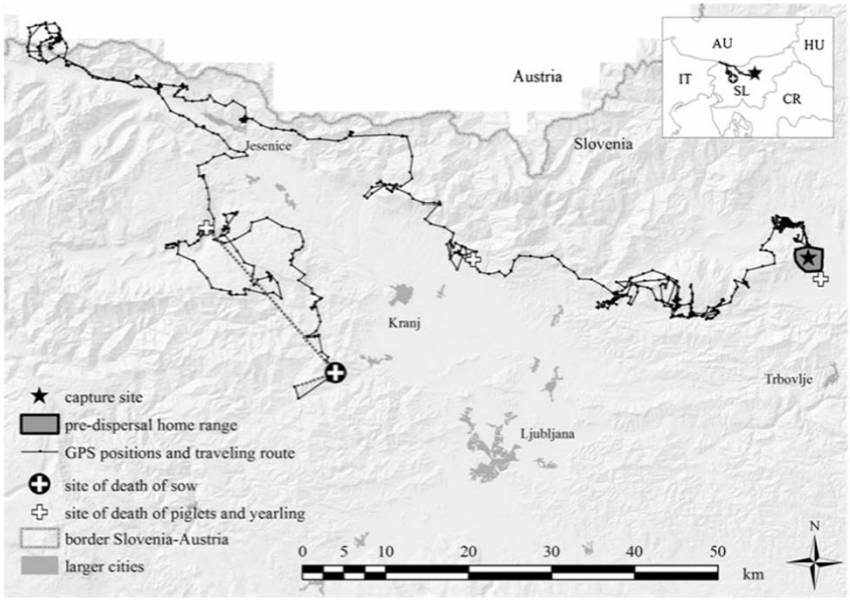
29



30

Dispersal and long-distance movements

Fig. 2 Travelling route of the wild boar sow, its eight piglets and a yearling after they left their home range. The sow's 2-month dispersal ended with a culling 60 km from capture site. In between, it maximally moved 100 km away from its pre-dispersal home range



Eur J Wildl Res
DOI 10.1007/s10344-014-0796-1

ORIGINAL PAPER

First evidence of long-distance dispersal of adult female wild boar (*Sus scrofa*) with piglets

Klemen Jerina · Boštjan Pokorny · Matija Stergar

31

Wild boar play a key role in the spread of ASF, yet despite their significance, little is known about the key mechanisms that drive infection transmission and disease persistence

32

Tenacious DNA virus

Transmission requires blood contact

33

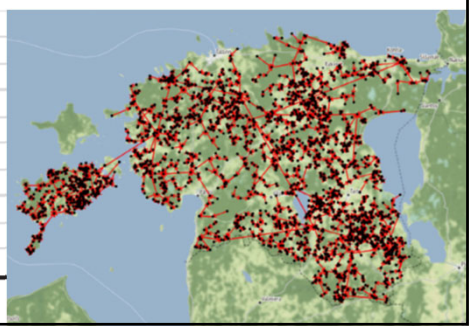
Speed of natural ASF spread

Country	Numbers of cases reported to ADNS	Time	Speed of propagation (km/year)			Mean(excluding extreme)
			P25	Median	P75	
Belgium	642	Closest	2.4	7.8	25.1	12.1
		> 7 days	2.3	5.7	15	8
Czechia	230	Closest	1.3	5	11.7	6.6
		> 7 days	0.7	2.9	6.6	3.4
Estonia	2,745	Closest	2.3	7.1	25.4	13.2
		> 7 days	2.2	6.3	19.1	9.9
Hungary	1,174	Closest	3.5	11.7	38.4	21.1
		> 7 days	3.2	8.6	24.1	13.1
Latvia	3,639	Closest	1.7	5	19.4	9.9
		> 7 days	1.6	4.5	15.3	7.8
Poland	5,080	Closest	2.9	9.1	31.1	16.1
		> 7 days	2.6	7.7	22.9	11.5
Lithuania	3,596	Closest	2.5	8.1	26.7	14.2
		> 7 days	2.3	6.9	19.9	10.5
Romania	671	Closest	9.3	31.4	120.3	64
		> 7 days	7.6	25	87.8	43.6


SCIENTIFIC REPORT

Epidemiological analyses of African swine fever in the European Union (November 2018 to October 2019)

Mean speed 10-13 km/year



34

What happens in case of an ASF outbreak?

- Huge and long-lasting drop in population density
- Peak in infected density ≈6 months after the virus is initially discovered
- Persistence of the virus over years despite low population density


Contents lists available at ScienceDirect

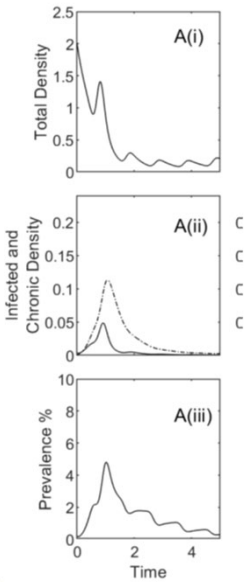
Preventive Veterinary Medicine

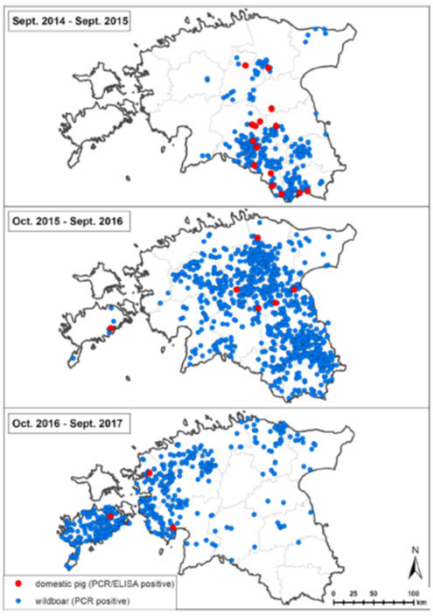
journal homepage: www.elsevier.com/locate/prevetmed

SVEPM: 2018

Epidemiological analysis of the 2015–2017 African swine fever outbreaks in Estonia

Imbi Nurmoja, Kerli Mõtus, Maarja Kristian, Tarmo Niine, Katja Schulz, Klaus Depner, Arvo Viltrop





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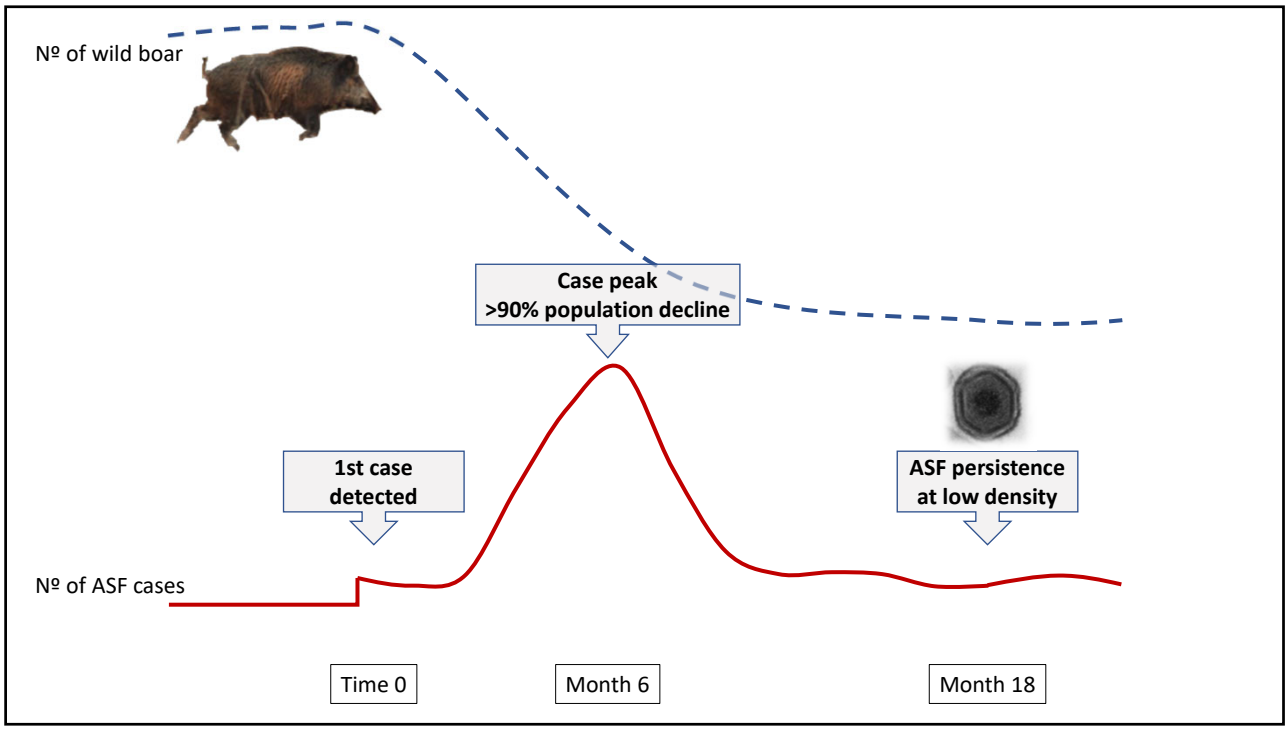

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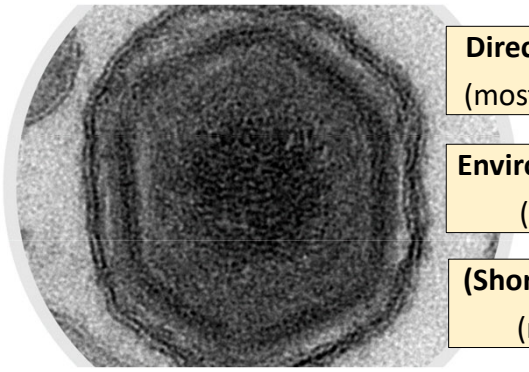
Insights from modelling

SCIENTIFIC REPORTS
nature research

Modelling the transmission and persistence of African swine fever in wild boar in contrasting European scenarios

Xander O'Neill[1], Andy White[1*], Francisco Ruiz-Fons[2] & Christian Gortázar[2]



Direct transmission
(mostly intra-group)

Environmental transmission
(carcass-mediated)

(Short-term) Survivors
(maintenance)

- **All 3 mechanisms are essential** to capture the initial population crash and long-term persistence of ASF at low density.
- The **long-term persistence** of ASF makes the virus difficult to eradicate and increases the opportunity of infectious spread to neighboring populations.

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SCIENTIFIC REPORT

EFSA Journal

APPROVED: 8 November 2018
doi: 10.2903/j.efsa.2018.5494

Epidemiological analyses of African swine fever in the European Union (November 2017 until November 2018)

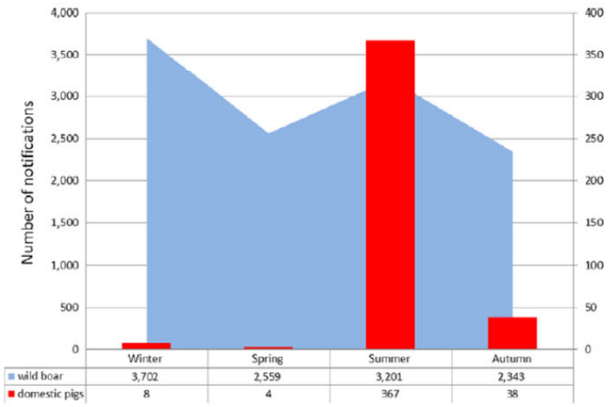
European Food Safety Authority (EFSA),
Anette Boklund, Brigitte Cay, Klaus Depner, Zsolt Földi, Vittorio Guberti, Marius Masiulis, Aleksandra Miteva, Simon More, Edvins Olsevskis, Petr Šatrán, Mihaela Spiridon, Karl Stahl, Hans-Hermann Thulke, Arvo Viltrop, Grzegorz Wozniakowski, Alessandro Broglia, José Cortinas Abrahantes, Sofie Dhollander, Andrey Gogin, Frank Verdonck, Laura Amato, Alexandra Papanikolaou and Christian Gortázar

RAPID COMMUNICATION — WILEY

Infection of pigs with African swine fever virus via ingestion of stable flies (*Stomoxys calcitrans*)

Ann Sofie Olesen | Louise Lohse | Mette Frimodt Hansen | Anette Boklund | Tariq Halasa | Graham J. Belsham | Thomas Bruun Rasmussen | Anette Bøtner | René Bødker

Is ASF seasonality vector-mediated?



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Medical and Veterinary Entomology
Medical and Veterinary Entomology (2021) 35, 484–489 doi: 10.1111/mve.12499

SHORT COMMUNICATION

The contribution of insects to African swine fever virus dispersal: data from domestic pig farms in Lithuania

J. TURČINAVIČIENĖ[1], A. PETRAŠIŪNAS[1], R. BERNOTIENĖ[1], M. MASIULIS[2,3] and V. JONUŠAITIS[2]

Stomoxys

Musca

Culex

Table 2. Number of target Diptera insect specimens collected using Nzi traps in Lithuania in 2018 and 2019.

