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Epidemiological analysis of African swine fever in the European Union during 2022

European Food Safety Authority (EFSA),
Karl Ståhl, Anette Boklund, Tomasz Podgórski, Timothée Vergne, José Cortiñas Abrahantes, Alexandra Papanikolaou, Gabriele Zancanaro and Lina Mur

Abstract

This report presents the epidemiological analysis of African swine fever (ASF) during 2022 based on the surveillance and pig population data submitted by the European Union (EU) affected countries and one neighbouring country. Coinciding with regulatory changes and an important decrease in ASF outbreaks in 2022 in the EU, the number of domestic pig samples tested as part of active surveillance decreased by 80%, while the number of samples from passive surveillance almost doubled compared with 2021. Most outbreaks among domestic pigs in the EU were detected by testing clinical suspicions (93% of outbreaks), followed by tracing activities (5%) and weekly testing of the first two dead pigs per establishment (2%). Although most of the wild boar samples came from hunted animals, the probability of detecting PCR-positive animals was much higher in wild boar found dead. The ASF outbreaks among domestic pigs in the EU decreased by 79% while a decrease of 40% in the wild boar cases was observed in comparison with 2021. This was strongly marked in Romania, Poland and Bulgaria, with a reduction of 50–80% compared with 2021. In many countries, an important decrease in the number of pig establishments was observed, especially of small establishments with fewer than 100 pigs. The regional between farm incidence and proportion of pigs lost due to ASF in the EU was in general very low (average of 1%) apart from some regions in Romania. The impact of ASF on wild boar populations was variable, with a decline in wild boar abundance observed in certain countries versus a stable or even increased population after ASF introduction. This supports the negative relationship observed in this report between the proportion of the country with restricted zones due to ASF in wild boar and wild boar hunting bags.

Keywords: ASF, epidemiology, surveillance, monitoring, pigs, wild boar

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Correspondence: biohaw@efsa.europa.eu

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Summary

The European Food Safety Authority (EFSA) has a mandate from the European Commission to generate annual epidemiological analyses of the spread and impact of ASF Genotype II in the European Union (EU) and neighbouring countries affected by African swine fever (ASF). In this context, affected countries were invited to submit laboratory test results of ASF surveillance activities and pig population information to EFSA. These data were used in combination with other data sources such as official ASF cases and outbreaks information in wild boar and domestic pigs, wild boar population estimates and restricted zone data to improve the harmonisation of the data collected and produce this report.

For the surveillance of domestic pigs, nine countries (eight EU and one non-EU country) submitted laboratory data related to test results from domestic pigs. In total, 638,280 samples originating from domestic pigs were analysed for ASF in the reporting countries, compared with 1,972,793 samples reported in the previous year. The vast majority of samples (94%) were analysed using only PCR, while ~ 4% of the samples were analysed only by ELISA and 2% were analysed by both tests in parallel. Coinciding with regulatory changes and a 79% decrease in the number of ASF outbreaks in 2022 in the EU, the number of samples tested as part of active surveillance has decreased by 80%, while the number of samples tested as part of passive surveillance almost doubled compared with the previous reporting year. The vast majority of outbreaks in the EU were detected through passive surveillance based on testing clinical suspicions (92%) and eight outbreaks (2%) were detected using the enhanced passive surveillance based on continuous weekly testing of at least the first two dead pigs at every establishment. The remaining 5% were detected through tracing contacts from infected herds.

Among wild boar, the surveillance activities were more intensive in affected areas or in areas neighbouring the affected areas, focusing on early detection of the disease, as done in Czechia at the border with Poland. Although most of the samples collected were from hunted animals, the probability of detecting PCR-positive animals was much higher in wild boar that were found dead. This highlights once more that testing found-dead wild boar by PCR appeared to be the most effective surveillance activity for detecting infected individuals and thus early detection of the disease.

Eight EU countries (Bulgaria, Germany, Italy, Latvia, Lithuania, Poland, Romania and Slovakia) and four non-EU neighbouring countries (Moldova, North Macedonia, Serbia and Ukraine) notified ASF outbreaks to the Animal Diseases Information System (ADIS), among domestic pigs in 2022. Romania was the most affected EU country with 327 reported outbreaks among domestic pigs (87% of the EU outbreaks). A single outbreak of ASF among domestic pigs was notified on mainland Italy, the first domestic pig outbreak caused by ASFv Genotype II in the country. A decreasing trend in the number of outbreaks among domestic pigs was observed in most EU countries, on establishments with both fewer and more than 100 pigs, except in Lithuania, where a slight increase was observed, caused by the cluster of outbreaks notified in the south-western part of the country. This decreasing trend was particularly marked in Romania, Poland and Bulgaria, where the number of outbreaks was reduced by 50–80% compared with previous years. Among domestic pigs, a clear summer peak in the number of outbreaks was observed on small as well as large establishments, with the exception of Romania where a winter and a summer peak was present in small size outbreaks. Among the non-EU countries reporting to ADIS, Serbia was the most affected by ASF, with 107 outbreaks, while ASF was notified for the first time in North Macedonia, and Moldova notified outbreaks in areas previously non-affected.

In 2022, the total area of restricted zones III[1] (used as a proxy for domestic pig-affected areas) in the EU has decreased by 26% since 2021. Restricted zones in Romania and Bulgaria contributed to 90% of the total area of restricted zones in the EU for domestic pigs. In Romania, despite the considerable decrease in the number of outbreaks, the restricted zones remained stable at 100% of the country's territory, while a reduction of the restricted zone III was observed in Bulgaria and Poland. In the rest of the affected countries, less than 10% of the country was in a restricted zone III. In many EU countries, such as Poland, Romania and Bulgaria, a large decrease in the number of pig establishments was observed, especially small establishments with fewer than 100 pigs. However, this decrease in the number of establishments might be the consequence of ASF and associated control measures, but also of the global economic situation. The between farm incidence of ASF was generally

[1] Restricted zones as described in Annex I of Commission Implementing Regulation (EU) 2021/605 due to the occurrence of ASF outbreaks among domestic pigs.

very low in the affected NUTS 3 regions (1%), with a few regions reaching only a maximum of 5%. The proportions of animals lost to ASF in NUTS 3 areas in 2022 reached 50% in a few regions of Romania, where there were few outbreaks in large commercial establishments, while it remained very low (generally 1%) in the rest of the affected regions.

In 2022, 11 EU Member States (all the Member States with outbreaks among domestic pigs plus Czechia, Estonia and Hungary), and four non-EU countries (Moldova, North Macedonia, Serbia and Ukraine) notified ASF cases in wild boar in ADIS. During 2022, ASFv generally persisted in wild boar populations across the Baltic states and much of the previously affected areas of Poland, Germany, Slovakia, Hungary, Romania and Bulgaria. Some newly affected areas reported ASF cases in wild boar in south-central Poland, while other previously affected regions in Estonia, Romania or Bulgaria did not report any wild boar cases. The most relevant events regarding wild boar occurred on mainland Italy (the first introduction of ASFv Genotype II), Czechia (a re-occurrence after a 4-year absence). In the non-EU neighbouring countries, the disease spread in Serbia and was firstly detected in North Macedonia, affecting north-eastern part of the country.

The number of ASF cases notified in wild boar in the EU during 2022 declined by 40% in comparison with 2021, being the first time that the increasing trend has changed since the introduction of ASF to the EU in 2014. A decline in positive rates of wild boar carcasses was observed in Hungary, Lithuania, Poland, Slovakia and Hungary. However, a steady increasing trend in the proportion of positive wild boar from passive surveillance was observed in Estonia and Latvia, while a stable trend continued in Romania.

For wild boar, a distinct seasonality was observed in Poland, Slovakia and Hungary, with clear peaks in the proportion of positive carcasses in winter and spring, and the lowest proportions during late summer. In contrast, no seasonality in the proportion of positive wild boar carcasses was seen in Germany and Romania, whereas a slight winter increase was observed in Estonia, Latvia and Lithuania. As previously observed, the seasonal patterns of positives rates among domestic pigs and wild boar are not synchronised. However, there should be additional research to understand the drivers of these trends. The number of potential secondary cases in wild boar attributed to one single source was calculated per year and affected country, to evaluate the extent of ASF spread in wild boar populations over time. In most countries, small or no changes were observed in the number of potential secondary cases in wild boar compared with 2021. A decrease in the number of secondary cases in wild boar was observed in Hungary, Lithuania and Slovakia, although this was not always related to a decrease in the number of officially reported ASF wild boar cases.

In 2022, despite the important decrease in the number of ASF cases in wild boar, the total area of restricted zones II + III (used as a proxy of wild boar-affected areas) in the EU slightly increased by 1%. Romania and Bulgaria contributed 50% of the total area of these restricted zones. The area of restricted zones II + III remained stable or slightly increased in all countries except Lithuania, where a slight decrease was observed.

As a consequence of the large decrease in the number of ASF cases in wild boar, the number of wild boar reported as direct lost due to ASF (sum of animals notified in ADIS as dead and killed) also showed a considerable decline in 2022, although differences were observed between countries. The declining trend of wild boar populations (approximated by the hunting bags) in the Baltic states reversed after 5 years, while it continued in Romania and Bulgaria, where ASF was introduced later. In other countries, where ASF is restricted to certain areas (Poland, Germany, Hungary and Slovakia), the countrywide wild boar populations continued to grow or did not show significant change after ASF introduction. This supports the negative relationship observed in this report between the proportion of the country with restricted zones due to ASF in wild boar and wild boar hunting bags.

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1. Introduction

Since the Genotype II of African swine fever virus (ASFv) was detected in eastern Europe in 2007, the virus has spread to numerous countries in Europe and far beyond (Asia, the Americas, Oceania). In the European Union (EU), Genotype II of ASFv was detected for the first time in 2014 in Eurasian wild boar (*Sus scrofa*) in Poland and the Baltic countries. Since then, African swine fever (ASF) has been reported in several EU countries, affecting kept and wild porcine animals (as defined in Article 4 of Regulation 2016/429[2]), here referred to as domestic pigs and wild boar.

As no vaccine is available, the control of the disease in the EU follows a regionalisation approach, comprising a set of control measures mostly based on preventive biosecurity measures, a restriction of the movement of domestic pigs and wild boar and their products, the culling of domestic pigs at affected establishments and the management of wild boar populations. Therefore, the collection of samples and analysis of the surveillance data are critical to evaluate the evolution of the disease and monitor the effect of the control measures on the target animal populations.

From 2016, the European Food Safety Authority (EFSA) has been producing annual epidemiological reports summarising the evolution of ASF Genotype II, analysing epidemiological trends and studying the risk factors involved in the occurrence of the disease, its spread and persistence[3]. The current report focuses on the epidemiological assessment of ASF Genotype II from 1 January to 31 December 2022 in the EU Member States and neighbouring countries that notified ASF outbreaks among domestic pigs or wild boar in 2022 to the Animal Diseases Information System (ADIS), hereafter referred to as 'affected countries'.

In 2022, 11 EU Member States were affected by ASF Genotype II. Estonia, Czechia and Hungary notified ASF cases in wild boar only; while Latvia, Lithuania, Poland, Germany, Slovakia, Romania, Bulgaria and Italy notified ASF cases in wild boar and outbreaks in domestic pigs. ASF Genotype I is still present in Sardinia (Italy), but due to the differences in epidemiological situation and as mentioned in the mandate and the protocol (EFSA, 2023), Sardinia was not included in this report. In this period, four non-EU countries notified ASF in ADIS (Moldova, North Macedonia, Serbia and Ukraine)

2. Data and methodologies

The data and methodology used for the current report were detailed in the protocol published in parallel as a technical report (EFSA, 2023). In summary, the report focuses on the epidemiological situation of ASF Genotype II for the year 2022 (from 1 January 2022 to 31 December 2022), taking into account the previous years for historical time series. Only the EU countries that notified ASF during 2022 (Estonia, Latvia, Lithuania, Poland, Germany, Czechia, Slovakia, Hungary, Romania, Bulgaria and Italy) and the neighbouring countries affected during 2022 reporting through ADIS (Moldova, North Macedonia, Serbia and Ukraine), are included in the report.

Throughout the report, in the tables and graphs, instead of alphabetically, the EU Member States are ordered based on their geographical location, from north to south, clearly differentiating from non-EU countries. A visual representation of that order can be found in Figure 1.

[2] Regulation (EU) 2016/429 of the European Parliament and of the Council of 9 March 2016 on transmissible animal diseases and amending and repealing certain acts in the area of animal health ('Animal Health Law'). OJ L 84, 31.3.2016, p. 1–208.