Insect family and genus	Poškaičiai* 2018	Papečiai† 2018	Skuoliai† 2018	Poškaičiai* 2019	Sirvydai* 2019	No of tested insects‡	Ažuolų Būda†,§ 2019	Total trapped
Tabanidae								
Haematopota	71	4	16	4	25	10	1	121
Hybomitra	52	63	5	5	699	5	0	824
Chrysops	1	2	3	1	5	2	0	12
Muscidae								
Stomoxys	48 (8)	47	9	59	124	94	367 (1)	654
Other	34 (1)	75	0	19	1	13	0	129
Culicidae	2 (1)	11	2	11	23	20	8	57
Calliphoridae	44	20	5	76 (1)	64	41	29	238
Total						185		2035

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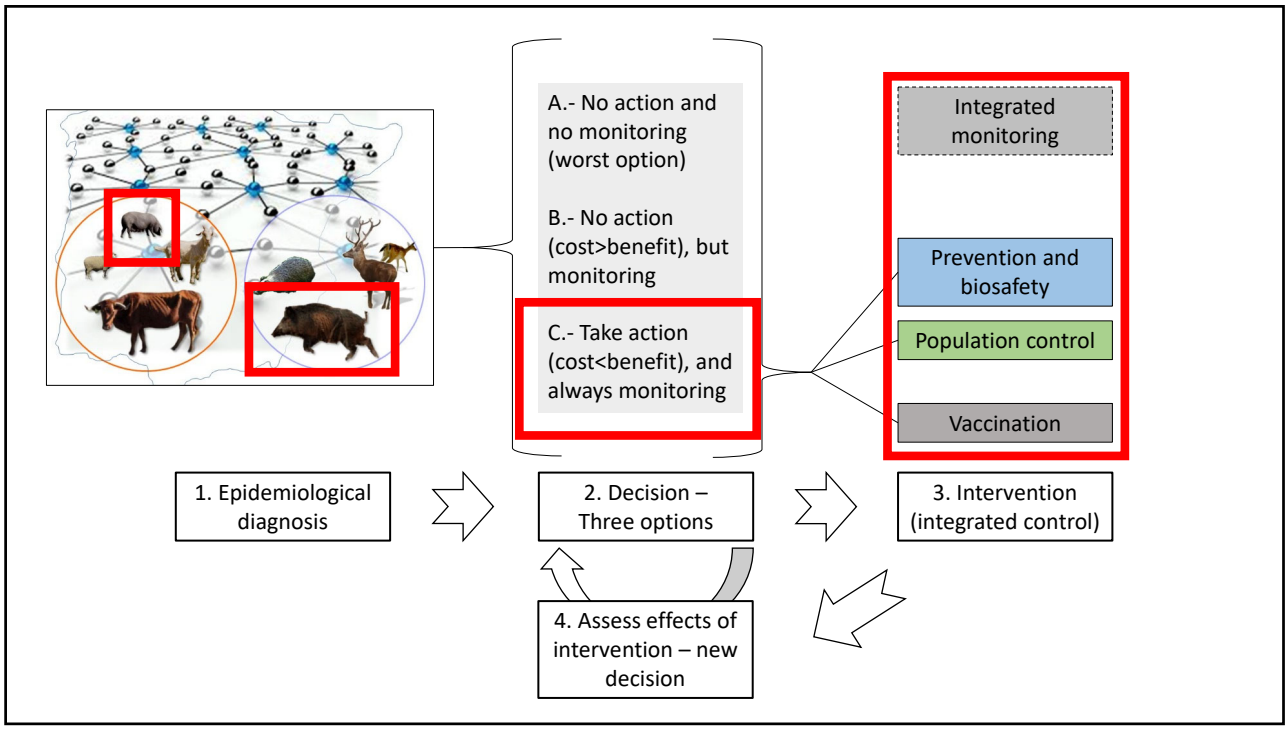
EMERGENCIA SANITARIA
PROHIBIDO EL PASO

40


A.- No action and no monitoring (worst option)
B.- No action (cost>benefit), but monitoring
C.- Take action (cost<benefit), and always monitoring
Integrated monitoring
Prevention and biosafety
Population control
Vaccination
1. Epidemiological diagnosis
2. Decision – Three options
3. Intervention (integrated control)
4. Assess effects of intervention – new decision

41

ASF vaccines

- Inactivated → safe but ineffective
- Vector and subunit → safe but low level of protection
- Life attenuated → dangerous
- Recombinant life attenuated → maybe
- (other)

ELSEVIER

Virus Research

Volume 287, 2 October 2020, 198099

Review

African swine fever – A review of current knowledge

Sandra Blome, Kati Franzke, Martin Beer

Bosch-Camós et al. Porcine Health Management (2020) 6:17
https://doi.org/10.1186/s40813-020-00154-2

Porcine Health Management

REVIEW Open Access

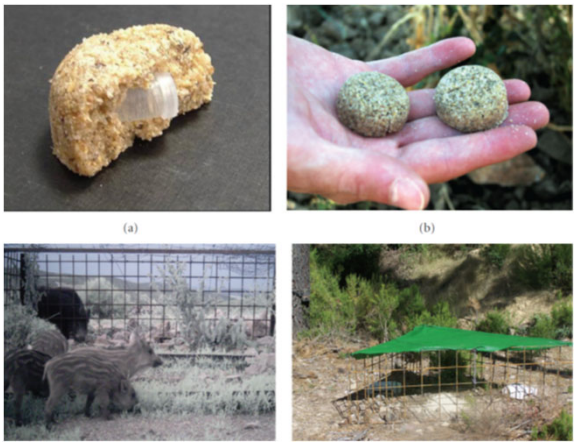
African swine fever vaccines: a promising work still in progress

Laia Bosch-Camós, Elisabeth López and Fernando Rodriguez*

42

ASF vaccines

- Baits needed → IREC bait achieved uptake rates >70%



(a) (b)

Contents lists available at ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

Evaluation of baits for oral vaccination of European wild boar piglets

Cristina Ballesteros[a], Christian Gortázar[a], Mario Canales[a], Joaquín Vicente[a], Angelo Lasagna José A. Gamarra[a], Ricardo Carrasco-García[a], José de la Fuente[a,b,*]

Preventive Veterinary Medicine 155 (2018) 11–20

Contents lists available at ScienceDirect

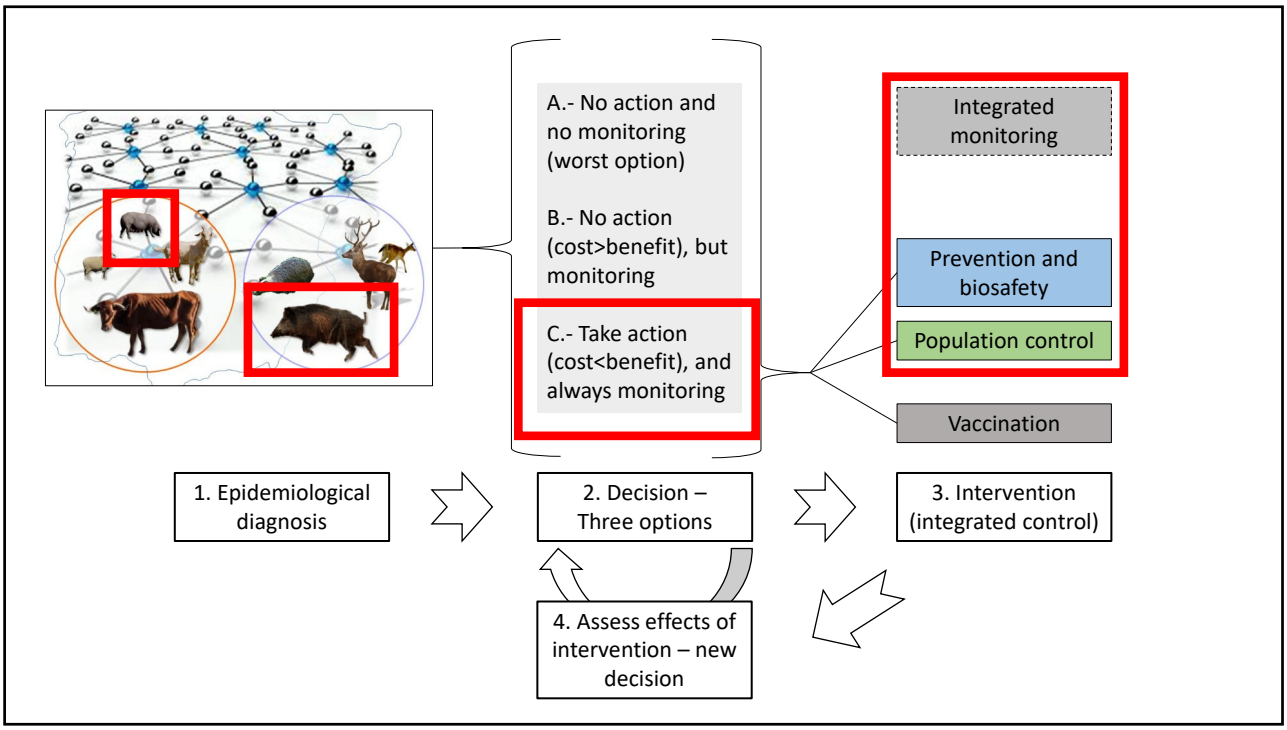
Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

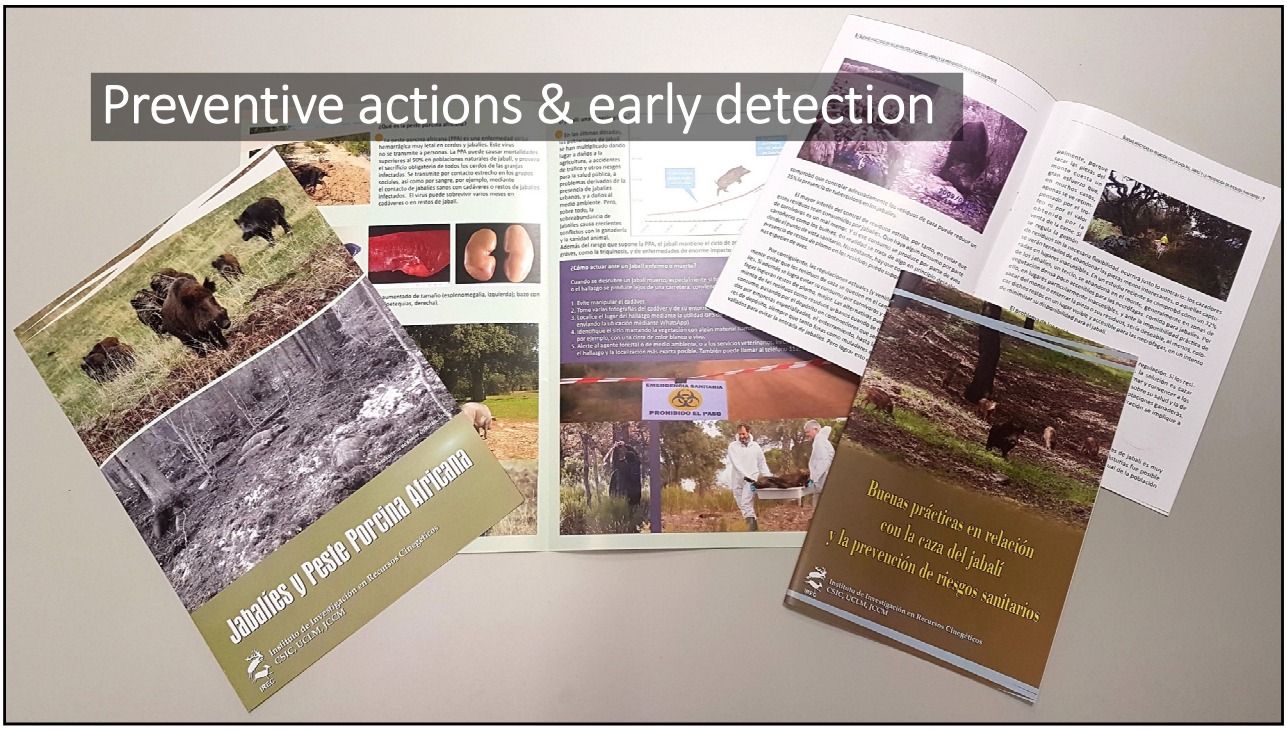
Impact of piglet oral vaccination against tuberculosis in endemic free-ranging wild boar populations

Iratxe Díez-Delgado[a,b,*], Iker A. Sevilla[c], Beatriz Romero[d], Eleanor Tanner[e], Jose A. Barasona[a,d], Andrew R. White[e], Peter W.W. Lurz[f], Mike Boots[g,h], José de la Fuente[b,i], Lucas Dominguez[a,d], Joaquin Vicente[b], Joseba M. Garrido[c], Ramón A. Juste[c,i], Alicia Aranaz[a], Christian Gortazar[b]

43


A.- No action and no monitoring (worst option)
B.- No action (cost>benefit), but monitoring
C.- Take action (cost<benefit), and always monitoring
Integrated monitoring
Prevention and biosafety
Population control
Vaccination
1. Epidemiological diagnosis
2. Decision – Three options
3. Intervention (integrated control)
4. Assess effects of intervention – new decision

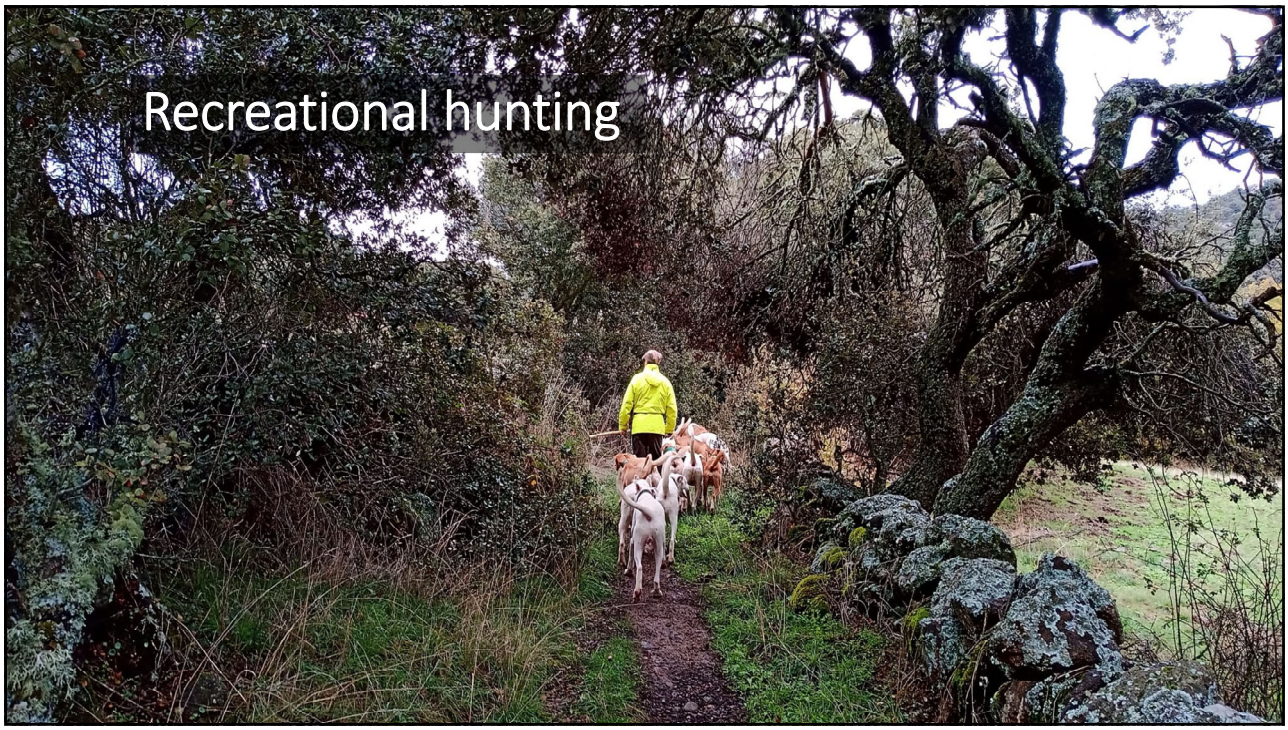
44


Preventive actions & early detection
Jabalíes y Peste Porcina Africana
Buenas prácticas en relación con la caza del jabalí y la prevención de riesgos sanitarios