[3] See the ASF page on the EFSA Journal website for further publications on the topic: https://efsa.onlinelibrary.wiley.com/doi/toc/10.2903/1831-4732.african-swine-fever

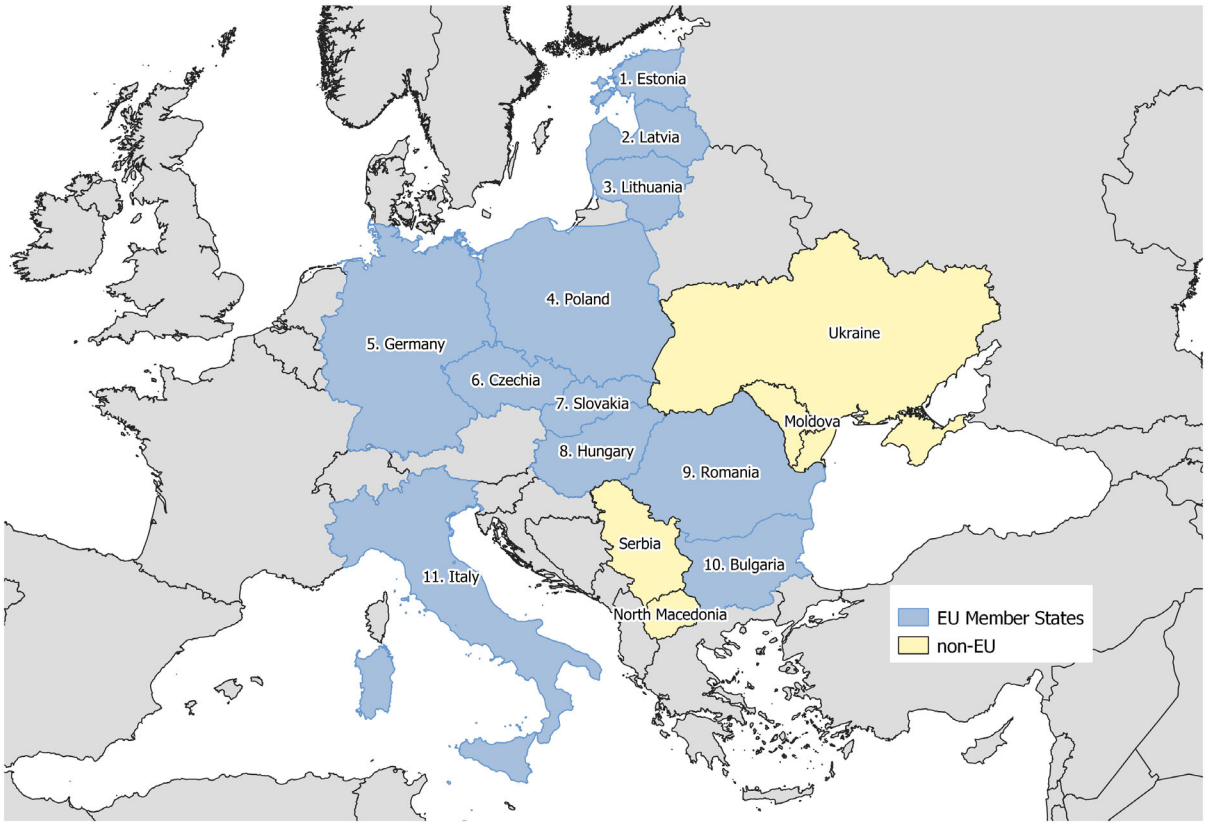

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Figure 1: Countries included in the report showing the order of appearance in the tables and graphs. In blue: EU Member States that notified ASF outbreaks in 2022; in yellow: non-EU countries that reported ASF outbreaks to the Animal Diseases Information System in 2022

To improve the harmonisation of the data collected and produce this report, six different data sources were used: (i) ASF laboratory results of samples for domestic pigs and wild boar that were submitted by affected countries to EFSA's Data Collection Framework (DCF) up to 31 January 2023 following the guidance for reporting laboratory data on ASF (EFSA, 2022a); (ii) data on the domestic pig population (location and type of establishments, number of animals, etc.) submitted by affected countries to the DCF up to 31 January 2023 following the guidance for reporting animal population data (EFSA, 2022b); (iii) data on ASF Genotype II outbreaks confirmed in 2022 notified in the EU's Animal Diseases Information System (ADIS), which was accessed on 1 February 2023; (iv) data on annual wild boar hunting bags (the number of harvested animals per km^2) that was collected by the ENETWILD Consortium up to 3 March 2023; (v) modelled wild boar abundance as published by the ENETWILD Consortium (2022); and (vi) data on EU restricted zone measures for ASF that were provided by the Directorate-General for Health and Food Safety up to December 2022[4].

In addition, representatives from the EU affected countries completed an online questionnaire to share contextual information about their ASF surveillance activities and wild boar management strategies (answers in Appendix A). A summary of the type of data available for each affected country can be found in Table 1.

[4] The latest version can be consulted on https://santegis.maps.arcgis.com/apps/webappviewer/index.html?id=45cdd657542a437c84bfc9cf1846ae8c.

Table 1: Availability of the different data sources used in the report, by affected country

	Country	Laboratory results in domestic pigs	Laboratory results in wild boar	Pig population data	ADIS outbreaks	Wild boar hunting data	Wild boar modelled abundance	EU zoning data	Surveillance questionnaire
EU Member States	Estonia	✓	✓	✓	✓	✓	✓	✓	✓
	Latvia	✓	✓	✓	✓	✓	✓	✓	✓
	Lithuania	✓	✓	✓	✓	✓	✓	✓	✓
	Poland	✓	✓	✓	✓	✓	✓	✓	✓
	Germany	No	✓	No	✓	✓	✓	✓	✓
	Czechia	✓	✓	✓	✓	✓	✓	✓	✓
	Slovakia	✓	✓	✓	✓	✓	✓	✓	✓
	Hungary	No	✓	No	✓	✓	✓	✓	✓
	Romania	✓	✓	✓	✓	✓	✓	✓	✓
	Bulgaria	No	No	✓	✓	✓	✓	✓	✓
	Italy	✓	✓	✓	✓	✓	✓	✓	✓
Non-EU countries	Moldova	No	No	No	✓	✓	No	NA	NA
	North Macedonia	✓	✓	✓	✓	✓	✓	NA	NA
	Serbia	No	No	No	✓	✓	✓	NA	NA
	Ukraine	No	No	No	✓	✓	No	NA	NA

The data were summarised in tables, maps and graphs, emphasising the major changes and evolution of the disease in EU Member States and non-EU countries in 2022. Additional information on the methods, for which explanation is required (i.e. potential secondary outbreaks), can be found in the protocol (EFSA, 2023). The rest of the analyses are descriptive and considered self-explanatory.

3. Assessment

3.1. Disease surveillance

3.1.1. ASF surveillance of domestic pigs

Passive surveillance (i.e. the investigation of clinical suspicions, including testing dead pigs and pigs with clinical signs) is considered the basis for the early detection of ASFv among domestic pigs. As an additional component to support timely detection, an enhanced passive surveillance can be implemented on establishments, based on the weekly testing of at least two dead post-weaning pigs (older than 60 days) as described by the EFSA AHAW Panel (2021) and as recommended for restricted zones in accordance with the 'Strategic approach to the management of African Swine Fever for the EU' (European Commission, 2020). Note that for small establishments where fewer than two dead pigs are found per week, it is recommended to test every single pig found dead. Such enhanced passive surveillance[5] is also used by the competent authorities of EU Member States to confirm freedom of disease status at domestic pig establishments prior to authorising animal movements in restricted areas, as prescribed by the European legislation (Regulation (EU) 2021/605[6]). Active surveillance activities that target apparently healthy pigs are not included in the current legislation and are not implemented unless considered necessary by the competent authority.

Via the online questionnaire that was developed for this report, all affected Member States reported that passive surveillance was implemented in the whole of their territories. Moreover, in seven of the affected Member States, the enhanced passive surveillance was implemented in the whole territory, and in four Member States it was limited to the restricted areas. According to the replies received, the target population for the enhanced passive surveillance was restricted in six of the Member States to

[5] Surveillance by means of testing with pathogen identification tests for ASF virus with negative results each week on at least the first two dead kept porcine animals over the age of 60 days or, in the absence of such dead animals over the age of 60 days, on any dead kept porcine animals after weaning.

[6] Commission Implementing Regulation (EU) 2021/605 of 7 April 2021 laying down special control measures for African swine fever. OJ L 129, 15.4.2021, pp. 1–64. This Regulation has been repealed by Regulation 2023/594, effective from 21 April 2023. Therefore, for the reporting period 2022, the previous Regulation applied.

commercial establishments or pig establishments that send animals to other establishments, whereas all types of establishment were targeted in five Member States.

Regarding active surveillance targeting apparently healthy pigs, various activities were reported by several affected Member States. Testing animals at slaughter was implemented but limited to restricted areas in two countries (Poland and Slovakia), whereas testing before moving animals outside restricted areas was implemented in three countries (Bulgaria, Hungary and Slovakia), again limited to restricted areas. In Czechia, testing before movement was only performed when passive surveillance is not done according to Regulation (EU) 2021/605 Art. 16 point 1(c). In addition, targeted sampling on non-affected establishments was carried out in Estonia once a year (see, further, Table A.1 in the Appendix A).

In the EU, 374 outbreaks in domestic pigs of ASF Genotype II were confirmed during 2022. According to the countries' responses in the questionnaire, the vast majority of outbreaks were detected through the passive surveillance based on testing clinical suspicions (93%), whereas eight outbreaks (2%) were detected using the enhanced passive surveillance based on regular weekly testing of at least two dead pigs. The other 5% (20 outbreaks) were detected by sampling pigs in relation to tracing from affected establishments.

Nine countries (eight EU and one non-EU country) submitted laboratory data related to test results from domestic pigs. In total, 638,280 samples originating from domestic pigs were analysed for ASFv Genotype II in the reporting countries, compared with 1,972,793 samples in the previous year. This reduction in the number of samples reflects a reduced surveillance effort targeting apparently healthy pigs (active surveillance[7]), as it decreased from 1,791,846 samples in 2021 to 376,283 samples in 2022 (Figure 2). Concurrently, an increasing trend in the surveillance effort targeting diseased and dead domestic pigs (passive surveillance[8]) can be observed. From 2021 to 2022, the number of samples tested as part of the passive surveillance has almost doubled from 128,882 to 248,489 samples. In all reporting countries but one (Poland), the number of samples tested as part of the passive surveillance was higher than the number tested as part of the active. This change coincides in time with the implementation of EU Regulation 2021/605, in which testing of apparently healthy domestic pigs is no longer prescribed. Moreover, the focus on surveillance components targeting diseased or dead pigs rather than apparently healthy pigs is in accordance with the recommendations given by the EFSA AHAW Panel (2021). This pattern also coincides with a large decrease in the number of outbreaks notified in 2022, which is explained in detail in Section 3.2.2.

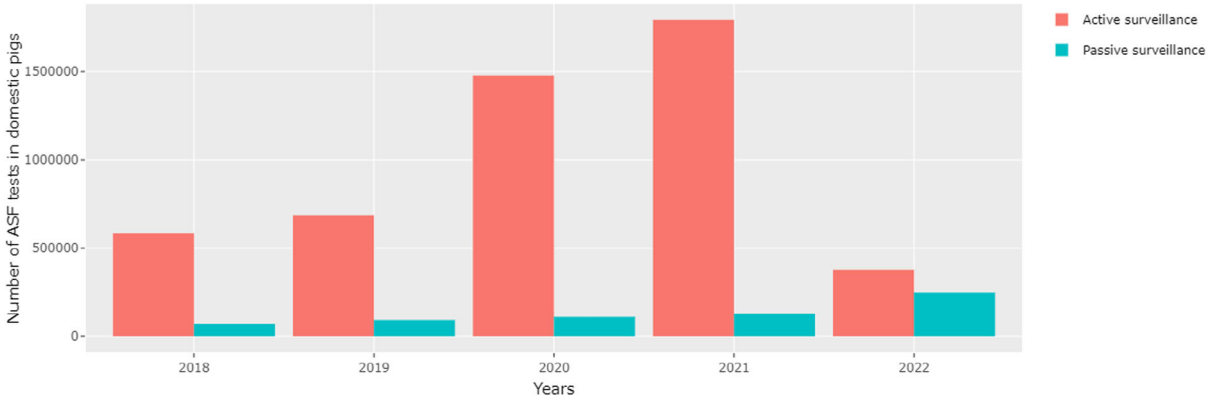

Figure 2: Number of domestic pig samples analysed for ASFv Genotype II by the reporting countries per year, differentiating active from passive surveillance components

More than 94% of samples originating from domestic pigs during 2022 were analysed only by PCR (587,595 samples), whereas approximately 4% of the samples were analysed only by ELISA tests (23,843 samples) and 2% of samples (12,888) were tested by PCR and ELISA in parallel. This can be compared with the previous reporting year, when 91% of samples were analysed by PCR vs 9% by

[7] 'Active surveillance' included the samples reported to the DCF as 'alive' or 'alive non-symptomatic', 'slaughtered', 'hunted' and 'hunted non-symptomatic' (for wild boar).

[8] 'Passive surveillance' included the samples reported to the DCF as 'alive symptomatic', 'dead (either symptomatic or asymptomatic)', 'culled animals' and 'hunted symptomatic' (for wild boar).

ELISA. Other tests, such as the indirect immune-peroxidase test (IPT), direct fluorescence antibody test and virus isolation were used on a limited number of samples (1,033 samples, 0.2% of tests).

In North Macedonia, 5,963 pig samples were analysed for ASFv only by PCR, almost equally distributed between active and passive surveillance components.

Table 2: Summary of the ASFv Genotype II surveillance results per surveillance component for domestic pigs, as reported by the affected countries. (–) represents no data submitted

	Surveillance component	Country	Sample results[a]				Establishments sampled[b]	Outbreaks[c]
			ELISA tests		PCR tests			
			Tests	%Pos	Tests	%Pos		
EU Member States	**Active surveillance**	Estonia	39	0	862	0	94	–
		Latvia	0		0		0	–
		Lithuania	1	0	1	0	1	–
		Poland	11,869	< 0.1	345,172	< 0.1	NA	–
		Germany	–		–		–	–
		Czechia	0		1,251	0	NA	–
		Slovakia	0		1,134	0	129	–
		Hungary	–		–		–	–
		Romania	21,281	0.2	3,677	2.2	1,350	–
		Bulgaria	–		–		–	–
		Italy	0		0		0	–
	Active surveillance total		**33,190**	**0.1**	**352,097**	**0.1**	**1,574**	–
	Passive surveillance	Estonia	93	0	2,803	0	85	0
		Latvia	29	0	3,133	0.8	52	6
		Lithuania	1,813	1.2	4,370	1.4	903	16
		Poland	186	0.5	185,869	0.1	NA	14
		Germany	–		–		–	3
		Czechia	0		1,348	0	NA	0
		Slovakia	0		3,459	0.4	186	5
		Hungary	–		–		–	0
		Romania	1,420	3.2	37,406	2.1	5,533	327
		Bulgaria	–		–		–	2
		Italy	0		4,035	0.1	1,225	1
	Passive surveillance total		**3,541**	**1.9**	**242,423**	**0.4**	**7,984**	**374**
	Total surveillance		**36,731**	**0.3**	**594,520**	**0.2**	**9,558**	**374**
Non-EU countries	**Active surveillance**	North Macedonia	0		2,939	0.9	NA	30
	Passive surveillance		0		3,024	1.9	NA	

Note: The proportions of positive test results do not correspond to the prevalence since the sampling was not necessarily done randomly.

(a): Sample data from countries reported to the data collection framework.

(b): Sample data were aggregated at the establishment/subunit level (e.g. farms, pastures, slaughterhouse). When subunit_Id was not submitted in the laboratory data or quality of data were not enough (at least 90% samples provided subunit ID) for aggregating data at establishment/subunit level, NA appears in the table.

(c): Outbreak data as reported to ADIS. As no differentiation can be done by the detection method, the total number of outbreaks were included only in the lower part of the table to avoid duplication.

Highlights

- Coinciding with regulatory changes and a 79% decrease in the number of ASF outbreaks in 2022, the number of samples tested as part of active surveillance activities has decreased by 80%, while the number of samples tested as part of passive surveillance almost doubled compared with the previous reporting year.
- The vast majority of samples (94%) were analysed using only PCR, whereas approximately 4% of the samples were tested by ELISA only, and 2% by both tests in parallel.
- The vast majority of outbreaks in the EU were detected through passive surveillance based on testing clinical suspicions (93%), while eight outbreaks (2%) were detected using enhanced passive surveillance based on weekly testing of at least the first two dead pigs at every establishment. The remaining 5% were detected by tracing contacts from infected herds.

3.1.2. ASF surveillance of wild boar

In the questionnaire sent for this report, all the affected Member States reported that they performed passive surveillance of wild boar with clinical signs or found dead in the whole country, including testing wild boar killed by vehicle collision. Six EU Member States (Estonia, Hungary, Latvia, Lithuania, Hungary, Romania and Bulgaria) reported that they tested all hunted wild boar in the whole country. Germany reported testing 100% of the hunting bag in the restricted areas and 7% in the rest of the country. The four other affected countries (Poland, Czechia, Slovakia and Italy) tested the hunting bags only in restricted areas (from 31.7% of the hunting bag in Poland, to 100% in Czechia).

The spatial distribution of the number of wild boar samples collected by NUTS 3 region relative to the wild boar abundance as estimated by the ENETWILD project (ENETWILD Consortium, 2022), is presented in Figure 3. The NUTS 3 regions where at least one sample of wild boar tested positive in 2022 are highlighted with red borders. As can be seen, the sampling efforts are highly heterogeneous spatially, with affected areas or areas neighbouring affected areas more intensively sampled. This pattern can be clearly observed at the affected borders between Poland and Germany and between Slovakia and Hungary. It can also be observed that wild boar surveillance in Czechia in the border region with Poland was more intensive than in the rest of the country, suggesting a risk-based surveillance approach: while all found-dead wild boar were tested in the whole country, this at-risk zone also implemented serological and virological tests on all hunted wild boar.

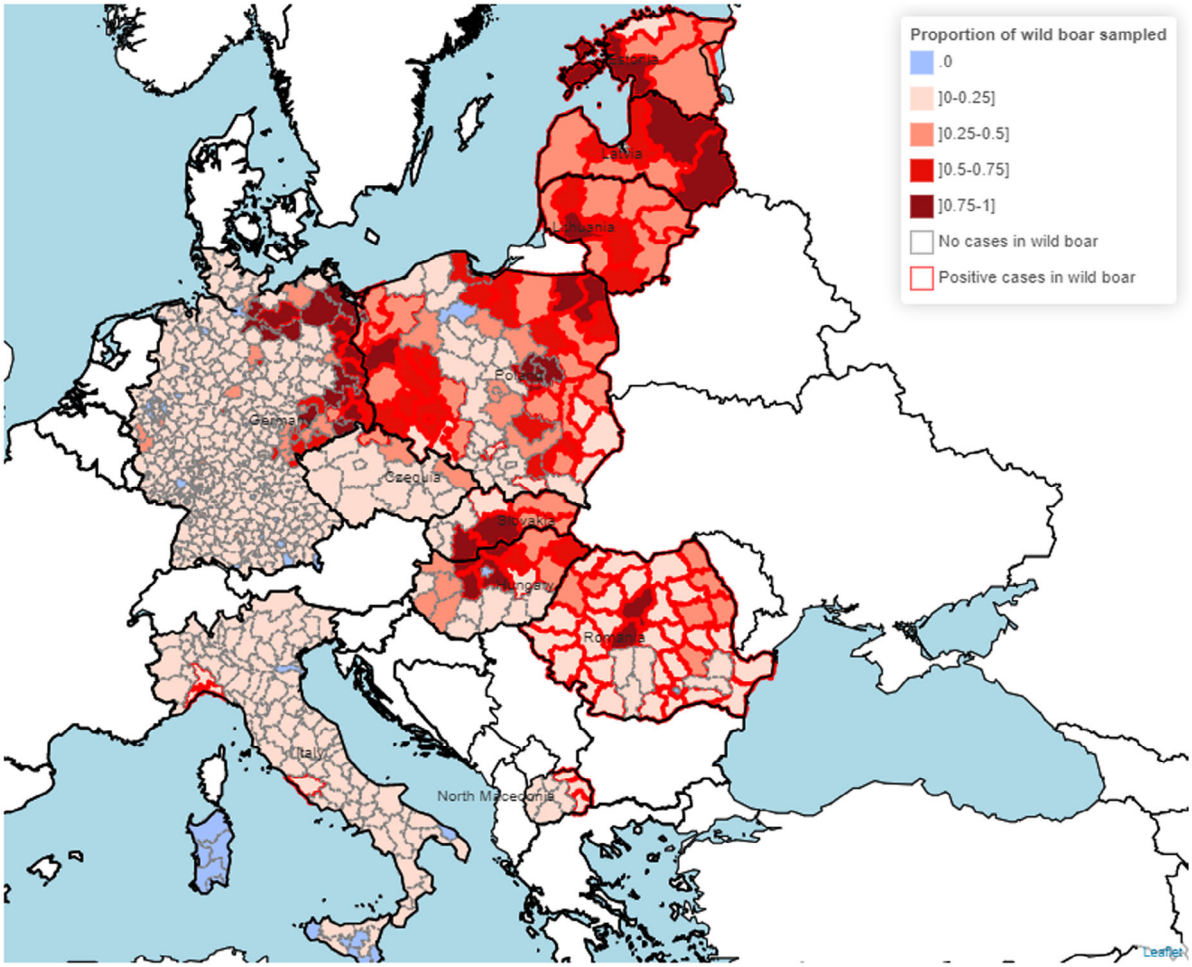

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Figure 3: Spatial distribution of the intensity of African swine fever (ASF) virus Genotype II surveillance of wild boar populations (NUTS 3 regions background colour) and of the presence of ASF cases in wild boar (NUTS 3 borders in red) in 2022. The intensity of ASF surveillance was approximated by the ratio between the number of wild boar samples tested for ASF and the wild boar abundance (heads) as estimated by the ENETWILD Consortium per NUTS 3 region in reporting countries

Eleven countries (10 EU and 1 non-EU) submitted laboratory data related to test results from wild boar (Table 3). In total, 496,482 samples from wild boar were analysed for ASF in 2022 (493,336 from EU countries and 3,146 from North Macedonia). This is an increase of more than 55,000 samples compared with the data reported in 2021, although two more countries reported in 2022. As observed in previous years (see Figure 4), most of the samples analysed in the Member States came from hunted wild boar (93% of samples in 2022), followed by wild boar found dead (4%) and road kills[9] (3%). In 2022, the number of samples from hunted wild boar increased by 13% and the road kills by 40%. However, the samples from found-dead wild boar have steadily decreased since 2020 (an approximately 12% decrease per year). This decrease in the number of found-dead wild boar samples could be multifactorial, involving an apparent decreased incidence of ASF in wild boar in the EU in 2022 (see Section 3.2.2), a decrease in population in certain areas (see Section 3.3.3), and a potential fatigue on carcasses reporting.

[9] Wild boar samples were classified as road-killed and reported as such by the countries, referring to wild boar found in close proximity to roads or railways.

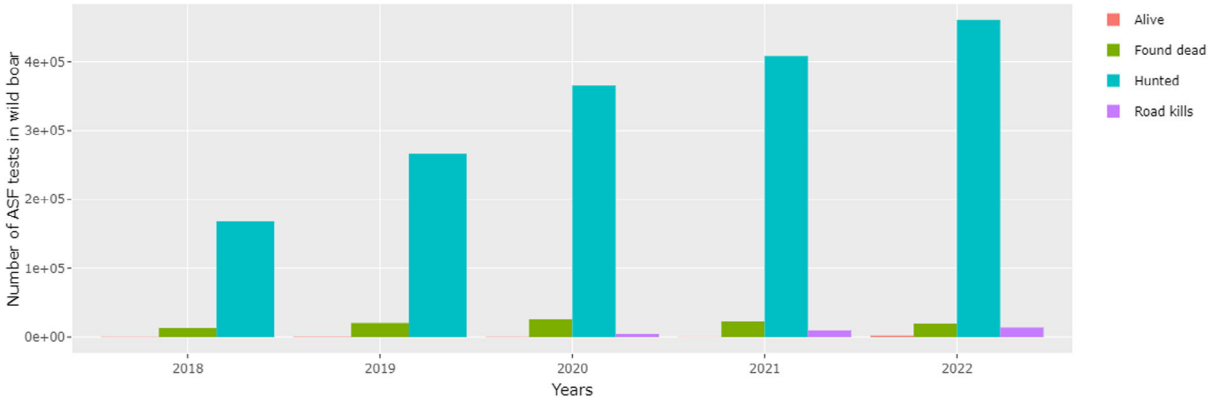

Figure 4: Number of samples from wild boar analysed for ASFv Genotype II by the reporting countries per year, differentiating the type of animal sampled

Approximately 63% of wild boar samples were analysed only by PCR test (313,115 samples), 30% were tested in parallel by PCR and ELISA (150,393 samples), followed by ~ 5% tested only by other tests such as IPT (23,836 samples; data not shown in Table 3) and 2% by ELISA only (9,138 samples). Most of these IPT tests were conducted in Slovakia on hunted asymptomatic wild boar samples (90% of the total IPT tests). The importance of using the correct samples with the appropriate tests, as recommended in the guidelines from the European Union Reference Laboratory for ASF (ASF EURL) (CISA, 2022), should be stressed. As previously mentioned (EFSA, 2021), this is essential for badly preserved samples such as fluids from found dead wild boar or haemolysed samples from hunted wild boar tested by ELISA, as they can give erroneous results if the appropriate test with the appropriate matrix is not used.

The positivity rates of wild boar samples differed between the tests used, and, importantly, by the category of wild boar sampled (hunted vs found-dead vs road-killed). An overall positivity rate of 1.5% was found for the wild boar samples analysed by PCR for ASFv Genotype II in the EU, and 0.7% for the ones tested by ELISA. As shown in Table 3, the positivity rate was highest for found-dead animals tested by PCR (27%), consistent with previous reports (EFSA, 2022c), with Latvia and Slovakia reporting more than 60% of PCR-positive carcasses. The positivity rate among hunted animals tested by PCR was under 1% for all countries except for Romania which reported 1.8% for PCR-positive hunted wild boar. Road-killed wild boar were PCR-positive in 0.5% of the samples, mostly driven by Estonia and Lithuania (four and one PCR-positive samples from road-killed wild boar, representing 10.3% and 13.3%, respectively), while the rest of countries presented very low rates. As in previous reports (EFSA, 2021, 2022c), the observed proportion of positive ELISA tests carried out on hunted animals or found-dead animals were rarely positive (< 1%), with a few exceptions in Latvia and Romania, which reported positive rates between 2% and 4%.

In North Macedonia, it was not possible to classify the samples in the same groups as for the other countries. However, the results of the PCR tests are quite similar to those observed in Slovakia or Romania, with a percentage of PCR positive samples in passive surveillance (equivalent to found-dead) of 50%, and 0.9% for active surveillance (similar to hunted animals).

Table 3: Summary of the surveillance results for ASFv Genotype II per type of wild boar sampled, as reported by the affected countries. Note that the total number of samples tested does not equal the number of ELISA and PCR tests, since some samples were analysed by ELISA, PCR and/or other tests. (–) represents no data submitted

	Sampled population	Country	ELISA tests		PCR tests		Total	
			Number of samples tested	%Pos	Number of samples tested	%Pos	Number of samples tested	%Pos[a]
EU Member States	**Hunted[b] wild boar**	Estonia	12,599	0.4	12,590	0.1	12,608	0.5
		Latvia	29,893	2.1	30,171	0.9	30,177	2.5
		Lithuania*	22,059	0.6	22,109	0.3	22,115	0.9
		Poland	66,273	0.1	129,405	0.4	130,381	0.4
		Germany	–		119,860	0.2	119,860	0.2
		Czechia*	7,697	0.0	13,315	0.0	13,678	0.0
		Slovakia	0		22,722	0.8	45,380	0.4
		Hungary	4,451	0.5	58,502	0.6	58,502	0.6
		Romania	15,178	1.8	16,119	1.8	24,140	2.3
		Bulgaria	–		–		–	
		Italy	0		2,398	0.4	2,398	0.4
	Total hunted		**158,150**	**0.7**	**427,191**	**0.4**	**459,240**	**0.6**
	Found-dead wild boar	Estonia	1	0.0	53	32.1	53	32.1
		Latvia	13	0.0	823	64.4	829	63.9
		Lithuania*	4	0.0	126	47.6	126	47.6
		Poland	113	0.0	4,489	39.5	4,491	39.5
		Germany	–		6,576	20.0	6,576	20.0
		Czechia*	639	0.0	1,068	0.0	1,289	0.0
		Slovakia	0		1,040	62.4	1,273	51.0
		Hungary	1	0.0	1,304	29.1	1,304	29.1
		Romania	185	3.2	389	57.3	541	41.6
		Bulgaria	–		–		–	
		Italy	0		3,290	7.6	3,290	7.6
	Total found dead		**956**	**0.6**	**19,158**	**27.1**	**19,772**	**26.3**
	Road-killed wild boar	Estonia[c]	31	6.5	39	10.3	39	12.8
		Latvia	6	16.7	6	0.0	6	16.7
		Lithuania	8	12.5	15	6.7	15	13.3
		Poland	30	0.0	5,953	0.6	5,953	0.6
		Germany	–		2,675	0.1	2,675	0.1
		Czechia*	350	0.0	585	0.3	664	0.3
		Slovakia	0		304	0.7	536	0.4
		Hungary	0		314	1.0	314	1.0
		Romania[d]	0[c]		0		0	
		Bulgaria	–		–		–	
		Italy	0		4,122	0.5	4,122	0.5
	Total road-killed		**425**	**0.9**	**14,013**	**0.5**	**14,324**	**0.5**
	Total wild boar in Member States		**159,531**	**0.7**	**460,362**	**1.5**	**493,336**	**1.6**
Non-EU countries	**Active surveillance**	North Macedonia[e]	0		1,988	0.9	1,988	0.9
	Passive surveillance		0		12	50	12	50
	Others		0		1,146	0.3	1,146	0.3

(a): A positive sample was defined as a sample that tested positive either by the PCR or by the ELISA test.

(b): 'Hunted wild boar' includes the samples reported to the data collection framework under the categories: 'hunted (symptomatic or not'), 'culled' and 'slaughtered'.
(c): Wild boar were classified as road-killed wild boar in Eastonia when they were found in close proximity to roads or railways.
(d): Road-killed wild boar in Romania were reported as found-dead wild boar as the national system did not differentiate between the categories. All road-killed wild boar were tested for ASF.
(e): Samples from North Macedonia were categorised differently from other countries, respecting the information provided for origin due to difficulties of assigning reporting categories in the laboratory.
*: At least one sample reported by these countries was made up of a pool of individual samples.