45

46

47



48

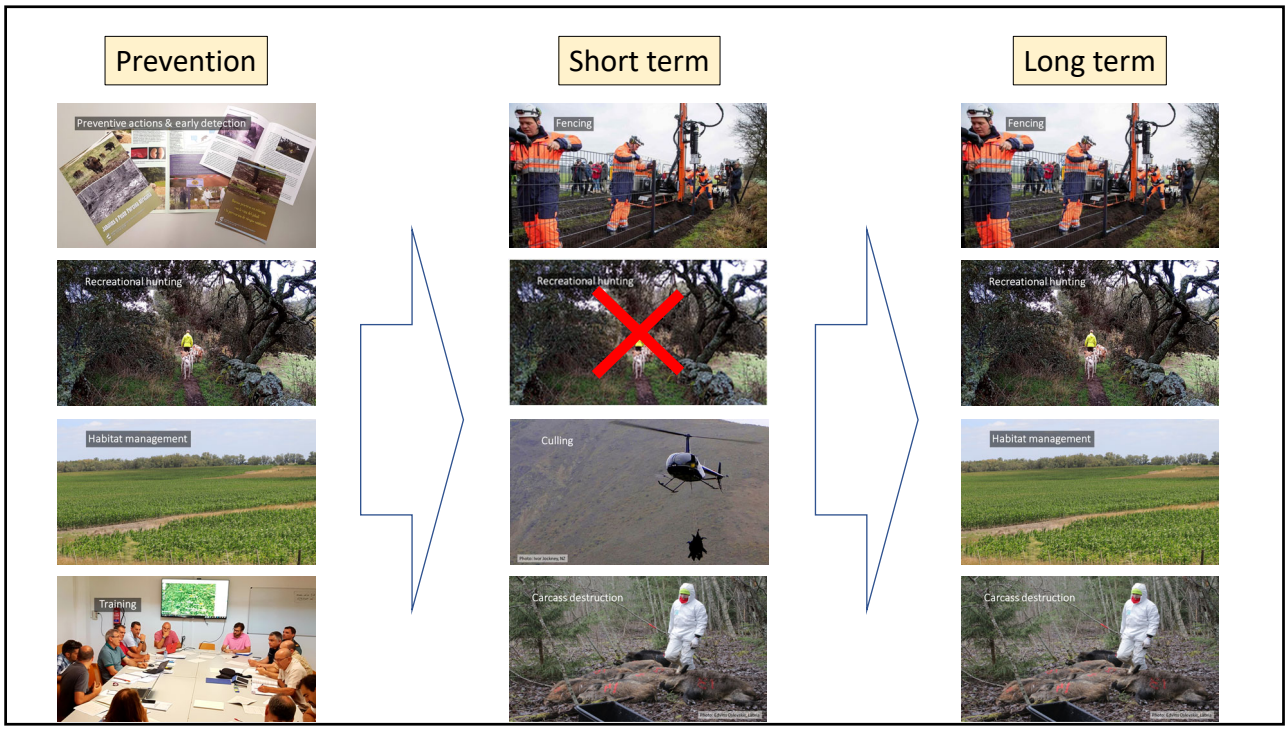
49


Fencing

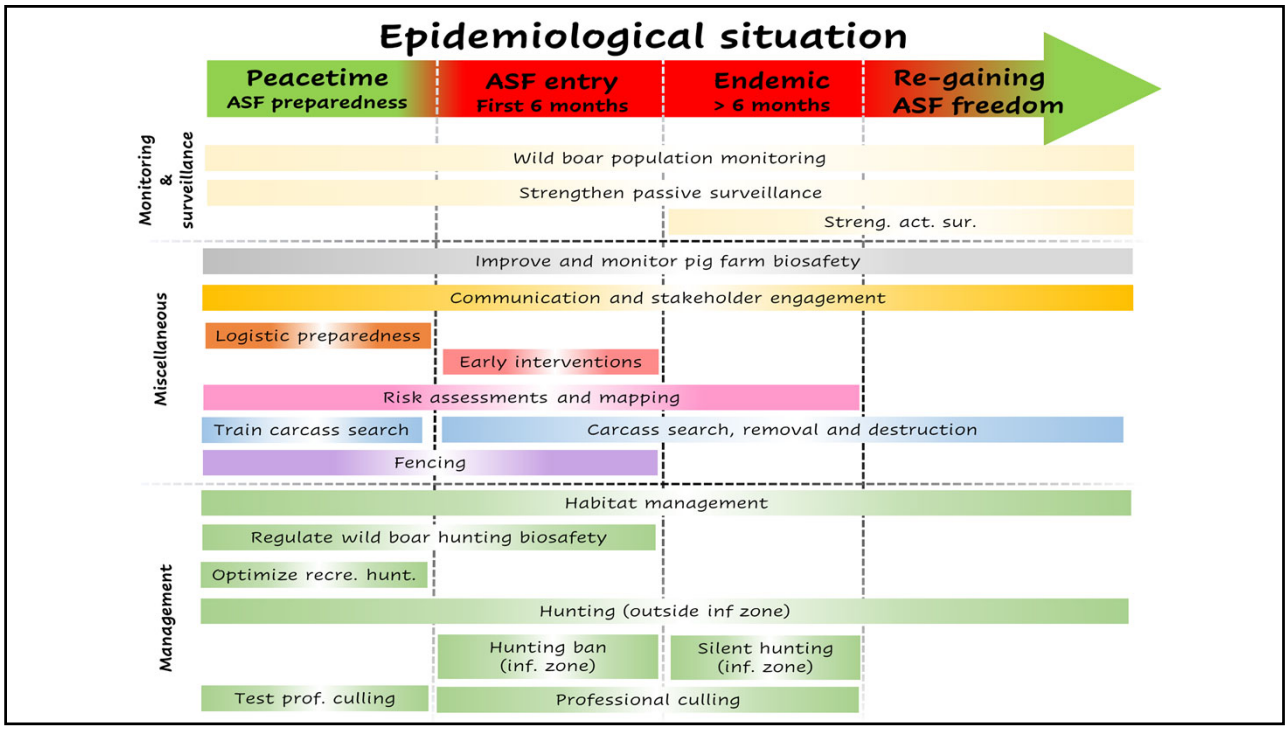
50


Carcass destruction
Photo: Edvins Oslevskis, Latvia

51


Prevention
Short term
Long term
Preventive actions & early detection
Recreational hunting
Habitat management
Training
Fencing
Recreational hunting
Culling
Carcass destruction
Fencing
Recreational hunting
Habitat management
Carcass destruction

52


Epidemiological situation
Peacetime
ASF preparedness
ASF entry
First 6 months
Endemic
> 6 months
Re-gaining
ASF freedom
Monitoring & surveillance
Wild boar population monitoring
Strengthen passive surveillance
Streng. act. sur.
Miscellaneous
Improve and monitor pig farm biosafety
Communication and stakeholder engagement
Logistic preparedness
Early interventions
Risk assessments and mapping
Train carcass search
Carcass search, removal and destruction
Fencing
Management
Habitat management
Regulate wild boar hunting biosafety
Optimize recre. hunt.
Hunting (outside inf zone)
Hunting ban (inf. zone)
Silent hunting (inf. zone)
Test prof. culling
Professional culling

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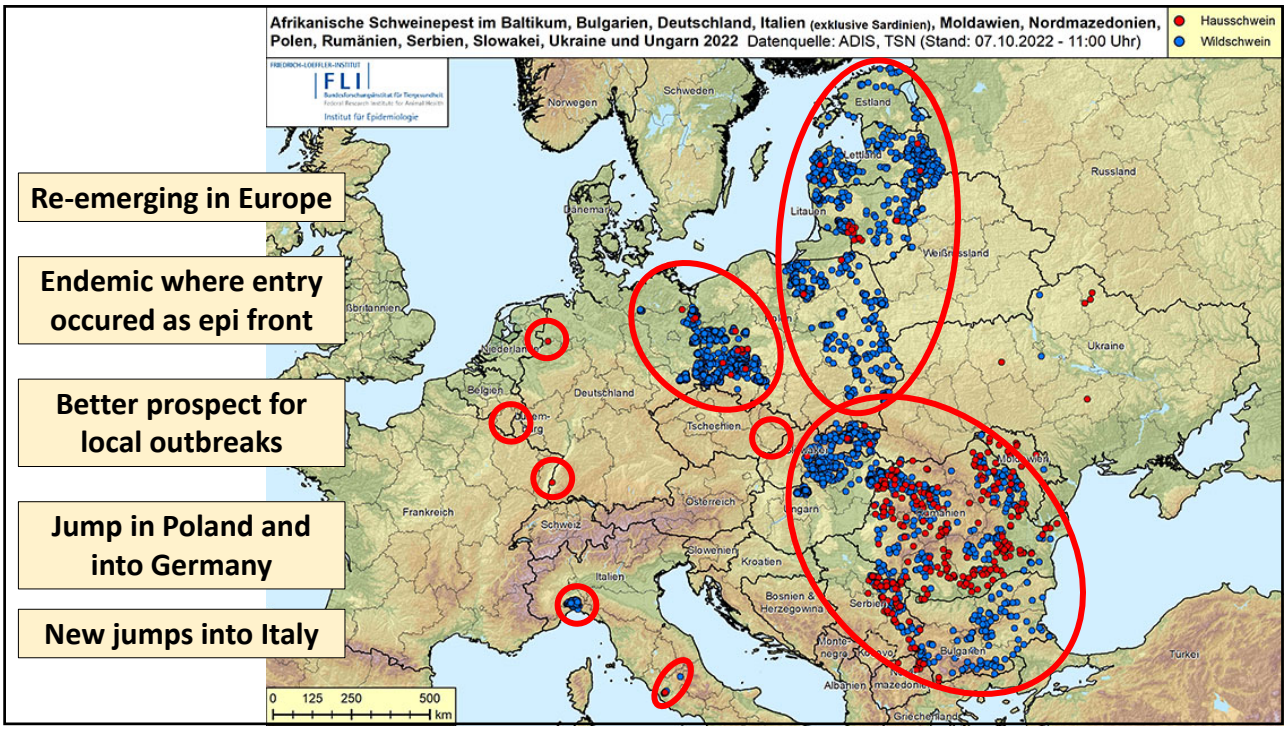
Presentation structure

- Intro
  - Wild boar and feral pig ecology
  - ASF epidemiology
  - ASF control tools
- **Disease control by scenario**
  - **Endemic regions**
  - **Point introductions**
  - **Epidemic fronts**
- Preventing ASF during peacetime
  - Pig farm biosafety
  - Population monitoring
  - Hunters & WB control
- Conclusions

54



55

Endemic zones

56

Wild boar maintain ASF even at low density

African Swine Fever scientific report

EFSA Journal

The epidemic of ASF in Estonia has been in a descending phase since the beginning of 2018. The last outbreaks in domestic pig herds occurred in summer 2017 and the number of cases detected among wild boar has been gradually decreasing. Most cases detected in wild boar have been antibody positive but virus (PCR) negative. The last PCR-positive wild boar in 2019 was detected in February.

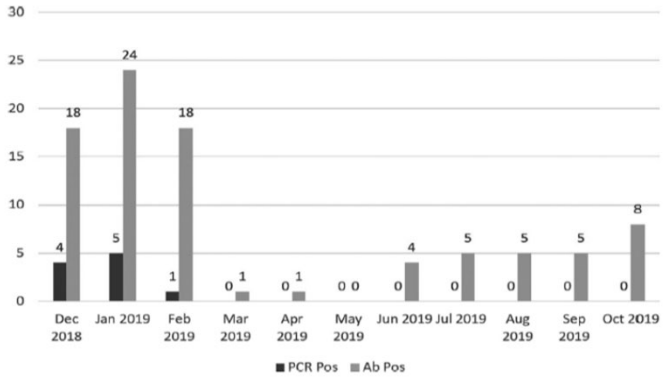


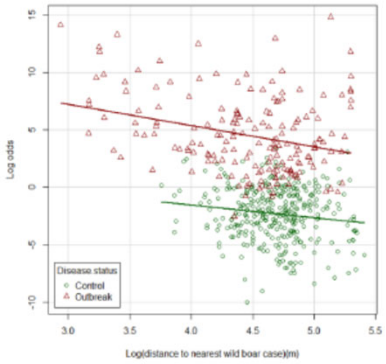
Figure 6: Numbers of ASF virus (PCR)-positive and antibody (Ab)-positive wild boar detected in Estonia in the period 1 December 2018 to 31 October 2019

Persistence at very low WB density

Fading out?