Highlights

- Surveillance activities for wild boar were more intensive in affected areas or in areas neighbouring affected areas.
- Most of the surveillance samples were taken from hunted wild boar (93%) followed by found-dead wild boar (4%) and road-killed wild boar (3%).
- Overall, PCR tests were positive for 1.5% of the analysed samples, while ELISA tests were positive for 0.7% of the samples.
- By PCR test, the highest positivity rates were obtained among found-dead wild boar (27.1%) followed by road-killed (0.5%) and hunted wild boar (0.4%).
- Testing found-dead wild boar by PCR appeared to be the most effective surveillance activity to detect infected individuals.

3.2. Spatial and temporal dynamics of the disease

3.2.1. Spatial dynamics

3.2.1.1. Spatial dynamics among domestic pigs

In 2022, 374 ASF outbreaks were confirmed and notified to ADIS among domestic pigs by eight Member States (Latvia, Lithuania, Poland, Germany, Slovakia, Romania, Bulgaria and Italy), compared with 1,807 outbreaks during the previous reporting year. In addition, 159 outbreaks were reported by non-EU countries (Moldova, North Macedonia, Serbia and Ukraine). All 12 countries that reported outbreaks among domestic pigs also notified cases among wild boar.

As in a previous report (EFSA, 2022c), within the EU, Romania was the country with the highest number of ASF outbreaks among domestic pigs (Figure 5), with 327 outbreaks reported across the territory, accounting for 87% of reported outbreaks in the EU. The remaining 47 outbreaks among domestic pigs in the EU were distributed across the other seven Member States. Comparing with 2021, Lithuania, which reported 16 outbreaks, experienced a local surge of outbreaks in the south-western part of the country during the third quarter of 2022 (Figure 6). Conversely, Poland, that notified 124 outbreaks among domestic pigs in 2021 distributed across the country, notified only 14 outbreaks in 2022, most of them clustered in the western regions. Estonia, which reported ASF outbreaks among domestic pigs in 2021, did not report any in 2022, even though it reported ASF outbreaks among wild boar (Figures 7 and 8). Italy notified for the first time the occurrence of ASFv Genotype II in mainland, with one single outbreak in domestic pigs in Latium, near Rome. No big changes occurred in the rest of the Member States that reported only low numbers of sporadic outbreaks, mostly during the third quarter (see Figure 5; Latvia, Slovakia and Germany).

Within the countries which reported outbreaks in 2022, a few long-distance viral translocation events are worth noting. In Germany, two isolated outbreaks were reported in the western part of the country; one in the north-western part of Germany involved one establishment of domestic pigs in Lower Saxony, and one in the south-western part of the country in Baden-Württemberg. Refer to Section 3.2.1.3 for a more precise description of these virus translocation events and others affecting wild boar populations, such as in Italy.

In the non-EU neighbouring countries, the situation deteriorated in comparison with 2021, as ASF continued to gradually spread in Serbia, where 107 outbreaks among domestic pigs were reported in 2022 (representing 67% of reported outbreaks in non-EU neighbouring countries). These outbreaks were mostly clustered in the north-eastern part of the country at the border with Romania, while it had been limited to the southern half of the country during the previous reporting period. North Macedonia, which did not report any ASF outbreaks in 2021, notified 30 outbreaks, mostly clustered in the eastern part close to Bulgaria. During 2022, Moldova notified an increased number of outbreaks in

domestic pigs (from 2 in 2021, to 15 outbreaks in 2022), and Ukraine notified 7 outbreaks spread across the country, mostly in the second half of the year, although external circumstances in the countries could have affected this reporting.

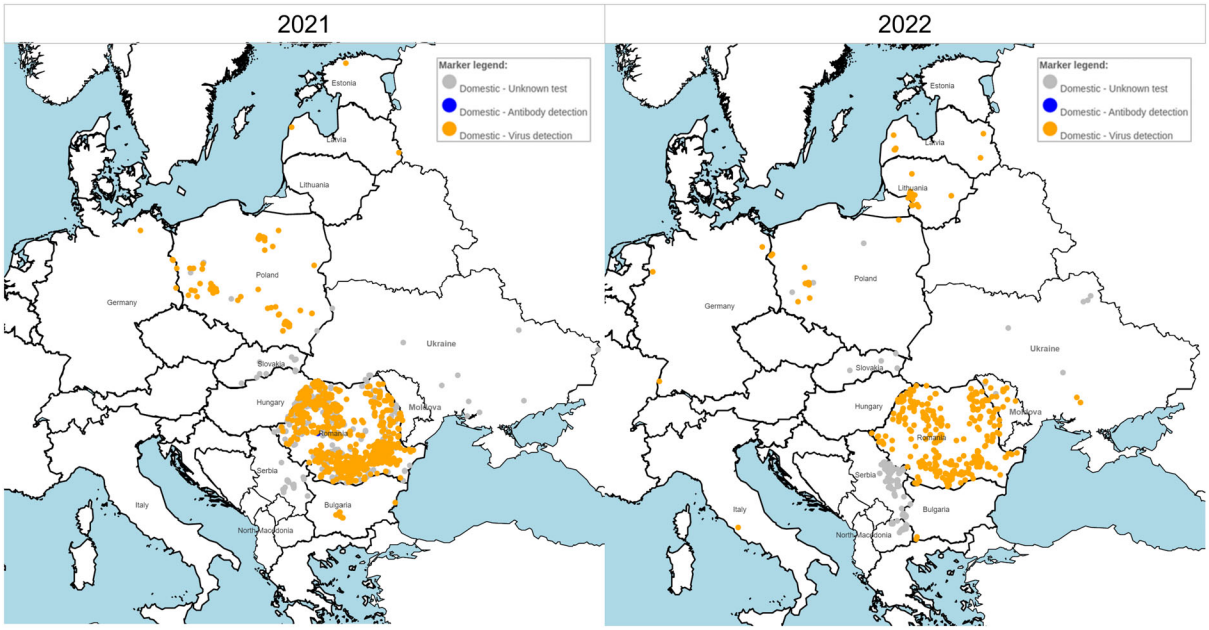

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Figure 5: Spatial distribution of ASFv Genotype II outbreaks among domestic pigs confirmed in 2021 (left) and 2022 (right). Source: ADIS, accessed 1 February 2023

To get a deeper insight into the spatiotemporal evolution of the disease, Figure 6 displays the distribution of ASF in the domestic pig sector, per quarter. For each quarter, the NUTS 3 regions (or GADM (Database of Global Administrative Areas)[10] in the case of Moldova and Ukraine) were coloured orange if at least one outbreak in domestic pigs had been notified during the previous quarter; grey if at least one outbreak in domestic pigs had been notified before the previous quarter; and white if no outbreak had been ever notified in domestic pigs. Overall, only 1.6% of the outbreaks notified in 2022 in the EU were in NUTS 3 regions not previously affected by ASF in domestic pigs, and just five NUTS 3 in the EU notified ASF outbreaks in pigs for the first time during 2022 (in Italy, Germany and Poland). Except for Romania, where ASF outbreaks occurred throughout the year, in the rest of the EU most outbreaks were notified in the second and third quarters, during the summer months.

During the first and second quarters, most of the domestic pig outbreaks were notified in Romania and Serbia in regions where ASF outbreaks were notified in domestic pigs in the previous quarter or before. In the first quarter, two new regions were affected in Serbia and North Macedonia. During the second quarter, two noteworthy long-distance translocation events occurred in south-west Germany and central Italy (see Section 3.2.1.4 for further details on these translocation events). At the same time, ASF continued to be notified by Romania and Serbia, there was one outbreak in Slovakia, in regions affected in the previous quarter and it reappeared in western Poland.

During the third and fourth quarters, half of the outbreaks were notified in NUTS 3 regions with ASF outbreaks notified in domestic pigs in the previous quarter (Romania and Serbia), another 40% were in regions affected before the previous quarter (more than 3 months without notification) and a few (only 5%) were in newly affected regions. Specifically, in the third quarter the virus was notified for the first time among domestic pigs in northwest Germany, probably the result of another long-distance translocation event, and on both sides of the northern part of the German–Polish border, probably the result of disease spill-over from infected local wild boar populations in which the virus

[10] Database of Global Administrative Areas, available in https://gadm.org/

was already circulating prior to 2022. In Serbia, two regions in the south-east bordering Bulgaria and North Macedonia were infected in the third quarter, while the disease spread to the northern region of North Macedonia in the last quarter of 2022. In Moldova outbreaks were notified across the country, in regions previously non-affected by ASF (Figure 6).

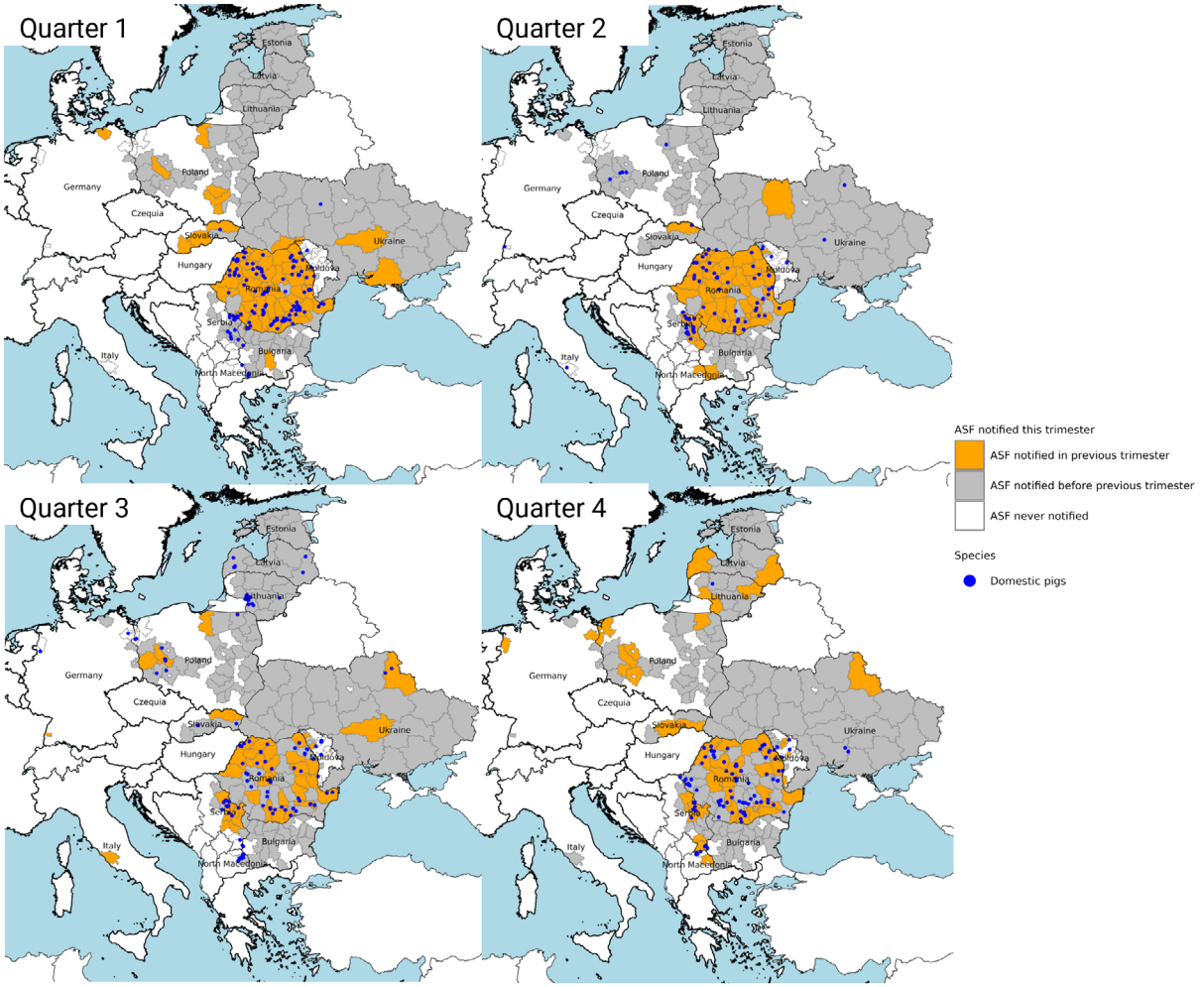

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Figure 6: Spatiotemporal distribution of ASF outbreaks among domestic pigs in 2022 per quarter per NUTS 3. Ukraine and Moldova divisions represent level 1 from GADM (Database of Global Administrative Areas), as NUTS 3 divisions do not cover them. Source: ADIS, accessed 1 February 2023

Highlights

- Eight EU countries (Latvia, Lithuania, Poland, Germany, Bulgaria, Slovakia, Romania and Italy), and four non- EU countries (Moldova, North Macedonia, Serbia and Ukraine) notified ASF outbreaks among domestic pigs to ADIS, and all of them also notified outbreaks among wild boar.
- Romania was the most affected EU country with 327 reported outbreaks among domestic pigs (87% of the outbreaks notified by EU countries).
- Except for Romania, where ASF outbreaks occurred throught the year, the rest of outbreaks in affected MS were very clustered temporally during second and third trimester, coinciding with the summer season.
- Among the non-EU countries reporting to ADIS, Serbia was the most affected by ASF, with 107 outbreaks (67% of the outbreaks notified to ADIS from the non-EU neighbouring countries), North Macedonia reported infections for the first time and Moldova notified outbreaks in previously non-affected regions.
- A single outbreak of ASF among domestic pigs was notified from mainland Italy; their first outbreak among domestic pigs caused by ASFv Genotype II.

3.2.1.2. Spatial dynamics among wild boar

As can be observed in Figure 7, during the current reporting period of 2022, ASF cases among wild boar were notified by 11 EU Member States (all the Member States with outbreaks among domestic pigs plus Czechia, Estonia and Hungary) and four non-EU countries (Moldova, North Macedonia, Serbia and Ukraine). The spatial distribution of wild boar cases in the EU was very similar to the previous year, with the exception of the introduction to mainland Italy in January 2022, and the re-occurrence in Czechia in December 2022 after more than 4 years of absence of the disease. As observed in Figure 7, ASF continued to occur in wild boar populations in the north-east (Baltic states), central and eastern Europe (Poland, Germany, Slovakia, and Hungary) and in the south-east (Romania and Bulgaria).