57

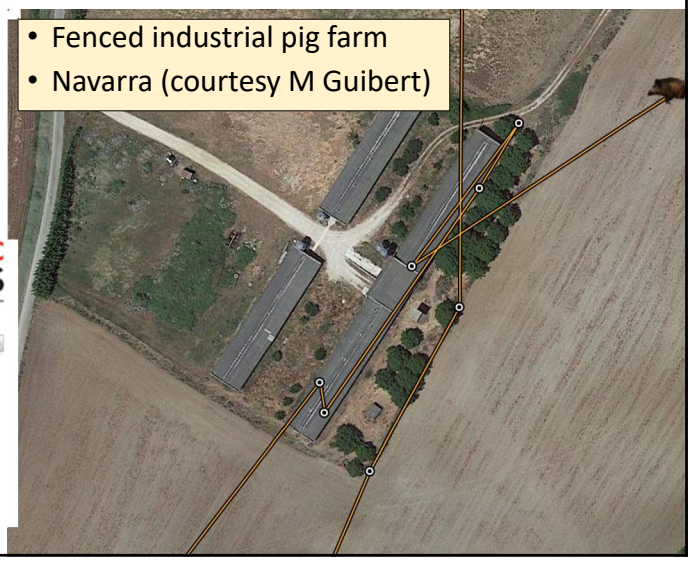
Focus on pig farm biosecurity



SCIENTIFIC REPORTS
nature research

Risk factors for African swine fever incursion in Romanian domestic farms during 2019

A. Boklund[1✉], S. Dhollander[2], T. Chesnoiu Vasile[3], J. C. Abrahantes[2], A. Bøtner[4,5], A. Gogin[6], L. C. Gonzalez Villeta[2], C. Gortázar[7], S. J. More[8], A. Papanikolaou[2], H. Roberts[9], A. Stegeman[10], K. Ståhl[11], H. H. Thulke[12], A. Viltrop[13], Y. Van der Stede[2] & S. Mortensen[14]

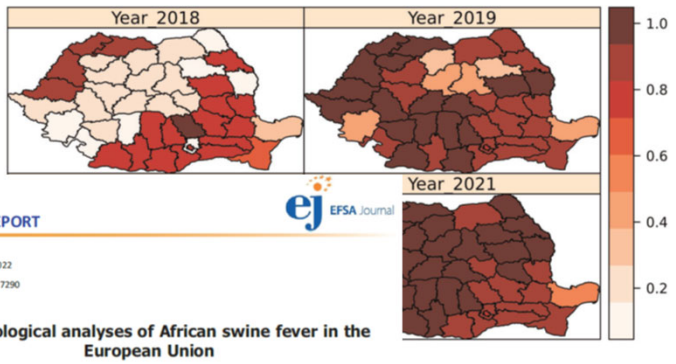


- Fenced industrial pig farm
- Navarra (courtesy M Guibert)

58

Keep wild boar populations hunted?

- "intense hunting helps to reduce the probability of recording positive PCR results in wild boar in Romania"



SCIENTIFIC REPORT

EFSA Journal

APPROVED: 30 March 2022
doi: 10.2903/j.efsa.2022.7290

Epidemiological analyses of African swine fever in the European Union

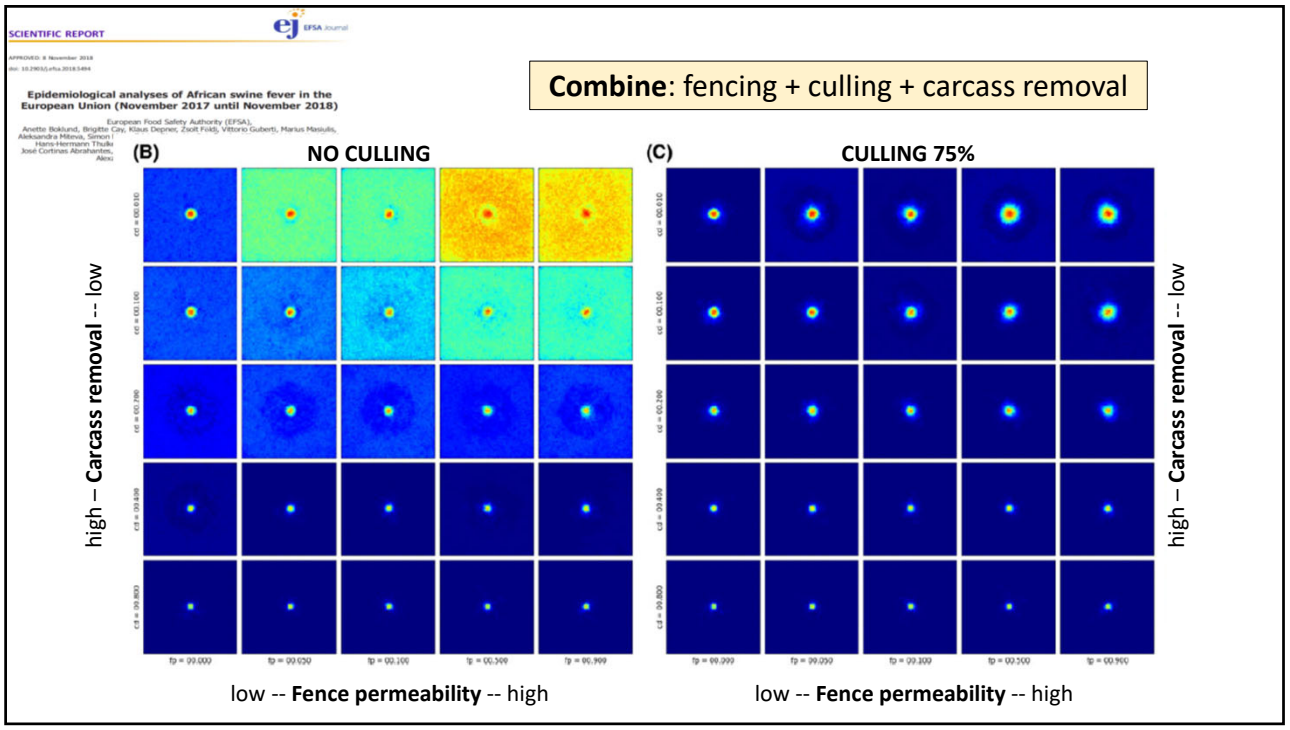
(September 2020 to August 2021)

EFSA (European Food Safety Authority),

59

Local outbreaks

60



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Expect better control prospects if:

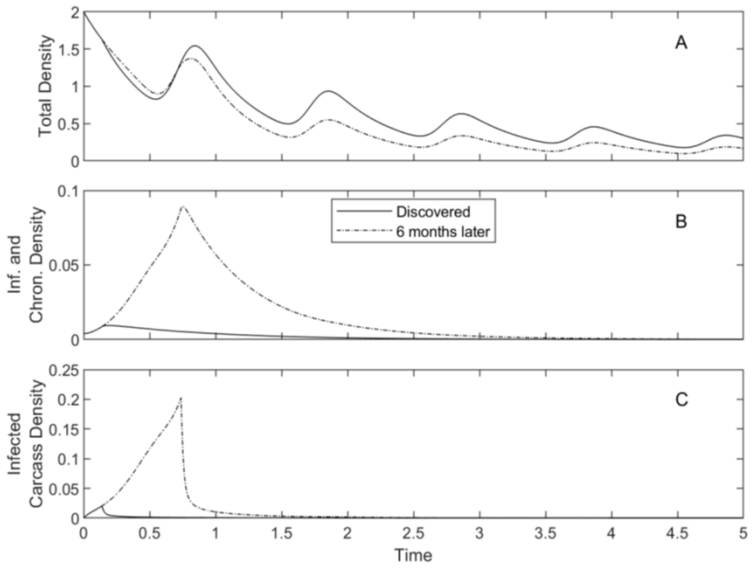
Early detection
→Interventions start early

Lower **wild boar density** and **habitat quality**

SCIENTIFIC REPORTS
nature research

Modelling the transmission and persistence of African swine fever in wild boar in contrasting European scenarios

Xander O'Neill[1], Andy White[1*], Francisco Ruiz-Fons[2] & Christian Gortázar[2]



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Belgium: control measures in wild boar

- **Zoning**: infected area + peripheral zones
  - WB feeding strictly prohibited
  - Initial hunting ban in the infected area
  - Partial ban of circulation and logging
- **Carcass search and removal**:
  - Active & systematic
  - Immediate carcass removal to rendering plant
- **Fencing**:
  - Network of concentric fences on the border & within the zones (≈300 km). Goals:
  - (i) slowing down spread
  - (ii) creating tight depopulation corridors
- **Depopulation**:
  - Trapping, night shooting, single hunting on baiting points, driven hunts with/without dogs with specific restrictions according to the area
  - Hunters were involved in the depopulation operations. Compensations (50 EUR or 100 EUR per wild boar, depending of the area) provided to agreed hunters w. specific training on biosecurity procedures, including packaging and transport of culled wild boar to the collect/diagnostic centres


SCIENTIFIC REPORT

EFSA Journal

APPROVED: 18 December 2019

doi: 10.2903/j.efsa.2020.5996

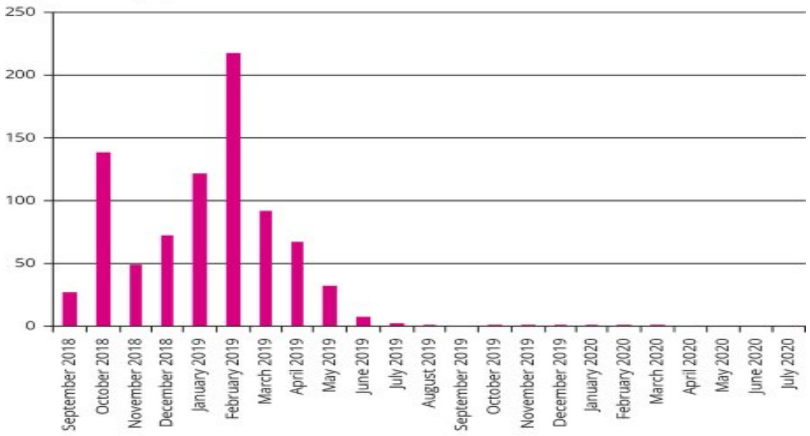
Epidemiological analyses of African swine fever in the European Union (November 2018 to October 2019)

European Food Safety Authority (EFSA),
Aleksandra Miteva, Alexandra Papanikolaou, Andrey Gogin, Anette Boklund, Anette Bøtner, Annick Linden, Arvo Viltrop, Christian Gortázar Schmidt, Corina Ivanciu, Daniel Desmecht, Daniela Korytarova, Edvins Olsevskis, Georgina Helyes, Grzegorz Wozniakowski, Hans-Hermann Thulke, Helen Roberts, José Cortiñas Abrahantes, Karl Ståhl, Klaus Depner, Laura C González Villeta, Mihaela Spiridon, Sasa Ostojic, Simon More, Theodora Chesnoiu Vasile, Vilija Grigaliuniene, Vittorio Guberti and Richard Wallo

63

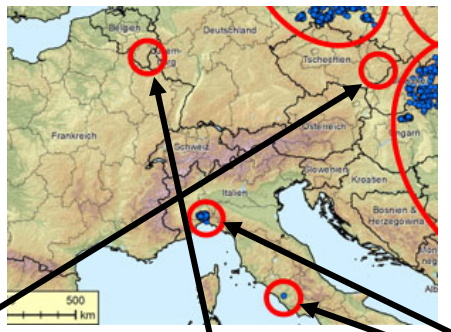
Belgium: ASF-free again

Figure 1 - ASF outbreaks in Belgium's wild boar population, Sept 2018-July 2020.



Source: Pig Progress on the basis of OIE data.

64



CZECH REPUBLIC
Infected zone 57 km²
190 ASFV+ wild boar (3/km²)
Time till clearance 1 year

BELGIUM
Infected zone 600 km²
833 ASFV+ wild boar (1.4/km²)
Time till clearance 2 years

MAINLAND ITALY
Infected zone >>1,600 km²
114 ASFV+ wb (0.07/km²)
Time till clearance ?

65

Cz and Be

	Czech Republic	Belgium
Timing	Jun 2017 – Apr 2018	Sep 2018 – Ongoing (data 30 Sep 2019)
Infected surface	500 km^2	<1106 km^2
Kernel zone with most cases	57 km^2	X>10 ≈500 km^2
Fencing	Incomplete	Incomplete
N^{er} confirmed ASF cases	230 (0.46/km^2)	827 (1.3/km^2)
N^{er} of wild boar culled	3563 (7.13/km^2)	≈2800 (2.53/km^2)
N^{er} of carcasses found & destroyed	319 (0.64/km^2) until Feb 2018	≈820 (1.64/km^2) by Sep 2019

Early detection is of Paramount importance to prevent local spread

Main control tools: Fencing (even incomplete); Carcass destruction; Culling

66

Belgium: ASF-free again

#USE fIGS

SCIENTIFIC OPINION

ADOPTED: 21 January 2021

doi: 10.2903/j.efsa.2021.6419

ASF Exit Strategy: Providing cumulative evidence of the absence of African swine fever virus circulation in wild boar populations using standard surveillance measures

European Food Safety Authority (EFSA), Søren Saxmose Nielsen, Julio Alvarez, Dominique Joseph Bicout, Paolo Calistri, Klaus Depner, Julian Ashley Drewe, Bruno Garin-Bastuji, Jose Luis Gonzales Rojas, Christian Gortazar Schmidt, Mette Herskin, Virginie Michel, Miguel Angel Miranda Chueca, Paolo Pasquali, Helen Clare Roberts, Lisa Helena Sihvonen, Hans Spoolder, Karl Stahl, Antonio Velarde, Christoph Winckler, José Cortinas Abrahantes, Sofie Dhollander, Corina Ivancu, Alexandra Papanikolaou, Yves Van der Stede, Sandra Blome, Vittorio Guberti, Federica Loi, Simon More, Edvins Olsevskis, Hans Hermann Thulke and Arvo Viltrop

Table 6: Minimum requirements during Exit Strategy proposed for two different epidemiological scenarios

	Exit Strategy I	Exit Strategy II
Target	Freedom following eradication scenario (see EU strategy[a])	Freedom following control scenario (see EU strategy[a])
	Local containment of epidemic in small area, e.g. the past epidemics in the affected area in Czechia and Belgium	Countrywide spread of epidemic, large area, e.g. Estonia and Latvia
Screening Phase (SP): **all samples negative**		
Passive surveillance	Number of carcasses – 2% of hunting bag prior to ASF introduction (2% HB)	Test at least 1 carcass per 1,000 km^2 per year (SP 1)[b] (baseline intensity)
Active surveillance	No specific requirements	Test all hunting bag for virus
Confirmation Phase (CP): **all samples negative**		
Passive surveillance	Number of carcasses – 2% of hunting bag prior to ASF introduction (2% HB)	Test at least 1, 2 or 6[c] carcasses per 1,000 km^2 per year (CP1, CP2 and CP3, respectively)[b] (increased intensity)
Active surveillance	No specific requirements	Test all hunting bag for virus
Minimum monitoring periods	Combination of duration Screening Phase (phase A) with the adequate period for Confirmation Phase (phase B) can be seen in Figure 29	Combination of duration monitoring period Screening Phase with the adequate period for Confirmation Phase can be seen in Figures 30–32. Example: To achieve a failure rate of maximum 2% (solid line) after 12 months applying Exit Strategy II's Screening Phase (including 1 carcass per 1,000 km^2 per year) one may need to monitor further 11 months in the Confirmation Phase with 1 carcass per year and 1,000 km^2 (Figure 30), 7 months with 2 carcasses (Figure 31), 3 months when collecting 6 carcasses (Figure 32)

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Front wave

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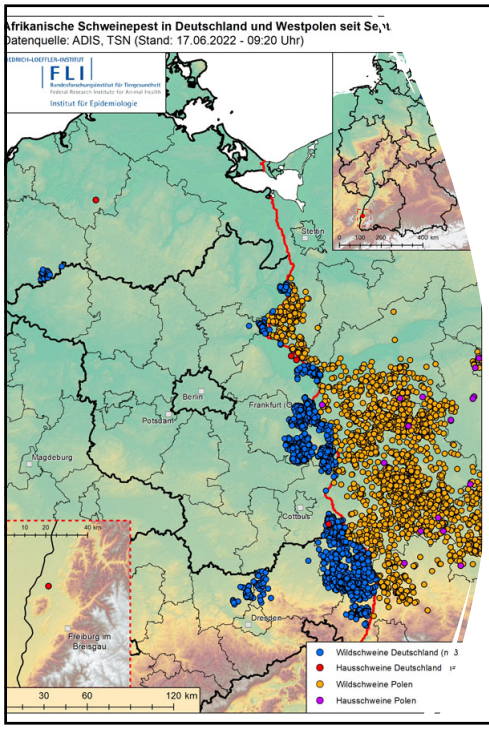
Polish-German border, 1939

69



Germany and Poland 2022

- Challenging, front-like setting
- Attempts to contain the wave failed
- (Hoping for oral vaccines)

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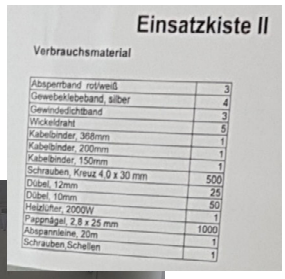
German ASF preparedness



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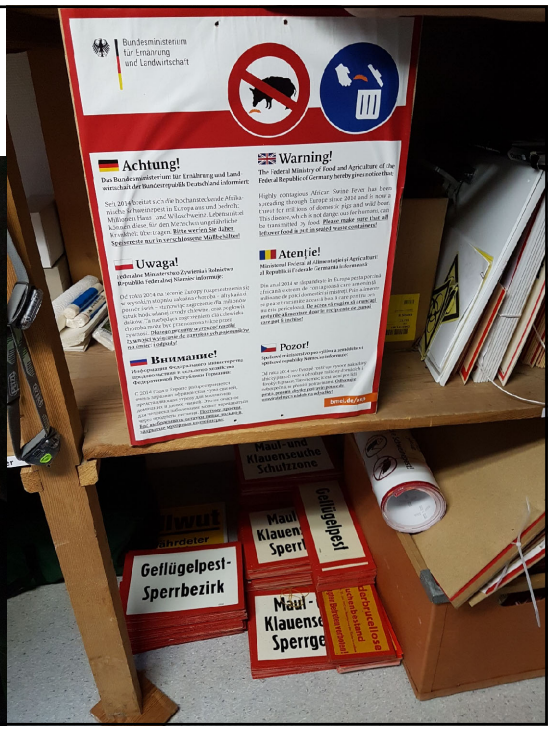
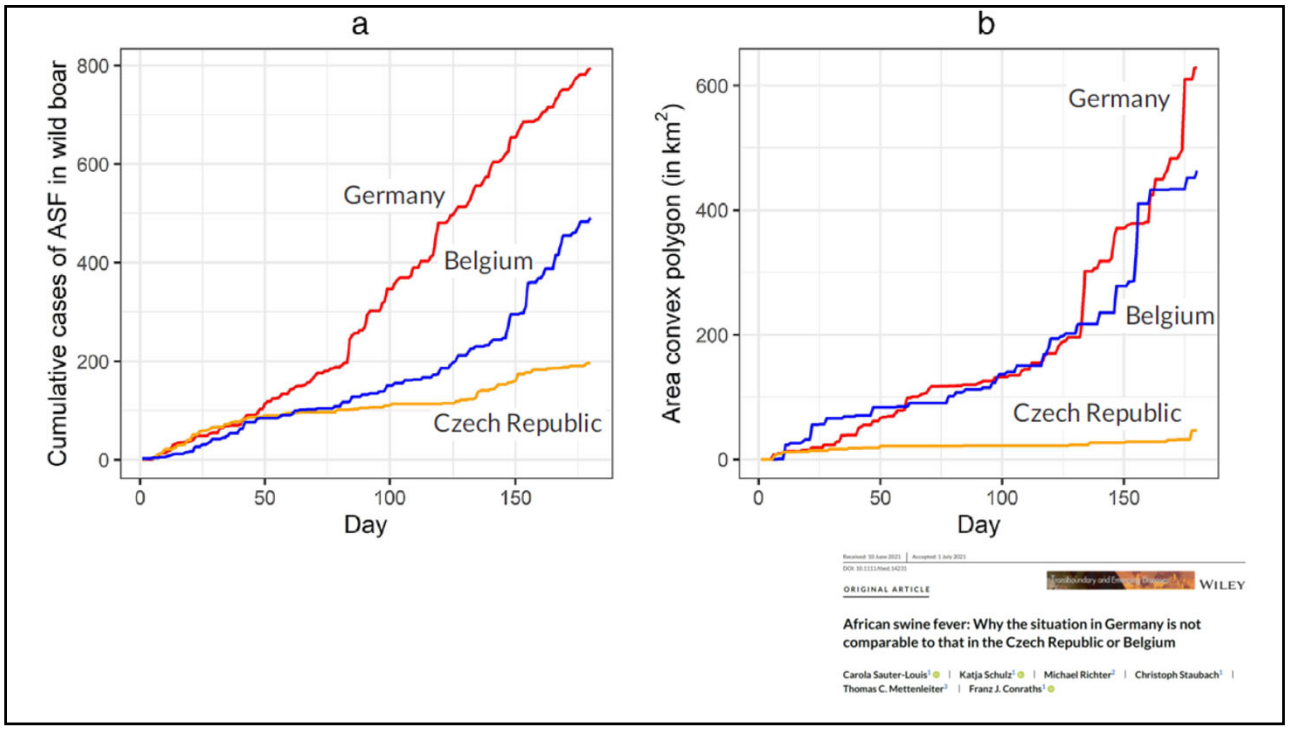
German ASF preparedness

AEG Schlagbohrmaschine	1
Ryobi Akkuschrauber	1
Kabeltrommel 50m	1
Seitenschneider	1
Kraftzange	1
gekröpfter Ringschlüssel 6 bis 17	1
Steinbohrer 10mm	1
Steinbohrer 12mm	1
Fäustel	1
Hammer	1
Heizlüfter 1500W	2
Spanngurt m. Ratsche 6m	3
Stirnlampe	0
Erdnägel	1
Adapter Verlängerung, blauer Stecker	1



72



ORIGINAL ARTICLE

WILEY

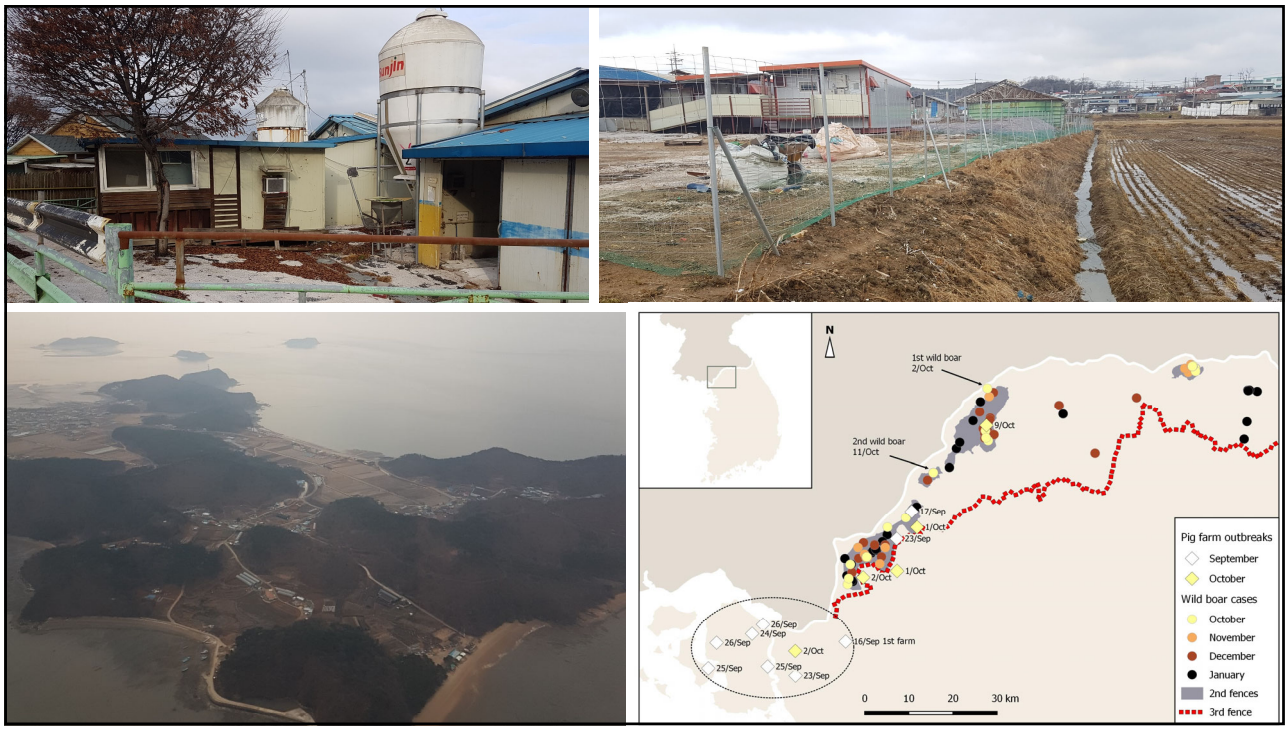
African swine fever: Why the situation in Germany is not comparable to that in the Czech Republic or Belgium

Carola Sauter-Louis | Katja Schulz | Michael Richter | Christoph Staubach | Thomas C. Mettenleiter | Franz J. Conraths

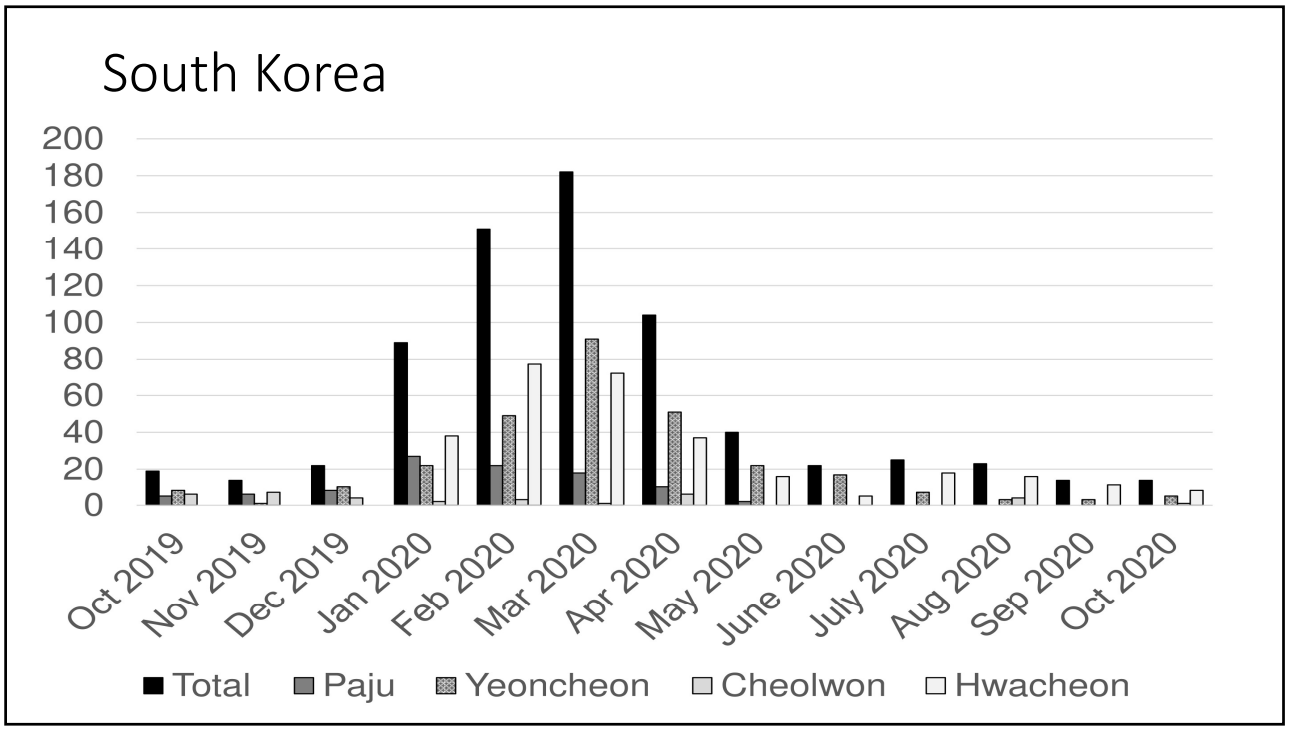
73


Current status and management of Africa
swine fever in wild boar in South Korea
Yeong-Seok Jo
National Institute of Biological Resources

74


N
1st wild boar
2/Oct
9/Oct
2nd wild boar
11/Oct
17/Sep
21/Oct
23/Sep
1/Oct
2/Oct
26/Sep
24/Sep
26/Sep
2/Oct
16/Sep 1st farm
25/Sep
25/Sep
23/Sep
0
10
20
30 km
Pig farm outbreaks
September
October
Wild boar cases
October
November
December
January
2nd fences
3rd fence