In the EU affected Member States, an expansion of the ASF cases was observed in Germany (near the Polish border), in Slovakia towards the west and in south-central Poland. Spatial expansion was associated with an increased number of cases in some countries (e.g. Latvia), while in others a spatial expansion occurred despite an overall decline in the number of cases reported (e.g. the area of Slovakia affected increased, while approximately 75% fewer outbreaks were notified in 2022 than in 2021). By contrast, some of the previously affected regions in Estonia, Lithuania and Bulgaria did not notify any cases among wild boar during 2022 (see Figure 7, left, for comparison). More detailed analysis of the temporal dynamics can be found in Section 3.2.2.1.

The four non-EU countries notified wild boar cases during 2022. In Serbia, ASF continued to spread, especially near the Romanian and Bulgarian borders, while the disease was reported for the first time in North Macedonia in January 2022 (see Section 3.2.1.2 for more detail). Very limited number of cases were notified in Moldova and Ukraine in wild boar (two and three), probably influenced by the external circumstances in the country.

If available, the type of test result used for case confirmation is presented in the maps. The majority of cases were PCR positive (21%), while 14% of cases were serological positive. The distribution of PCR/positive vs antibody/positive cases in a country or region is a reflection of the epidemiological situation. In some countries, the cases identified by virus detection were spatially clustered in comparison with cases reported by antibody detection (e.g. Bulgaria reported virus detection cases from the south-west; Lithuania from the south-west and Estonia from the south-eastern and north-eastern clusters), indicating the areas with a more active circulation of the virus (Figure 7).

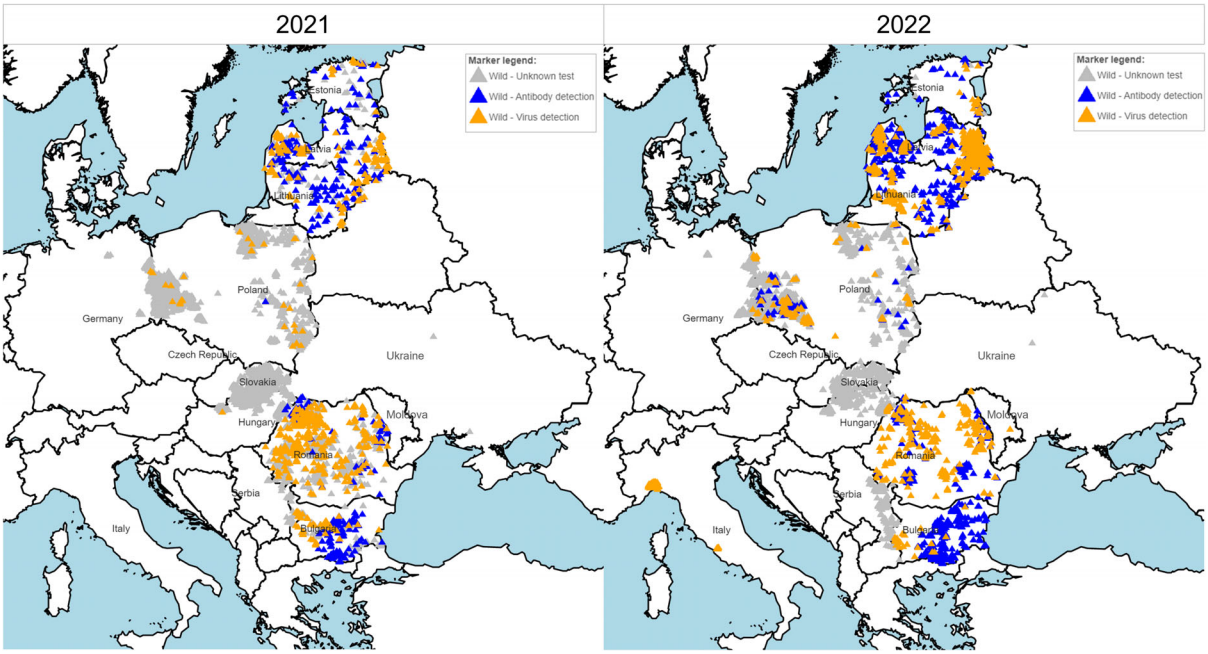

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Figure 7: Spatial distribution of ASF cases among wild boar confirmed during the year 2021 (left) and 2022 (right). Source: ADIS, accessed 1 February 2023

The spatiotemporal dynamics of ASF among wild boar in 2022 are presented in Figure 8. Overall during 2022, ASF persisted in wild boar populations across the Baltic states, many of the previously affected areas of eastern and western Poland, eastern Germany (close to the Polish border), Slovakia and Hungary, and expanded in isolated areas of Italy and Czechia. Among the non-EU countries, the disease expanded in eastern Serbia and North Macedonia, while almost no cases were notified in Moldova and Ukraine.

Only 2% of the wild boar cases notified in the EU during 2022 occurred in NUTS 3 regions not previously affected by the disease, and 14 new NUTS 3 got infected, suggesting a very slow expansion of the disease. In the first quarter of 2022, ASF was notified in most of the regions (NUTS 3) that had already been affected in the past or in the last quarter of 2021, except for 4% of the cases notified in areas previously not affected. Specifically, in Italy (the first case on mainland Italy; see Section 3.2.1.3 for more detail), one new region each in Slovakia and Poland. In the non-EU countries, new areas were affected in eastern Serbia, North Macedonia (first time affected in 2022) and one eastern region in Moldova.

In the second quarter, only 3% of the outbreaks notified occurred in areas previously unaffected, namely in central Italy, southern Poland (near the Slovakian border) and Serbia. However, many areas previously affected, particularly in Estonia, Romania and Bulgaria, did not report any cases.

In the third trimester, several NUTS 3 regions previously affected in Bulgaria, south and central Romania, eastern and western Poland, no longer reported wild boar cases. Only 0.5% of cases in this trimester were notified in newly affected regions. By contrast, antibody cases were notified by Estonia (see Figure 7), and a surge of cases was observed in eastern Latvia (near the borders with Russia and Belarus).

In the fourth quarter, a large number of cases continued to be reported from eastern Latvia and, additionally, a resurgence of cases was observed in eastern Bulgaria and eastern Serbia, in areas heavily affected during the first quarter of 2022. Czechia reported one wild boar case in a northern region bordering Poland that was affected for the first time, and a few countries reported cases in previously ASF-free regions (Germany, south-central Poland, North Macedonia and Serbia). In the last quarter of 2022, no cases were reported in several NUTS 3 regions within previously affected areas in eastern and western Poland, eastern Germany, Romania and Bulgaria.

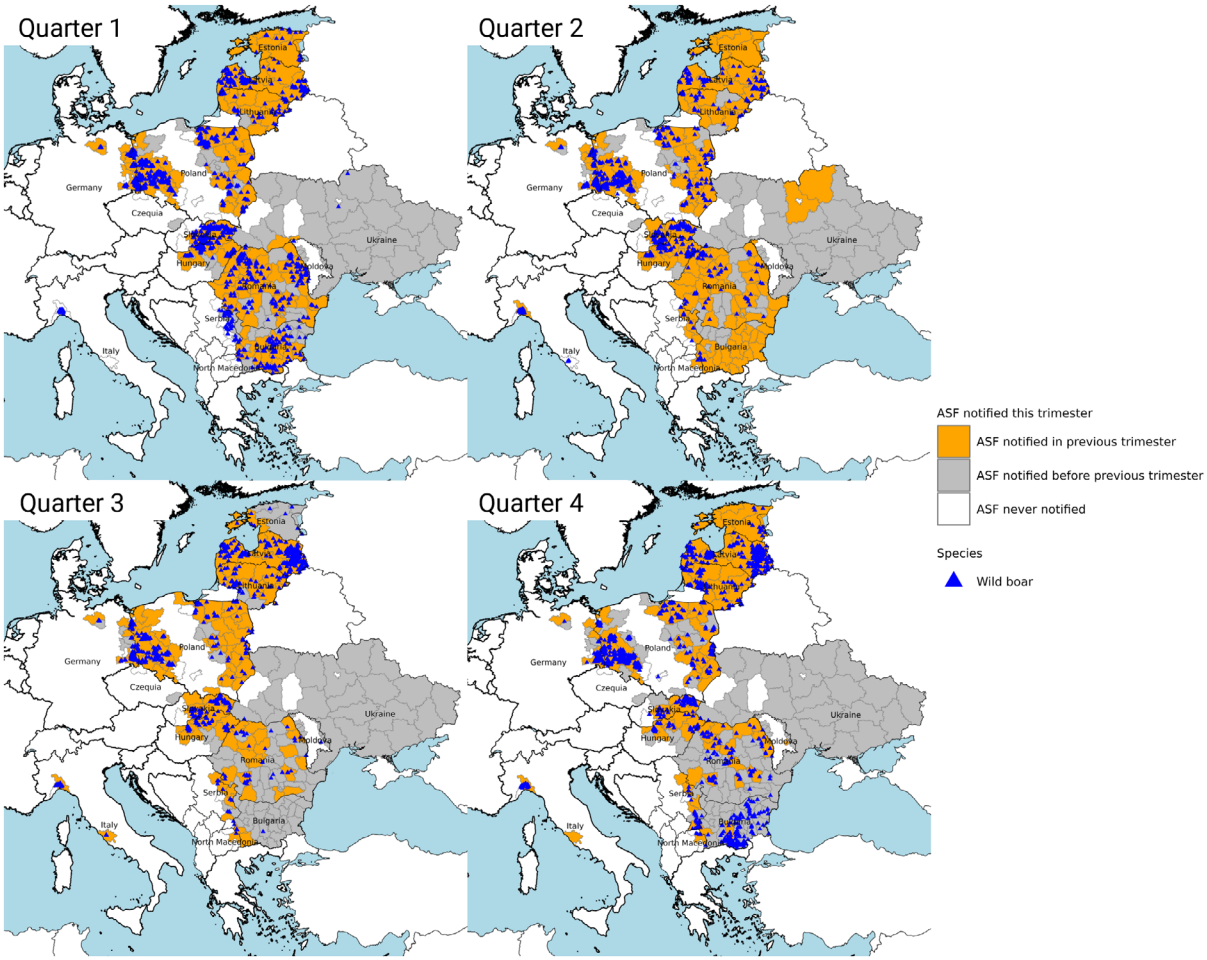

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Figure 8: Spatio-temporal distribution of ASF cases among wild boar in 2022 per quarter per NUTS 3. Ukraine and Moldova divisions represent level 1 from GADM (Database of Global Administrative Areas), as NUTS 3 divisions do not cover them. Source: ADIS, accessed 1 February 2023

Highlights

- In 2022, 11 EU countries (Estonia, Latvia, Lithuania, Poland, Germany, Czechia, Slovakia Hungary, Romania, Bulgaria and Italy) and 4 non-EU (Moldova, North Macedonia, Serbia and Ukraine) notified ASF cases in wild boar.
- The most relevant events among wild boar occurred on mainland Italy (the first introduction of ASFv Genotype II) and Czechia (a recurrence after an absence of 4 years).
- During 2022, ASF generally persisted in wild boar populations across the Baltic states and many of the previously affected areas of Poland, Germany, Slovakia, Hungary, Romania and Bulgaria.
- Some newly affected areas reported ASF wild boar cases (south-central Poland and eastern Serbia), while other previously affected regions in Estonia, Romania or Bulgaria did not report any wild boar cases.
- In the non-EU countries, the disease spread in eastern Serbia, and in the north-eastern part of North Macedonia, that got newly affected in 2022.

3.2.1.3. Translocation events

This section describes in more detail the translocation events which occurred in 2022 in the EU, emphasising the epidemiological information associated with the cases and genetic information that can elucidate the routes of introduction.

In addition, countries were asked about the use of whole genome sequencing (WGS) for analysing ASFv isolates. Use of WGS was reported from only four countries, and included up to a maximum of 25% of the samples. In those countries, WGS was used for the first occurrence in the country, or in a new area, when no epidemiological connection to other outbreaks had been described. One country reported routinely sending 30–40 samples for WGS every year. Detailed information on WGS is provided below for the two countries (Germany and Italy) where translocation events have been observed in 2022.

Germany: During 2022, long-distance translocation was observed in two of the three domestic pig outbreaks in Germany. These occurred in two federal states that had not previously been affected and had not experienced any wild boar cases. The source of introduction could not conclusively be explained in these cases.

WGS analysis were performed in the ASFv isolates from both outbreaks and results were compared with WGS from other German isolates. Genetic sequencing revealed in the case from north-west Germany a close relationship with the cases in eastern Germany (Forth et al., 2023), whereas no such relationship could be established for the case in the south-west of Germany. Human activity is suspected to be the origin of both outbreaks.

Italy: During 2022, two long-distance translocation events occurred on the Italian mainland namely Piedmont and Liguria regions (northern Italy) in January, and Latium region (central Italy), Rome municipality, in May. In both areas, affected wild boar were sampled as part of the passive surveillance activities of the national plan for ASF. Initial sequencing of the p72 gene from the index cases showed a very high homology with p72 Genotype II ASFv strains isolated in Europe and Asia from 2007 to date. This demonstrated the link with the current epidemics taking place worldwide and excluded an introduction from Sardinia, where Genotype I is present.

To date in Italy, the only ASF outbreak among domestic pigs outside Sardinia occurred in Latium region, near Rome, on 9 June 2022, in an area with a presence of infected wild boar. Two sows were found dead with typical lesions suggesting ASF at a small outdoor breeding establishment, with nine pigs in total. The establishment had been visited by the local veterinary services two weeks before the outbreak and was waiting for the scheduled depopulation activities due to its closeness to the wild boar index case. Since then, no further ASF outbreaks have been reported among domestic pigs on mainland Italy.

In Latium, a suspected wild boar case was reported in Rieti, very close in time (three weeks later) and in space (90 km) to the Rome cluster. Despite the weak positive reaction in the PCR analysis (RT-PCR positive in the 34th cycle), the case was initially considered to be a confirmed case of ASF in wild boar applying the precautionary principle. However, no viral isolation was possible in the sample and, after 4 months of enhanced surveillance in the area, the absence of ASFv circulation in the area was

demonstrated. Therefore, the Rieti case was downgraded to an unconfirmed case, based on these epidemiological and diagnostic findings.

Additional sequencing analyses were performed in the two regions to try to obtain additional information on the origin of the virus. The genetic material from the cases in the northern regions (Piedmont e Liguria) and Latium region was sent to the ASF European Reference Laboratory (EURL) for genetic analysis following the multi-gene sequencing approach described by Gallardo et al., 2023.