75


South Korea
200
180
160
140
120
100
80
60
40
20
0
Oct 2019
Nov 2019
Dec 2019
Jan 2020
Feb 2020
Mar 2020
Apr 2020
May 2020
June 2020
July 2020
Aug 2020
Sep 2020
Oct 2020
Total
Paju
Yeoncheon
Cheolwon
Hwacheon

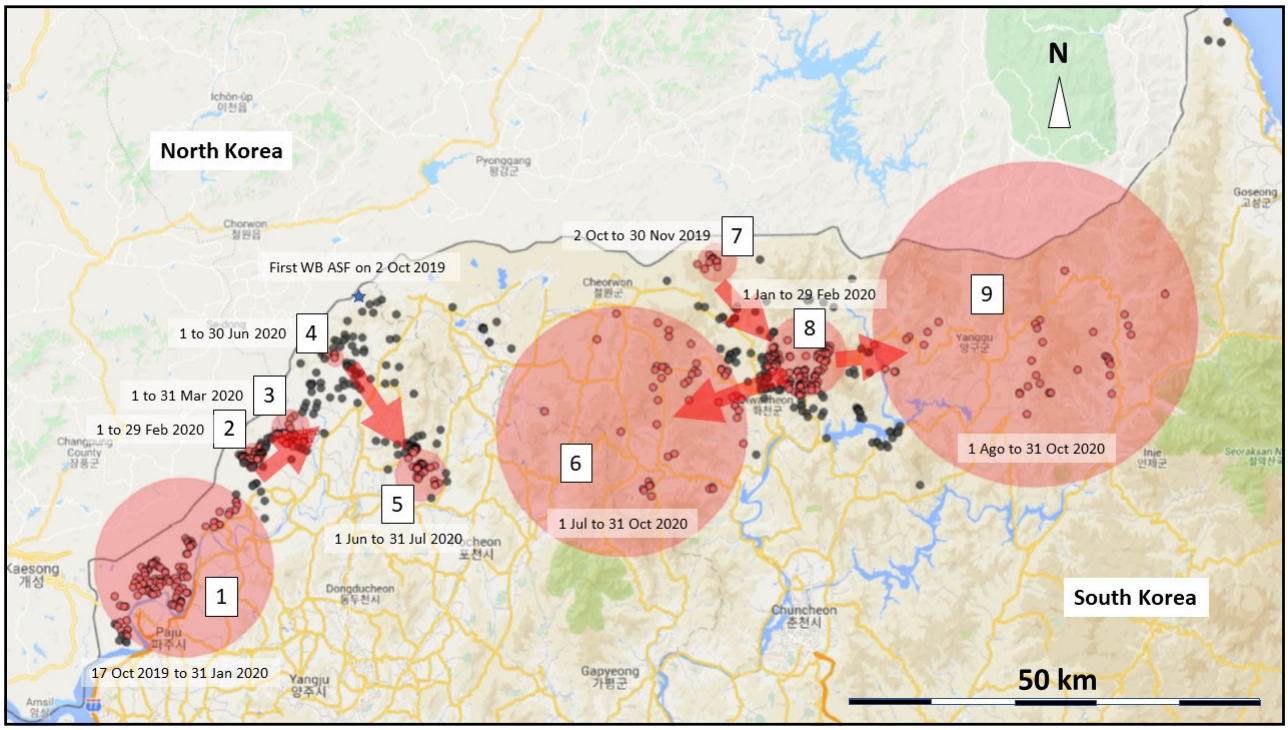
76


DANGER! 위험 안전제일

77

78

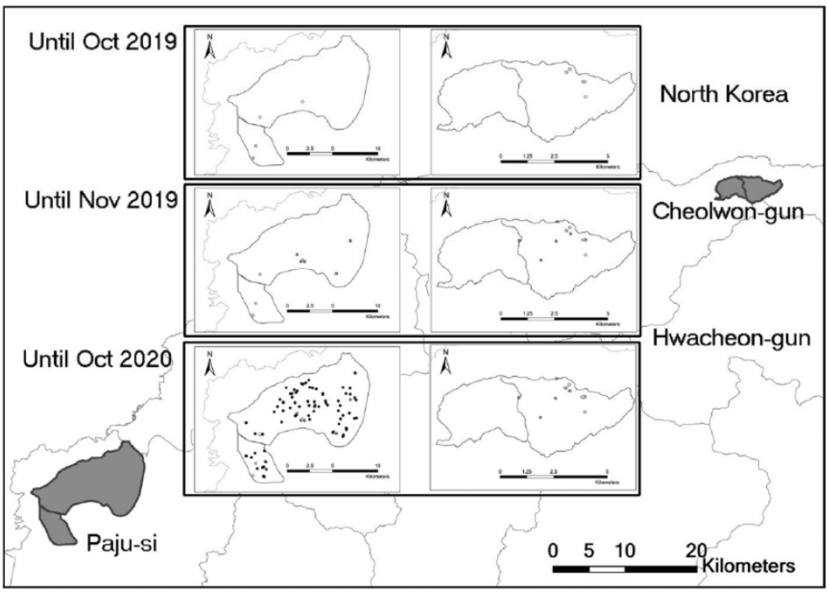
79



80

FIGURE 4 The effect of silent wild boar population control in fenced infected areas. Paju (left) run a silent culling campaign (by military, including shooting and trapping) in 2019, but switched to involving civilian hunters in 2020. Cheolwon (right) used trapping only. Grey lines represent steel-wire fences

Silent hunting & trapping (military) vs. civilian hunters



81


A
B
C
D

82


《공사 간 매설된 대인지뢰 다수발견》
○ GOP 지역에서는 과속을 절대 금지합니다
《민간차량 충돌사고》
《교통 시 군 차량 전복사고》
지 뢰
MINE
M 15
[대전차지뢰]
M 16
[대인지뢰]
M18A1
[크레모아]
Carcass search & destruction not viable…

83

Front waves are difficult to stop…

…unless you fight like Ukrainians!

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Presentation structure

- Intro
  - Wild boar and feral pig ecology
  - ASF epidemiology
  - ASF control tools
- Disease control by scenario
  - Endemic regions
  - Point introductions
  - Epidemic fronts
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  - **Pig farm biosafety**
  - **Population monitoring**
  - **Hunters & WB control**
- Conclusions

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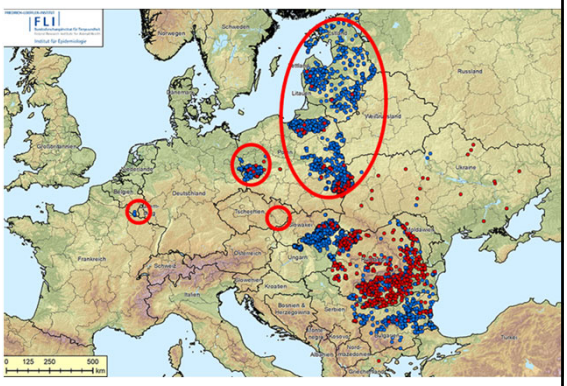
Can we control ASF in wild boar?

- A: point introductions
  - Czechia **OK**
  - Belgium **OK**
- B: epidemic front
  - Europe **NO**
  - South Korea **NO**



Point entry might be controlled – Epidemic fronts?

Uninfected countries: focus on prevention

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Pig farm biosafety

- Improve farm perimeter fencing
- Other BSMs depending on farm type (open air vs. indoor)
- Monitor BSM implementation
- Promote R&D on BSM efficacy
- Remember: farm biosafety is a must, can be (much) improved, but is not 100% effective

Jiménez-Ruiz *et al.*
Porcine Health Management (2022) 8:2
https://doi.org/10.1186/s40813-021-00246-7

Porcine Health Management

RESEARCH Open Access

Characterization and management of interaction risks between livestock and wild ungulates on outdoor pig farms in Spain

Saúl Jiménez-Ruiz[1,2], Eduardo Laguna[1], Joaquín Vicente[1*], Ignacio García-Bocanegra[2], Jordi Martínez-Guijosa[1], David Cano-Terriza[2], María A. Risalde[3,4] and Pelayo Acevedo[1]

SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 6 May 2021

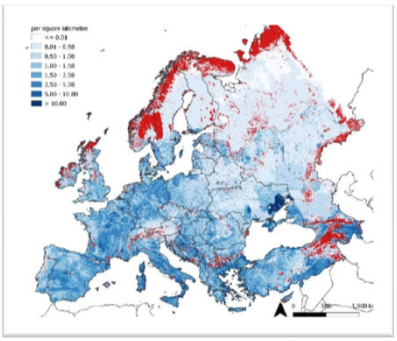
doi: 10.2903/j.efsa.2021.6639

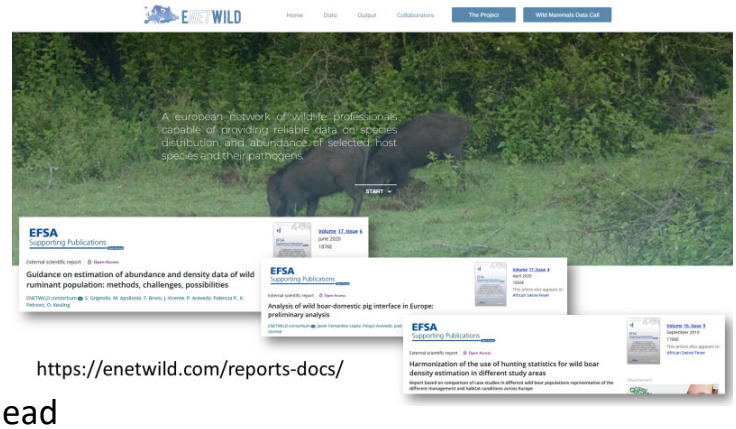
African swine fever and outdoor farming of pigs

EFSA Panel on Animal Health and Welfare (AHAW), Søren Saxmose Nielsen, Julio Alvarez, Dominique Joseph Bicout, Paolo Calistri, Elisabetta Canali, Julian Ashley Drewe, Bruno Garin-Bastuji, Jose Luis Gonzales Rojas, Mette Herskin, Miguel Ángel Miranda Chueca, Virginie Michel, Barbara Padalino, Paolo Pasquali, Helen Clare Roberts, Liisa Helena Sihvonen, Hans Spoolder, Karl Stahl, Antonio Velarde, Arvo Viltrop, Christoph Winckler, Sandra Blome, Simon More, Andrea Gervelmeyer, Sotiria-Eleni Antoniou and Christian Gortázar Schmidt

87

Monitoring wild boar & feral pigs





https://enetwild.com/reports-docs/

- In Europe, EFSA is taking the lead
- EFSA-funded Enetwild consortium:
  - New tools for wildlife abundance assessment
  - Maps and data on WB density & WB-pig interface

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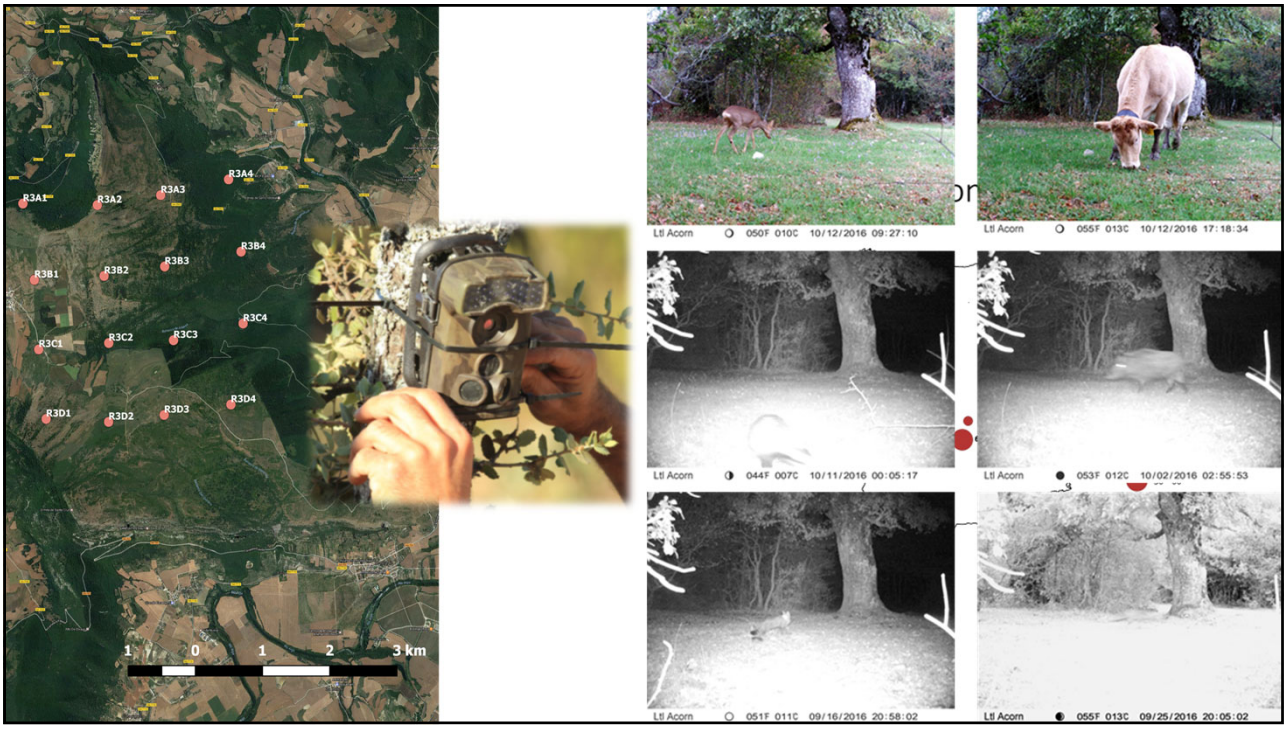

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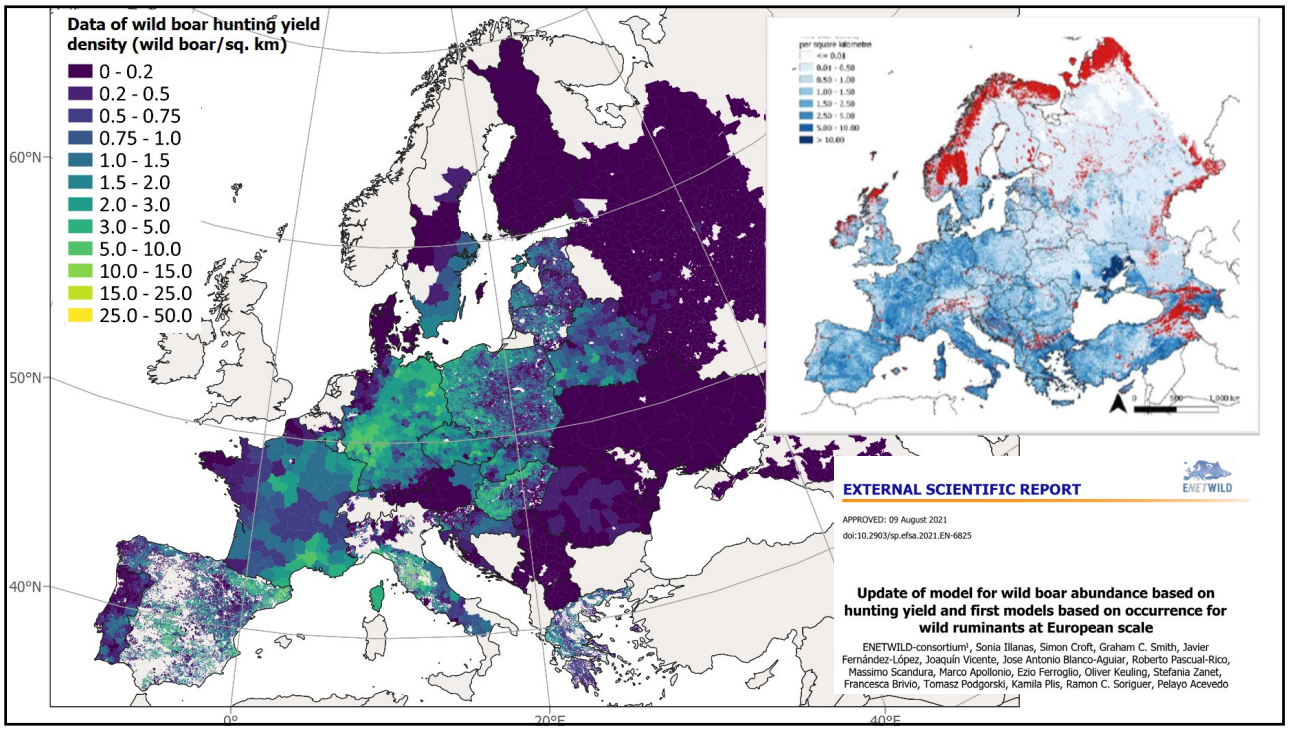

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The role of hunters

- Help in sampling
- Mortality detection
- Smart game management
- Pest species control (wild boar)
- Targeted culling of sick individuals
- Game meat hygiene and offal disposal

91


The benefits for society of involving hunters in IWM are clear –
which are the benefits for hunters of participating in IWM?

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GUÍA
VIGILANCIA SANITARIA
FAUNA SILVESTRE
AYÚDANOS A MANTENER LA SALUD DEL CAMPO
GOBIERNO DE ESPAÑA
MINISTERIO DE AGRICULTURA, PESCA Y ALIMENTACIÓN
Fieldguide for hunters
available at:
https://www.irec.es/divulgacion-cientifica/guia-vigilancia-sanitaria-fauna-salvaje/
GASTU
Nódulos linfáticos mandibulares
Palmaremos la consistencia de los nódulos retrofaríngeos
Sampling training for hunters
available at:
https://www.youtube.com/channel/UCqj5YeB1VolYdF9CVNasxCg/videos
Training and veterinary support

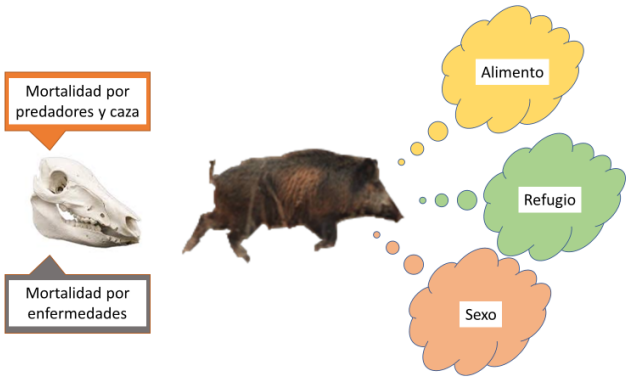
93

Can we control wild boar?

Opciones para control de jabalí

- **Aumentar la mortalidad**
  - ✓ Caza recreativa
  - ✓ Control profesional
  - ✗ Medios no autorizados en Europa: lazos, tóxicos
  - ✓ ✗ Favorecer a los depredadores: lobo

- **Reducir el reclutamiento**
  - ✗ Control de fertilidad
  - ✓ Manejo del hábitat: reducir alimento



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Can hunting control wild boar or ASF in wild boar?

- **Romanian** hunting grounds: intense hunting is a protective factor for ASF
- **Czechia & Belgium** used both silent culling & hunting
- In **South Korea**, silent culling delayed ASF spread while amateur hunting accelerated ASF spread
- **Modeling** insights:
  - "White zones" might work
  - Slower ASF spread at lower WB density
  - Integrated control: carcass destruction + fencing + culling
- Some **experts** are against hunting for wild boar or ASF control

EFSA 2014, O'Neill et al. 2020, Jo and Gortázar 2021, EFSA et al. 2022

95

VOL. 194, NO. 1 THE AMERICAN NATURALIST JULY 2019

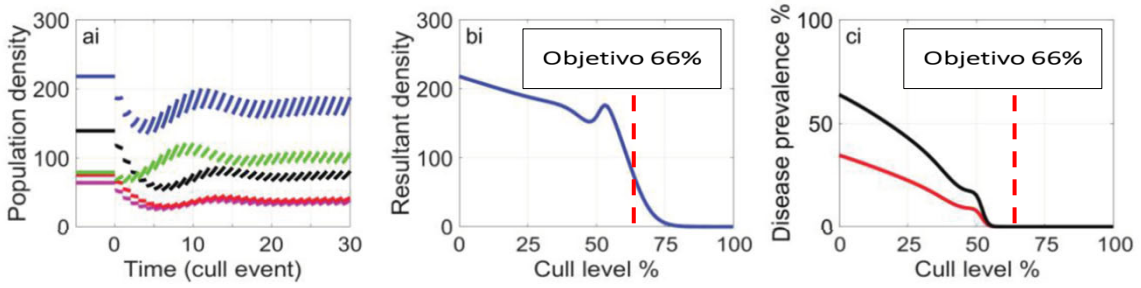
E-ARTICLE

The Critical Role of Infectious Disease in Compensatory Population Growth in Response to Culling

Eleanor Tanner,[1,*] Andy White,[1] Peter W. W. Lurz,[2] Christian Gortázar,[3] Iratxe Díez-Delgado,[3] and Mike Boots[4]

Hunting effect on…
- **Wild boar density**
- **Disease prevalence**

…depends on culling intensity



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Can hunting control wild boar?

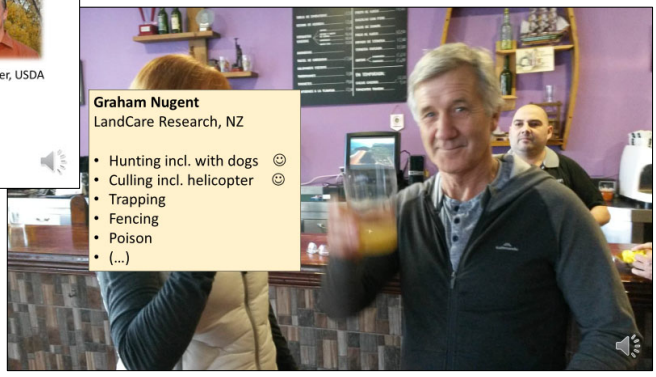
Hunting

Commentary

Research Priorities for Managing Invasive Wild Pigs in North America

Ryan Miller, USDA

"despite **evidence hunting is ineffective** at controlling invasive wild pigs in many instances (Campbell and Long 2009), some landowners, hunters, and other members of the public still view recreational hunting as an effective means for population control"



Graham Nugent
LandCare Research, NZ

- Hunting incl. with dogs ☺
- Culling incl. helicopter ☺
- Trapping
- Fencing
- Poison
- (…)

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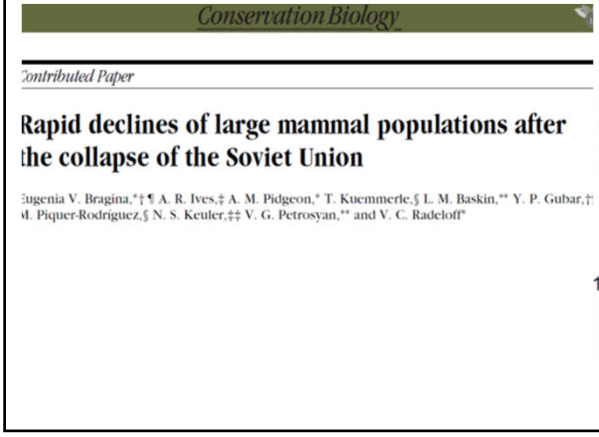
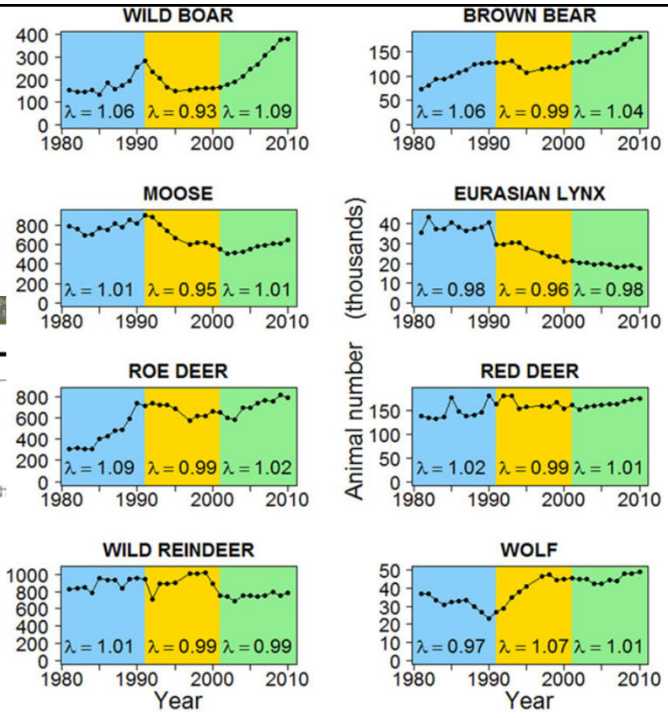
Subsistence hunting succeeded in reducing wild boar populations





99

Eur J Wildl Res
DOI 10.1007/s10344-017-1107-4

ORIGINAL ARTICLE

Hunters serving the ecosystem: the contribution of recreational hunting to wild boar population control

Francisco Quirós-Fernández[1] · Jaime Marcos[1] · Pelayo Acevedo[2] · Christian Gortázar[2]

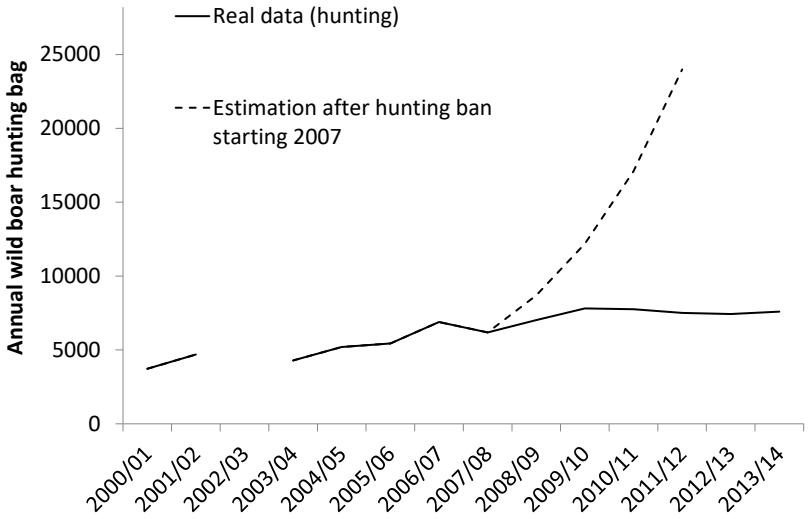
PLOS ONE

RESEARCH ARTICLE

Stochastic assessment of management strategies for a Mediterranean peri-urban wild boar population

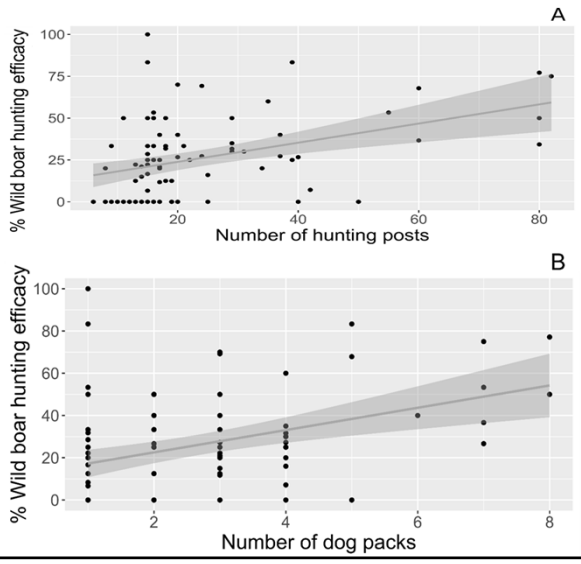
Carlos González-Crespo[1], Emmanuel Serrano[1,2], Seán Cahill[3], Raquel Castillo-Contreras[1], Lluis Cabañeros[3], José María López-Martín[3], Joan Roldán[3], Santiago Lavín[1], Jorge Ramón López-Olvera[1]*

Recreational hunting contributes to wild boar population control (though not enough)



100

Can hunting control wild boar?