Those analysis placed the Italian strains from both regions within the following groups: variant 1 of the Central variable region (CVR), variant 2 of the intergenic region (IGR) between the I73R and I329L genes and variant 1 of the intergenic region between the multigene family (MGF)505 9R and 10R genes and variant 1 of the O174L and K145R genes. Been these variants (CVR-1, IGR-2 and MGF-1, O174L1 and K145R1), the predominant pattern among the circulating ASFVs in Europe and Asia (EURL CISA-INIA report). However, further genetic analysis on the ECO 2 region (IGR between I329L and I215L and partial sequencing of I215L) placed the isolates from the north and central Italy in different groups, suggesting two different sources of virus introduction.

In addition, WGS was performed on isolates from both regions in Italy (Giammarioli et al., 2023a,b). Statistical analysis of WGS data of isolates seems to rule out a link with the affected zones in Piedmont and Liguria, supporting the results of the multi-gene sequencing approach.

Highlights

- The genetic analysis of the Italian isolates from the two newly infected regions (Piedmont/ Liguria and Latium) following a multi-gene sequencing approach suggests two different sources of introduction of the virus.
- The WGS analysis of the two long-distance translocation events observed in Germany in 2022 suggests a close relationship between the north-western outbreak and cases in eastern in Germany, while no relationship was identified with the south-western outbreak.
- The existing tools (multi-gene sequencing approach and WGS) for the characterisation of ASFv demonstrated their value for tracing and classifying European ASF isolates. However, access to a higher number of sequences from epidemiologically relevant isolates is needed in order to be able to compare and improve the results of those analyses.

3.2.2. Temporal dynamics

3.2.2.1. Time profile

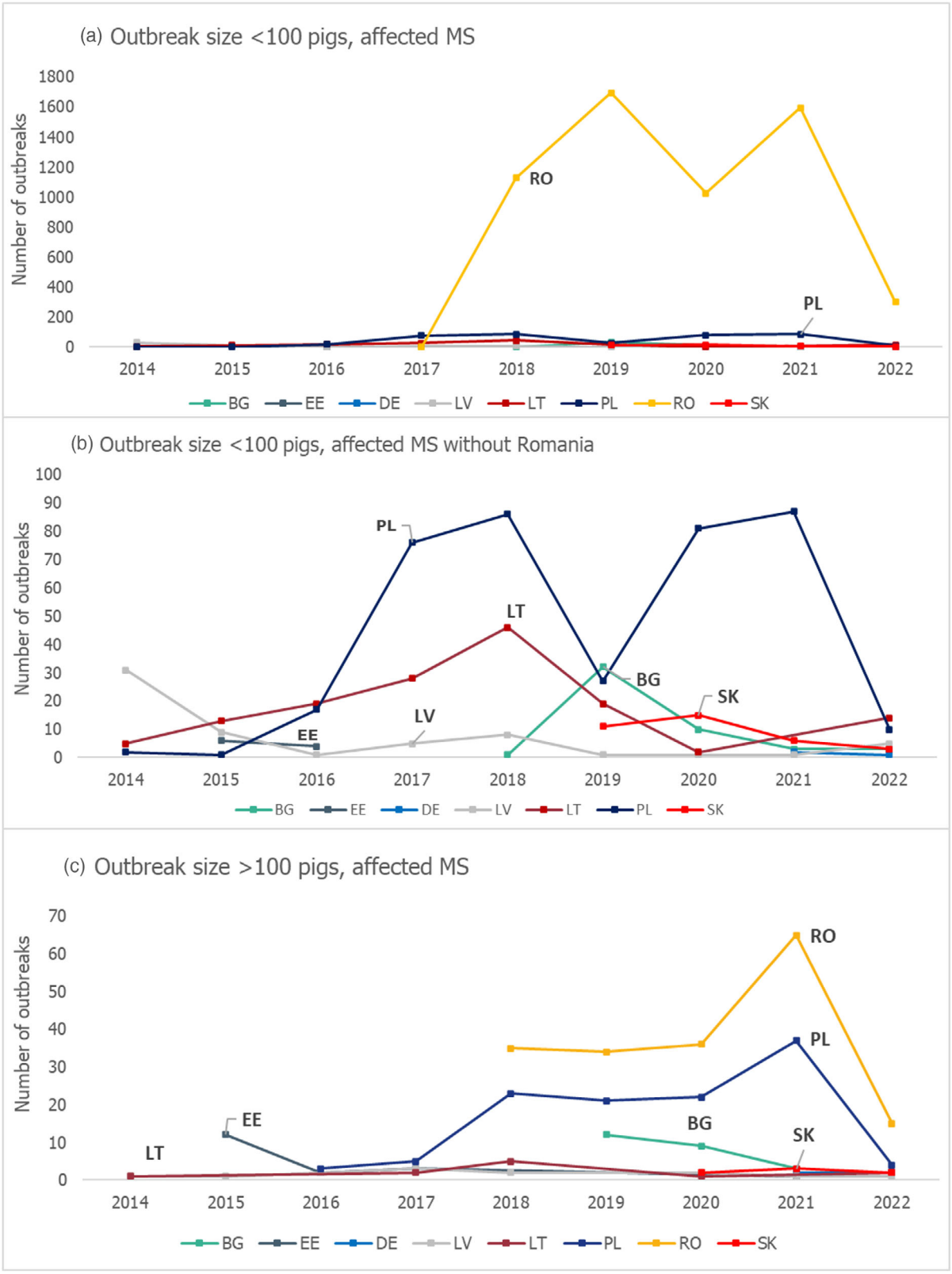
Domestic pigs

The temporal dynamics of the numbers of outbreaks per country were investigated for all EU Member States that had reported ASF outbreaks among domestic pigs for more than 1 year (Figure 9). The outbreaks were divided into two categories based on the number of susceptible pigs reported in the outbreak, considering 100 pigs as the threshold. The total number of outbreaks occurring on establishments with fewer than 100 pigs was 17 times higher than the ones on bigger establishments for the whole reporting period. This is also relevant when analysing the impact of the disease on the pig sector (see Section 3.3.2). When analysing the outbreaks on establishments with fewer than 100 pigs (Figure 9a), there was an important peak in Romania in 2018 and 2019, followed by small decrease in 2020 and a resurge in 2021, leading to a characteristic 'M' shape on the graph. Over these 4 years, more than 1,000 outbreaks were reported per year on establishments with fewer than 100 pigs. This trend drastically declined in 2022, when only 300 outbreaks of this type were reported in Romania. As discussed later, in the impact Section (3.3.2), in several affected countries including Romania and Bulgaria, an important decrease in the number of establishments with fewer than 100 pigs was reported in 2022. This could be directly related to the decline in outbreaks reported on that type of establishment.

Due to the substantial differences in the number of outbreaks between Romania and the other countries, it was impossible to visualise the trends of the other countries in Figure 9a. Therefore, a second graph (Figure 9b) was produced to plot the outbreaks on establishments with fewer than 100 pigs in Member States excluding Romania. In the second graph, a similar pattern to that observed in Romania is visible for Poland from 2018 until 2021, followed by a considerable decrease in 2022. In some countries, a steady or slightly decreasing trend over the last few years can be observed (Bulgaria

and Slovakia), while in Lithuania a slightly increasing trend is observed over recent years. This trend in Lithuania is mostly caused by the cluster that occurred during summer in the south-western region, as described previously in the Section 3.2.1 on spatial dynamics.

In establishments with more than 100 pigs (Figure 9c), the highest numbers of outbreaks were reported in 2021 by Romania and Poland, which was followed by a considerable decreasing trend in 2022, as previously seen for the smaller establishments. In Bulgaria, outbreaks on large establishments also decreased substantially from 2020 to 2022, while other affected countries only reported very sporadic outbreaks on large establishments (Figure 9c).



BG: Bulgaria; DE: Germany; EE: Estonia; LT: Lithuania; LV: Latvia; PL: Poland; RO: Romania; SK: Slovakia.

Figure 9: Yearly numbers of ASFv Genotype II outbreaks among domestic pigs notified in ADIS by EU Member State from 2014 to 2022. Countries with only 1 year of observations are excluded

Wild boar

Since ASFv Genotype II entered in the EU in 2014, 2022 was the first year when a decrease in the number of ASF cases in wild boar was observed. Despite the new introductions in Italy and Czechia, and the increase of wild boar cases in Latvia, in 2022 the number of wild boar cases declined by 40% in 2022 in comparison with 2021 (12,115 vs. 7,138 cases) (Figure 10). This overall decline is associated to the reduction of wild boar cases in Poland, Hungary, Germany and Slovakia. It can be hypothesised that this reduction likely reflects a true decrease of ASF cases, but a reduction in surveillance intensity due to a reporting fatigue or a lack of acceptability by field searchers cannot be excluded.

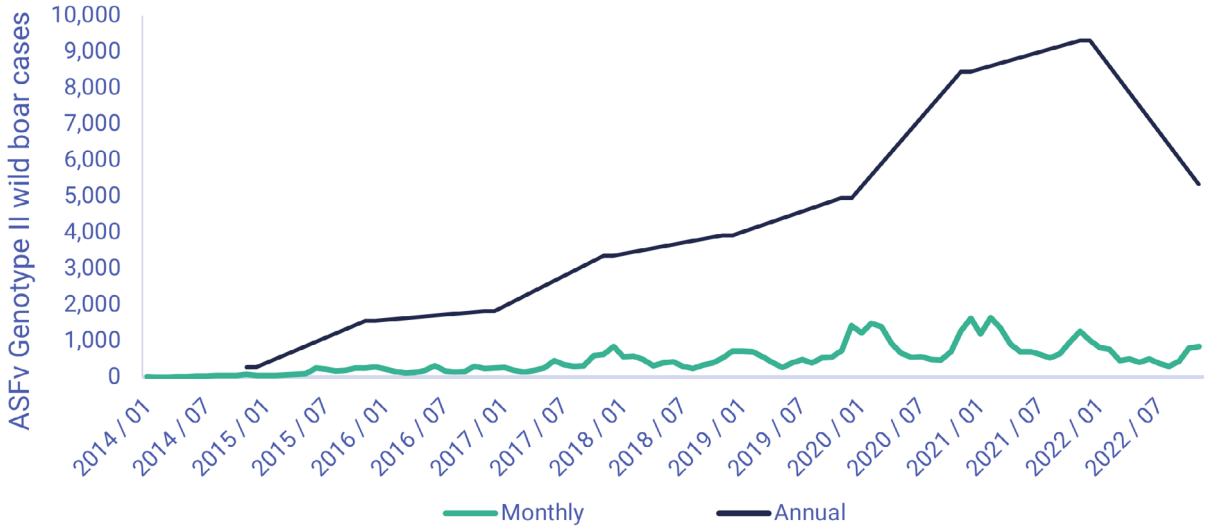


Figure 10: Monthly (grey) and annual (blue) numbers of ASFv Genotype II wild boar cases notified by the EU Member States to the Animal Diseases Information System, from 2014 to 2022

The proportion of positive samples from wild boar tested by PCR or Ab ELISA (herein called ELISA) as part of passive surveillance activities (found dead or hunted with clinical signs) is shown in Figure 11. This analysis was not feasible for the recently affected countries, nor for those with only 1 year of data available (i.e. Czechia, Germany, Italy and North Macedonia). Consequently, the analysis was only performed for the countries affected and that had been reporting data to the DCF for more than three consecutive years: the Baltic states and Poland, Hungary, Slovakia and Romania. This analysis was also done for the active surveillance samples (mainly hunted animals), but as all the countries showed a plain graph with values near or at zero, the graphs were not included in the report.

As in the previous reports (see EFSA, 2022c), the proportion of wild boar testing positive by PCR through passive surveillance has generally been much higher than the proportions testing positive to ELISA. Additionally, wide confidence intervals around the trend lines in the proportion of ELISA-positive samples, except for Romania and Poland, hinder reliable estimates of trends in positive rates from the results obtained with this type of test.

In the three Baltic states, a steady increasing trend in the proportion of PCR-positive samples from passive surveillance is observed, which started in mid-2020. The increasing trend in PCR-positive carcasses in the Baltic states may be related to recovering wild boar populations in this region (see Section 3.3.3 for more details).

In Poland, a declining trend in the proportion of positive wild boar samples, which started in 2020, continued in the reporting period, with the marked seasonality (winter peak) also observed in previous years. In Slovakia and Hungary, where no ELISA results were reported for wild boar samples, a clear declining trend in the proportion of PCR-positive samples was observed from the beginning of 2021. By contrast, in Romania, a stable trend of a high proportion of positive samples continued from the previous years into the reporting period, with high seasonality in 2022 (higher proportions of positives around the winter months).

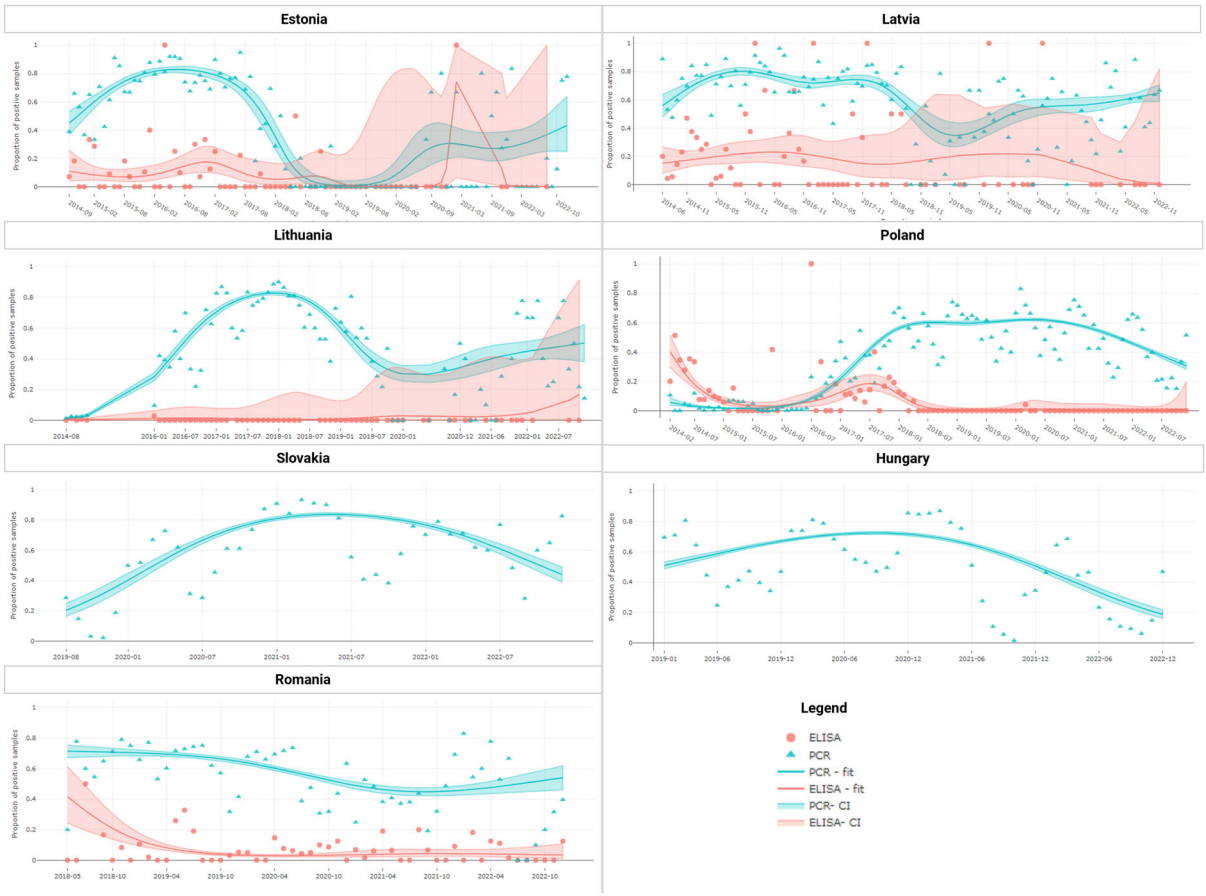


Figure 11: Proportion of ASFv Genotype II-positive samples over the tested samples (by Ab ELISA and PCR) from wild boar during passive surveillance activities in the ASF-affected countries. *Note: Only ASF-affected countries that had reported laboratory results to EFSA for more than three consecutive years were included in the analysis*

Highlights

- An important decline in the numbers of outbreaks among domestic pigs was observed in most EU Member States, on both small (≤100 pigs) and large establishments (>100 pigs, except in Lithuania where a slight increase was observed.
- This decreasing trend was strongly marked in Romania, Poland and Bulgaria, where the number of outbreaks among domestic pigs was reduced by between 50% and 80% comparing with 2021, coinciding with a reduction in the number of pig establishments.
- In 2022, the number of cases notified in wild boar decreased by 40% in comparison with 2021. This is the first time since the introduction of ASFv Genotype II in the EU in 2014 that a decline in the total annual number of cases in wild boar is observed.
- A declining trend in the proportion of positive wild boar carcasses was observed in Hungary, Lithuania, Poland, Slovakia and Hungary.
- A steady increase in the proportion of PCR-positive wild boar from passive surveillance was observed in Estonia, Latvia and Lithuania, while this proportion remained stable in Romania.

3.2.2.2. Monthly seasonality plots

Domestic pigs

For domestic pigs, the seasonality in the EU was described by numbers of outbreaks per month in 2022 (Figure 12), while the data from 2014–2021 is displayed in Appendix B (Figure B.2). Similar to the analysis of the outbreak evolution, the outbreaks were split based on establishment size, with a threshold of 100 pigs, and Romania was shown separately. On all establishments with domestic pigs, be

they small (≤ 100 pigs) or large (> 100 pigs), a clear seasonal trend was observed for several years, with more outbreaks occurring during the summer season (June to September), as described in previous reports (EFSA, 2021, 2022c) and shown in Figure B.2 of the Appendix B. This summer trend is still observed in 2022 in the EU Member States with the exception of Romania, although the numbers are much smaller than in previous years. In Romania, in 2022 a winter and a summer peak were observed in small establishments and no peak for the larger establishments (Figure 12b).

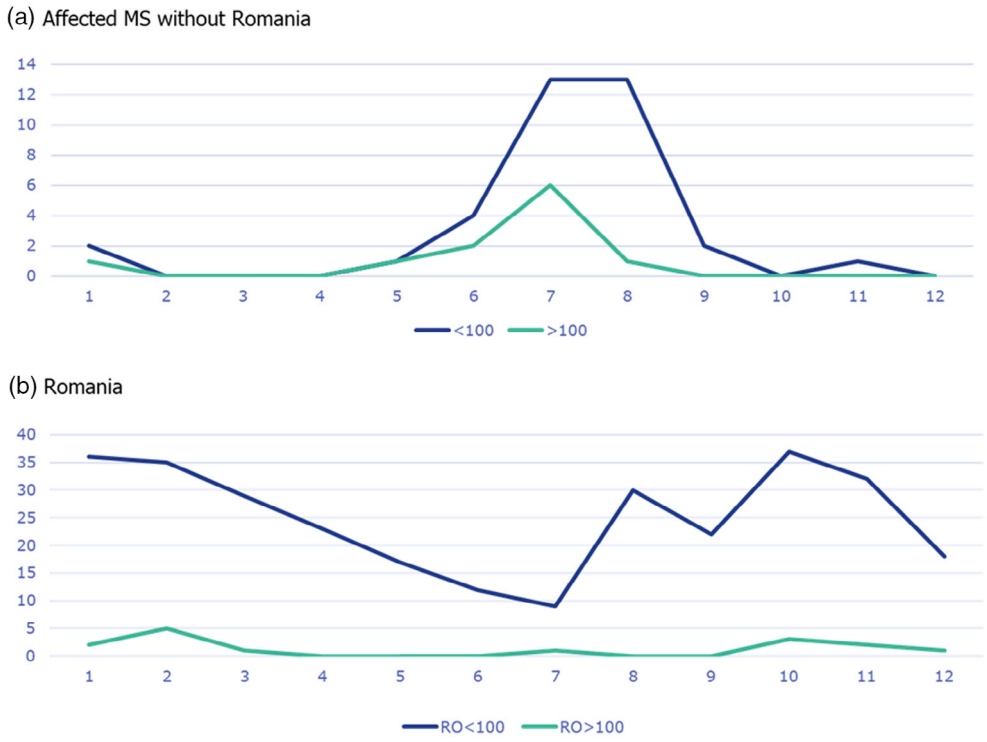


Figure 12: Temporal distribution of the numbers of outbreaks on domestic pig establishments with fewer than 100 pigs or more than 100 pigs in the EU Member States except Romania (a) and in Romania (b), by month of confirmation in 2022

Wild boar

The seasonality of PCR-positive wild boar found dead was calculated and plotted for all countries with sufficient data available. Czechia, Italy and North Macedonia were excluded due to the lack of sufficient temporal coverage, i.e. less than one year since introduction, while Bulgaria did not report laboratory data. Figure 13 shows the proportions of PCR-positive samples from wild boar tested through passive surveillance activities. The proportions of PCR-positive samples from active surveillance remained low throughout the year without visible seasonal patterns and are thus not shown.

In four out of eight countries from which data were available, the seasonal pattern in the proportion of PCR-positive wild boar carcasses was absent (Germany and Romania) or weakly marked (Estonia and Latvia) with a tendency for a slightly higher proportion of positives during winter and early spring. This tendency was more pronounced in Lithuania, where the highest proportion of found-dead PCR-positive wild boar was found in the period January–April. The seasonal patterns in Poland, Slovakia and Hungary had a unimodal distribution of detected PCR-positives with a peak in winter and spring and the lowest proportions during late summer (August–September). This lowest proportion of positive samples in warmer months have been previously observed in other EFSA reports (EFSA, 2020, 2021, 2022c), and as previously mentioned, the reasons behind it are likely to be multifactorial, including wild boar ecology and wild boar management (hunting and carcass search intensity) as well as climatic and viral conditions (EFSA, 2020).

This is in contrast with the seasonality of outbreaks in domestic pig in most of the EU (Figure 12) where a clear summer peak has been observed over the years. Further investigation is required to establish the possible drivers of the observed seasonality and differences between countries (e.g. climatic conditions, carcass persistence and carcass decomposition status, wild boar mortality, sampling effort and timing).

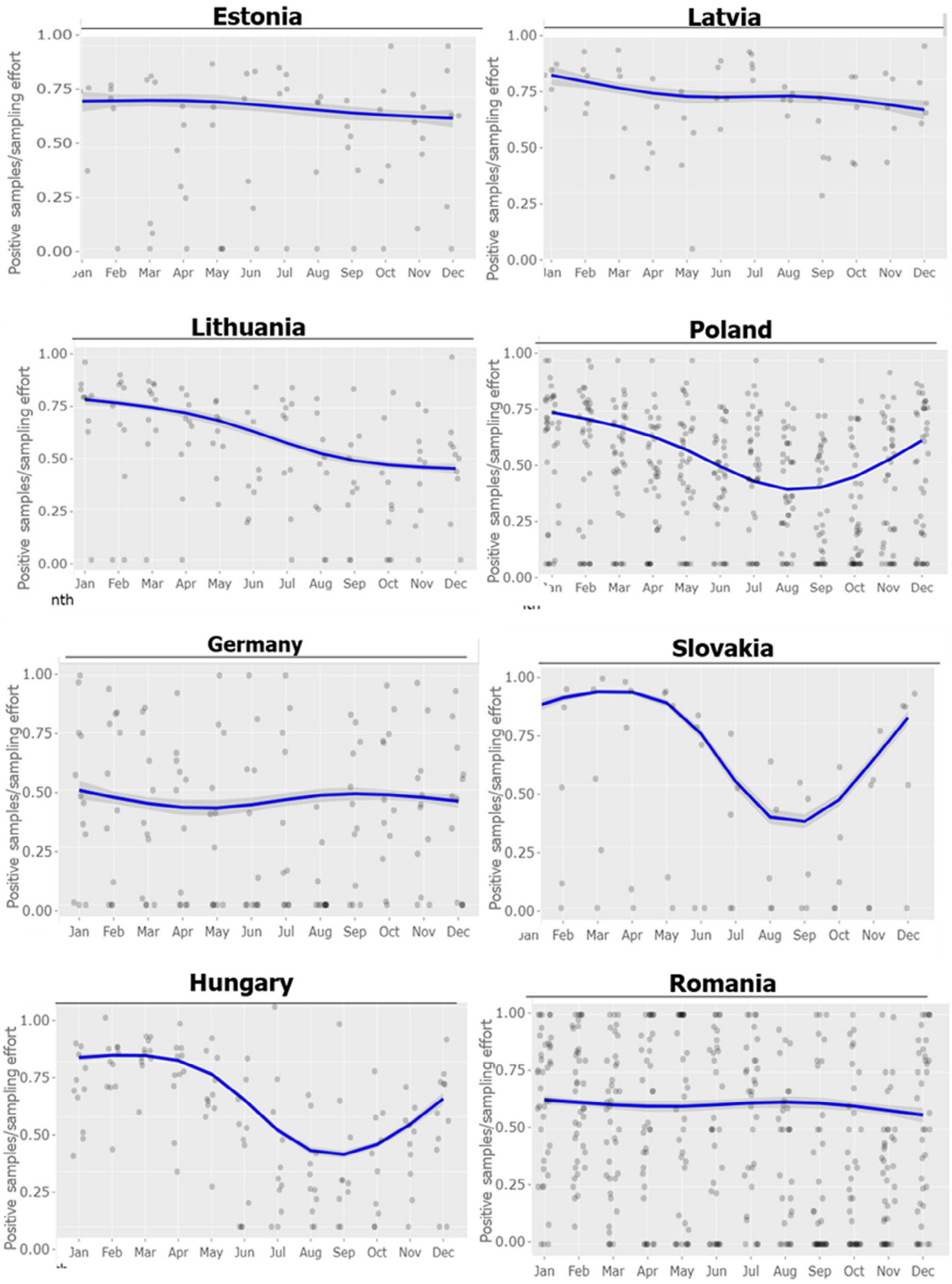


Figure 13: Average proportion of wild boar samples testing positive to ASFv Genotype II by PCR, aggregated by calendar month and NUTS 3 region, for wild boar found dead (passive surveillance) in the reporting countries with more than 3 years of ASF infection

Highlights

- Among domestic pigs, a clear summer peak in numbers of outbreaks was observed on small as well as large establishments in 2022, with the exception of Romania where a winter and a summer peak was present in small size outbreaks.
- Among wild boar, distinct seasonality was observed in Poland, Slovakia and Hungary with a clear peak in winter and spring, and the lowest proportions in late summer.
- The seasonality of the proportion of PCR-positive carcasses was absent in Germany and Romania or weakly marked with a slight winter increase in Estonia, Latvia and Lithuania.
- The seasonal patterns of positive rates among domestic pigs and wild boar are not synchronised.

3.2.2.3. Secondary cases in wild boar

As for the previous reporting period, the purpose of this investigation was to evaluate whether there was a development in the numbers of potential secondary cases that could be attributed to a single source and to compare the current reporting period with the first year of the epidemic and the previous reporting period. Although this potential number of secondary cases (means of bootstraps calculated with a network analysis) is not to be interpreted as the true reproduction number, it can be considered as a proxy for the extent of the spread in the evaluated period, and it therefore allows comparison between periods in the epidemic in the same country. This can be useful to help understand the trend of the epidemic, i.e. whether it is still in the expanding phase, or if it is rather fading out (EFSA, 2021).

Newly affected countries, such as Czechia, Italy or North Macedonia, and countries with very few notified cases (Moldova and Ukraine) were not included in this analysis, as not enough data are available to perform any comparison over time in these countries. The results of the bootstrap were plotted in Figure 14, and further details are presented in Table B.1 of the Appendix B. Czechia, Italy, Moldova, North Macedonia and Ukraine were not included in the analysis as they were only recently infected or notified very few cases and no comparison was possible.