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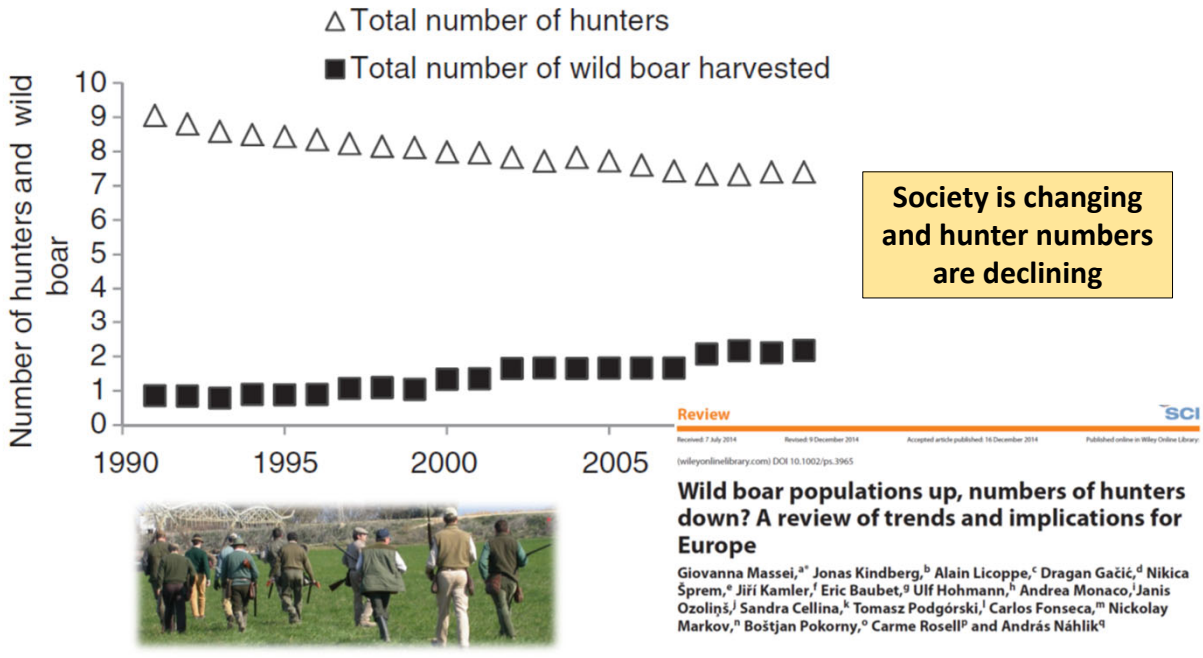

Society is changing and hunter numbers are declining

Review

SCI

(wileyonlinelibrary.com) DOI 10.1002/ps.3965

Wild boar populations up, numbers of hunters down? A review of trends and implications for Europe

Giovanna Massei,[a*] Jonas Kindberg,[b] Alain Licoppe,[c] Dragan Gačić,[d] Nikica Šprem,[e] Jiří Kamler,[f] Eric Baubet,[g] Ulf Hohmann,[h] Andrea Monaco,[i] Janis Ozoliņš,[j] Sandra Cellina,[k] Tomasz Podgórski,[l] Carlos Fonseca,[m] Nickolay Markov,[n] Boštjan Pokorny,[o] Carme Rosell[p] and András Náhlik[q]

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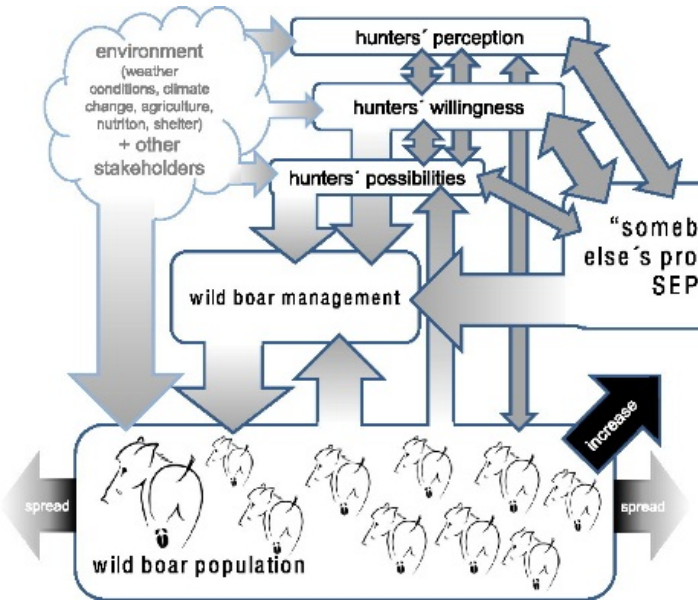


Oliver Keuling

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Regulating wild boar populations is "somebody else's problem"! - Human dimension in wild boar management

Oliver Keuling [a,*], Egbert Strauß [a,b], Ursula Siebert [a]

103

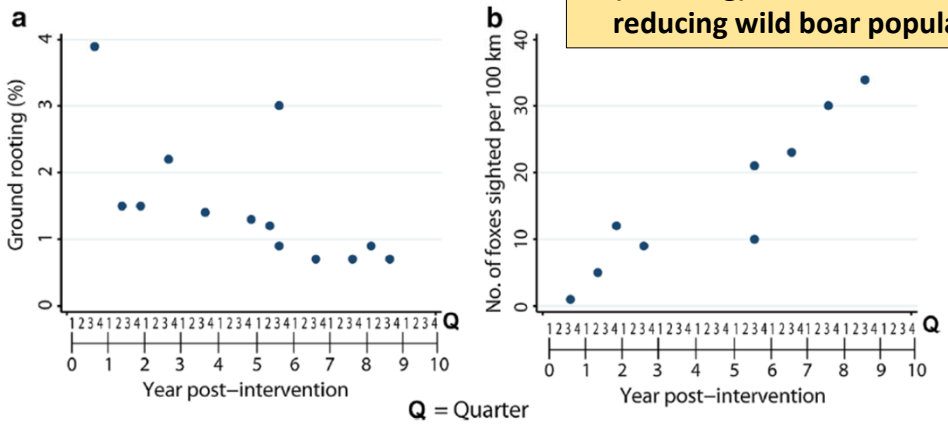
Biol Invasions (2017) 19:11–24
DOI 10.1007/s10530-016-1256-5

ORIGINAL PAPER

Coping with wild boar in a conservation area: impacts of a 10-year management control program in north-eastern Argentina

Ricardo E. Gürtler · V. Martín Izquierdo · Guillermo Gil · Marcelo Cavicchia · Aristóbulo Maranta

Professional population control (shooting) succeeded locally in reducing wild boar populations



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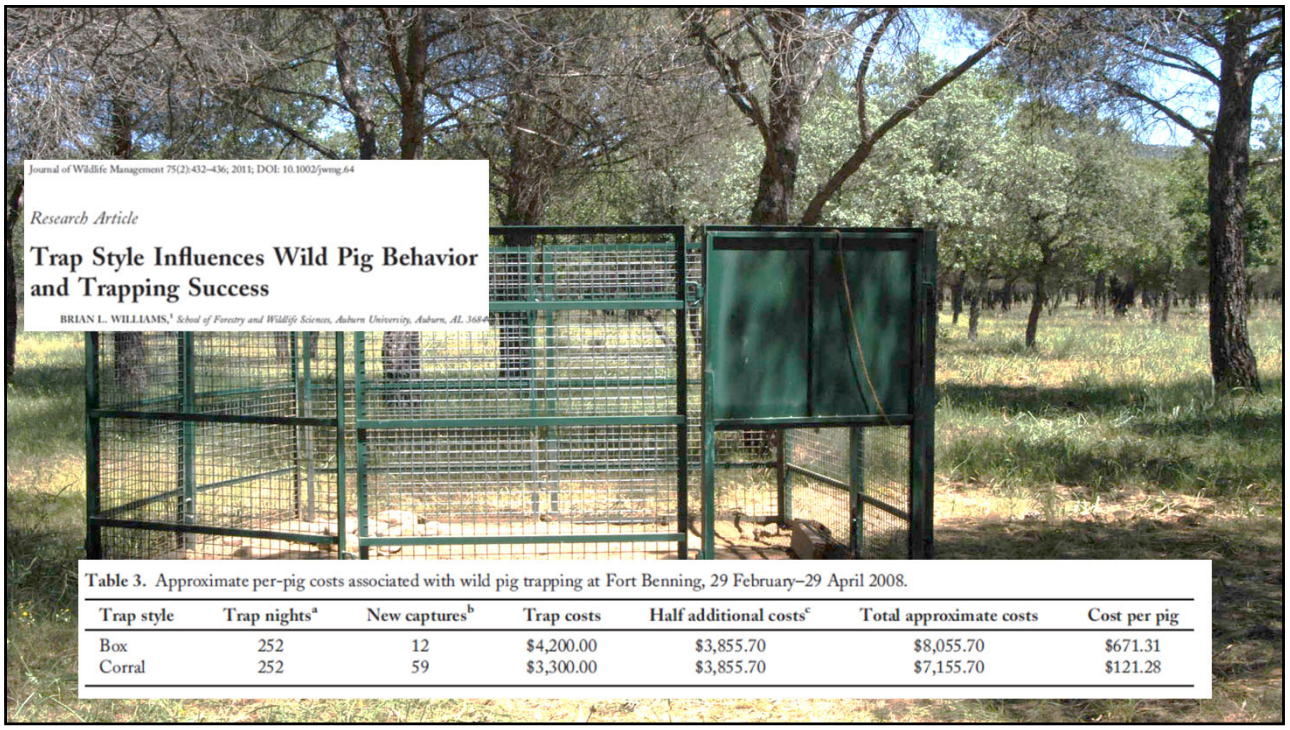

Journal of Wildlife Management 75(2):432–436; 2011; DOI: 10.1002/jwmg.64

Research Article

Trap Style Influences Wild Pig Behavior and Trapping Success

BRIAN L. WILLIAMS,[1] *School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849*

Table 3. Approximate per-pig costs associated with wild pig trapping at Fort Benning, 29 February–29 April 2008.

Trap style	Trap nights[a]	New captures[b]	Trap costs	Half additional costs[c]	Total approximate costs	Cost per pig
Box	252	12	$4,200.00	$3,855.70	$8,055.70	$671.31
Corral	252	59	$3,300.00	$3,855.70	$7,155.70	$121.28

105

Barasona et al. BMC Veterinary Research 2013, 9:107
http://www.biomedcentral.com/1746-6148/9/107

BMC Veterinary Research

RESEARCH ARTICLE Open Access

Trap-effectiveness and response to tiletamine-zolazepam and medetomidine anaesthesia in Eurasian wild boar captured with cage and corral traps

Capture method	Number of traps	Days before activation (mean; range)	Days activated (mean; range)	Days of work	Person-days of work	Number of capture events	Number of multiple captures	Wild boar captured	Wild boar per capture (mean; range)	Mortality	Days per wild boar (mean; range)	Person-days per wild boar (mean; range)
Cage-trap	7	26; 11-44	1.8; 1-5	103	135	13	5	25	1.9; 1-5	1	21.8; 2-46	7.9; 1-16
Corral-trap	7	28.9; 15-45	2.1; 1-3	114	154	11	9	52	4.7; 1-11	4	10.2; 4-33	4.8; 2-16
TOTAL	14	27.4; 11-45	2; 1-5	217	289	24	14	77	3.2; 1-11	5	16.5; 2-46	6.5; 1-16

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Received: 20 November 2020 | Revised: 16 August 2021 | Accepted: 23 August 2021
DOI: 10.1002/wsb.1260

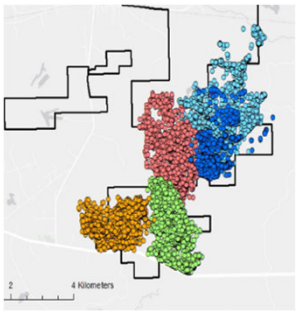
RESEARCH ARTICLE

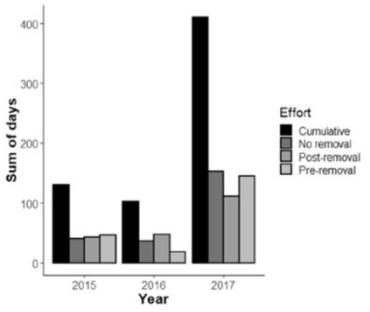
WILDLIFE SOCIETY BULLETIN | THE WILDLIFE SOCIETY

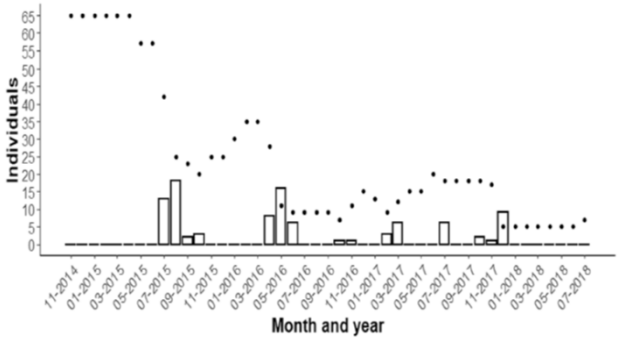
Shifting to sounders: Whole sounder removal eliminates wild pigs

Alexandra A. Lewis | Brian L. Williams | Mark D. Smith | Stephen S. Ditchkoff

- Monitoring at baiting sites (1/km^2) to optimize trap deployment
- 65 pigs on 27 km^2 (2.4/km^2)
- Culling whole social groups
- Corral traps: 5 panels of 5 m + trap door; cameras to target whole groups (sounders)
- 90% populayion decline in 12 months, 100% in 18 months







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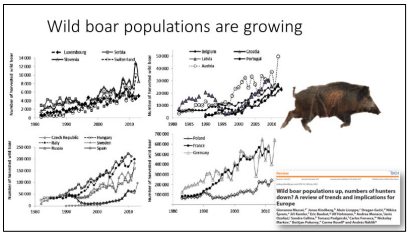
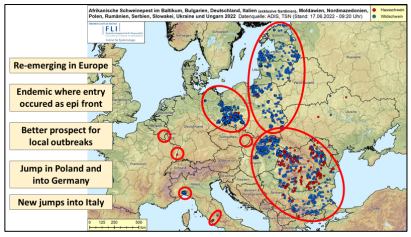
Concluding…



Invasive species, still expanding

ASF control success depends on setting



- Monitor wild boar or feral pig populations
- (Try to stabilize populations)
- Optimize pig farm biosafety
- Improve early detection (hunters!)
- Train interventions & prepare logistics

<u>Get ready</u>: The question is not **if** ASF will enter, but **when**

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illustration by Victor Juhsz

Several **crises** in sight

109


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¡Gracias!
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