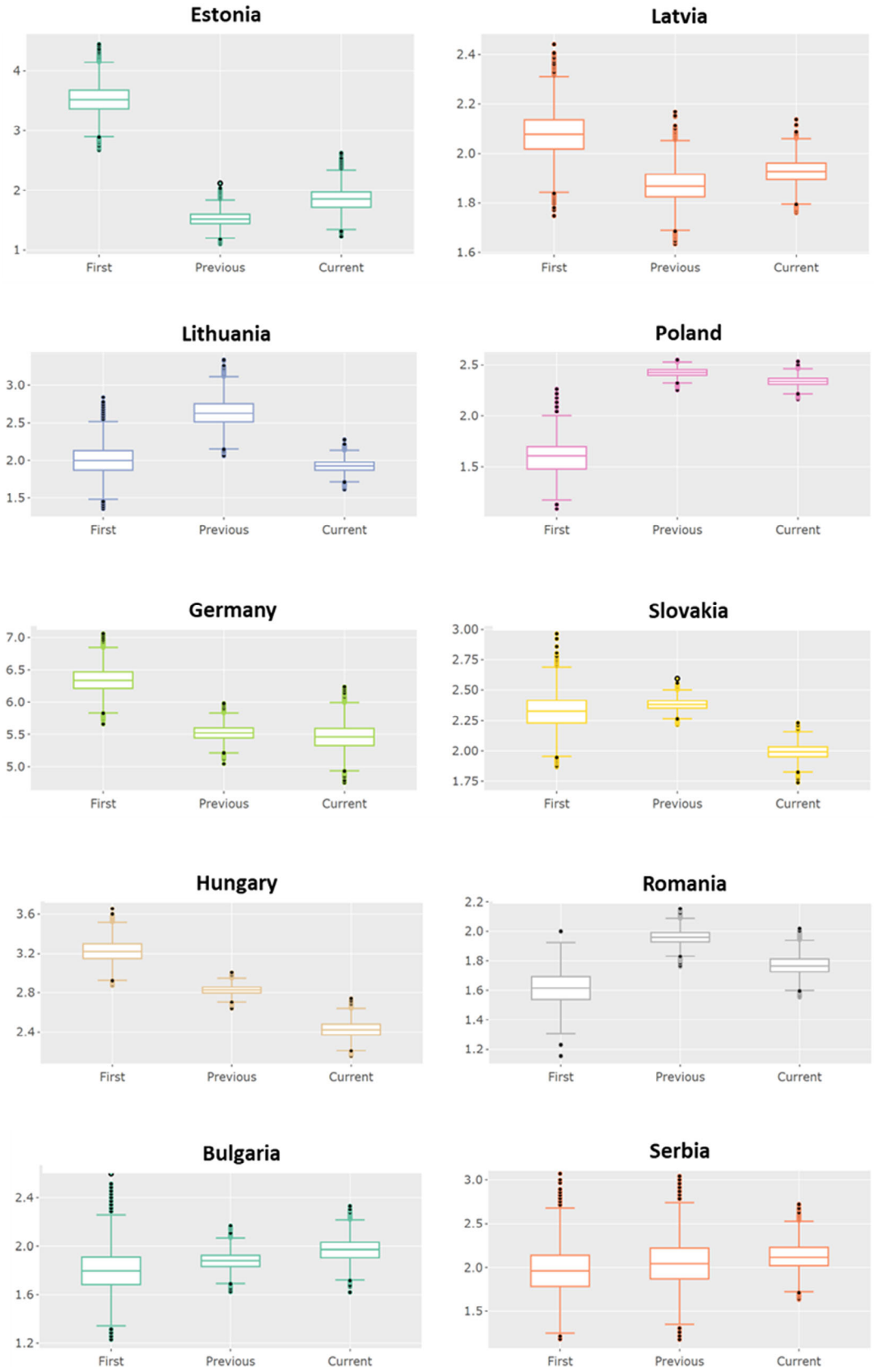


Figure 14: Bootstrapped number of ASF Genotype II secondary cases in wild boar per affected country comparing the whole reporting period since ASF was first detected, the previous year (2021) and the current reporting period (2022)

In general, small changes in the number of secondary cases were observed among the analysed countries. A significant decrease was observed in Lithuania, Slovakia and Hungary, which for Slovakia and Hungary, but not Lithuania, coincided with a decrease in the number of notified cases in wild boar (Table B.1 in Appendix B). As can be seen in Figure 14, this decrease in the number of secondary cases also coincides with decreasing proportions of PCR-positive samples originating from passive surveillance of wild boar in all three countries in question.

For Germany, the number of secondary cases remains at the same level as the previous year. This indicates that the epidemic is still in an expansive phase in the country, in spite of the decreasing number of outbreaks reported among wild boar compared with the previous year. However, it should be noted that the high number of secondary cases could also be related to the level of the surveillance effort in the country, as the higher the number of carcasses found in a smaller area, the higher the result of this analysis. This fact becomes relevant when considering the efforts made in Germany to systematically search for carcasses with trained dogs and drones (see Section 3.3.3 and Table A.3 in Appendix A for further information on this).

Highlights

- In most of the countries, small or no changes were observed in the number of potential secondary cases in wild boar compared with 2021.
- A decrease in the number of secondary cases in wild boar was observed in Hungary, Lithuania and Slovakia, although this was not always correlated with a decrease in the number of wild boar cases.

3.3. Impact of the disease

3.3.1. Evolution of the ASF-restricted zones

Data from the European Commission on ASF restricted zones, as described in Annex I of Commission Implementing Regulation (EU) 2021/605, was used to evaluate the size of ASF restricted areas at the EU global and EU country level since 2014 (Figures 15 and 16). For this report, we considered two types of area: restricted zones III (approximating the restricted zones due to the occurrence of ASF outbreaks among domestic pigs) and the union of restricted zones II and III (approximating the restricted zones due to the occurrence of ASF outbreaks among either wild boar or domestic pigs). Note that the most up-to-date map of these restricted zones is available online[11].

The size of restricted zones III has remained very stable between 2014 and 2017, under 50,000 km^2. Between 2018 and 2020, it increased sharply to almost 310,000 km^2, at an average pace of around 100,000 km^2 per year (Figure 15). It is worth noting that the fast increase in 2019 was mostly driven by the spread of ASF in Romania and Bulgaria, where 94% and 70% of the territory, respectively, were considered as restricted zones III for domestic pigs in early 2020 (Figure 16). From early 2021, the overall size of restricted zones III has decreased steadily for the first time since 2017, from around 350,000 km^2 in early 2021 to 260,000 km^2 in late 2022. In late 2022, the restricted zones III in Romania, representing 100% of the Romanian territory, accounted for more than 90% of the restricted zones III in the EU. The restricted zones III in all other affected Member States represented less than 10% of their national territories (Figure 16). These data suggest that although ASF continues to be widespread in Romania, the control efforts in the domestic pig sector in the rest of the EU have been successful in reducing the affected areas without spreading ASF to new areas.

[11] https://santegis.maps.arcgis.com/apps/webappviewer/index.html?id=45cdd657542a437c84bfc9cf1846ae8c

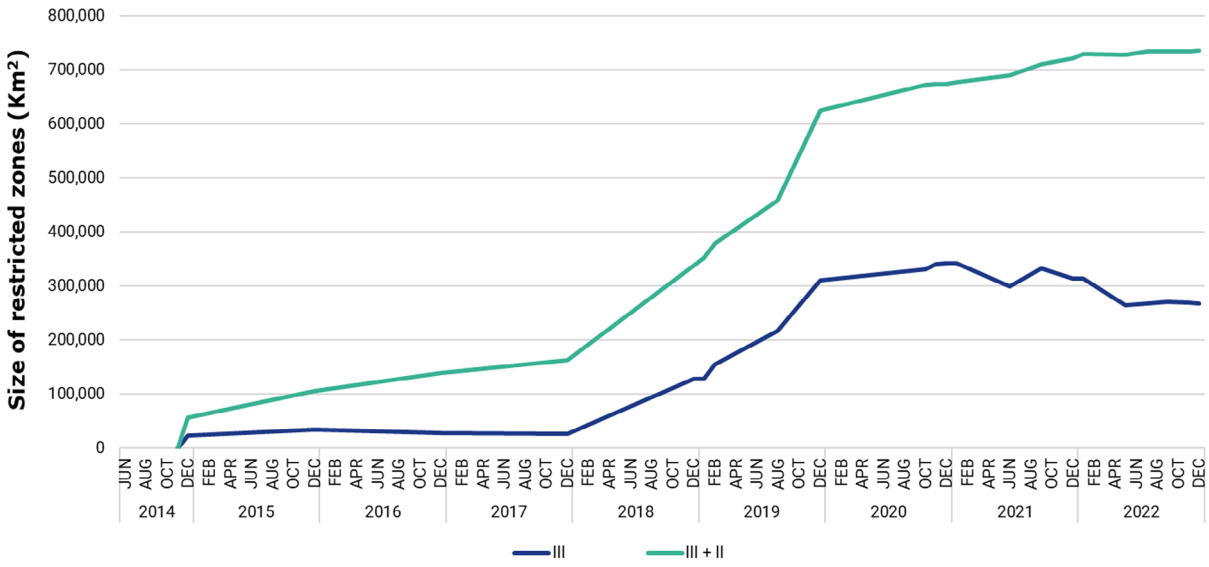


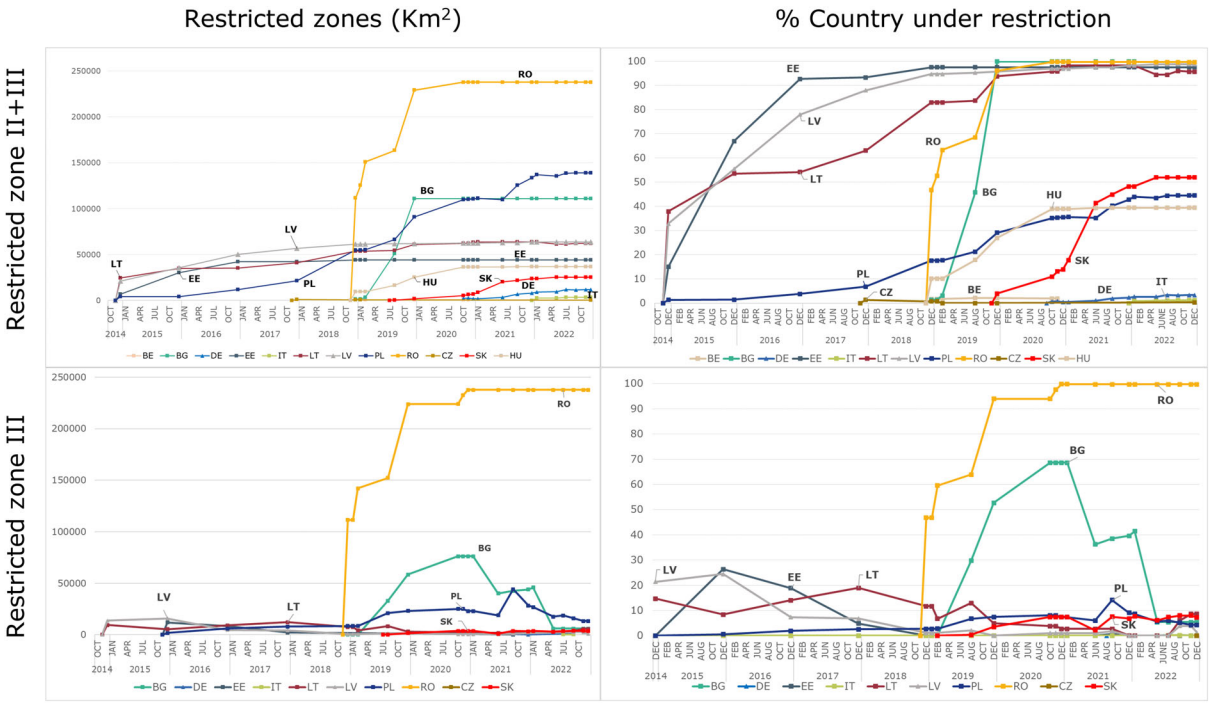
Figure 15: Temporal evolution of the size of the restricted zone III (in blue, approximating the restricted area due to the occurrence of ASFv Genotype II in domestic pigs) and restricted zones III + II (in green, approximating the restricted area due to the occurrence of ASFv Genotype II in wild boar and/or domestic pigs) in the EU from 2014 to December 2022

The size of restricted zones II + III has increased monotonically between 2014 and 2022, when it reached a maximum of around 735,000 km^2, corresponding to an average increase of around 92,000 km^2 per year, i.e. the approximate size of Hungary (Figure 15). Despite this apparent regularity, it is worth noting that the sharpest increase in the affected area occurred in 2018 (due to a cumulative increase in Estonia, Latvia, Lithuania, Poland and Romania) and 2019 (a further increase in Lithuania and Poland, but particularly in Romania and Bulgaria, which reached almost full country coverage by the end of that year). During 2020–2021 the size of restricted zones II + III increased steadily at a lower rate (similar to that observed in 2015–2017). In 2022, the overall size of restricted zones II + III has not changed substantially (1% increase) despite the long-distance viral translocation events in Italy (first in Piedmont and Liguria, then in Latium), the reintroduction in Czechia and the small increase in the size of restricted zones II + III in Germany, Poland and Slovakia (Figure 16).

In 2022, five Member States (Estonia, Latvia, Lithuania, Bulgaria and Romania) had over 90% of their territory covered by restricted zones II + III. These restricted zones constituted 40–50% of Poland, Slovakia and Hungary. In Italy and Germany, the restricted zones II + III covered less than 5% of the countries. In 2022 (from December 2021 to December 2022), the size of restricted zones II + III increased in Germany (+1%), Italy and Czechia (first affected or re-affected in 2022), Poland (+1.7%), Slovakia (+3.7%) and Latvia (+0.5%), while it remained stable in Estonia, Hungary, Romania and Bulgaria; and decreased only in Lithuania (−2.5%). In 2022, restricted zones II + III in Romania and Bulgaria, covering 100% of their territories, contributed to approximately 50% of the total restricted zones in Europe.

Officially lifting the restrictions in affected areas, in domestic pig or wild boar, usually requires an absence of outbreaks for at least 12 months (Regulation (EU) 2021/605).[12] Therefore, it is likely that the decrease observed in restricted zones III in 2021–2022 is the consequence of a reduction in the affected areas that started in 2020, driven mostly by Poland and Bulgaria (Figure 16). Conversely, almost all affected Member States noted either an increase or no change in the size of their restricted zones II + III during 2021–2022, except for Lithuania which experienced a small reduction.

[12] In exceptional situations, the restricted zones can be lifted earlier.



BE: Belgium; BG: Bulgaria; CZ: Czechia; DE: Germany; EE: Estonia; HU: Hungary; IT: Italy; LT: Lithuania; LV: Latvia; PL: Poland; RO: Romania; SK: Slovakia.

Figure 16: Temporal evolution of the restricted zones (in km^2) (left column) and the equivalent percentage of the country under restriction (right column) for restricted zones II + III (above) and restricted zones (III) per EU Member State from 2014 to December 2022

Highlights

- In 2022, the total area of restricted zones II + III in the EU slightly increased by 1% while the size of restricted zones III has decreased by 26% since 2021.
- The restricted zones in Romania and Bulgaria accounted for 90% and 50% of the total area of restricted zones III and II + III, respectively.
- The size of restricted zones III was mostly driven by Romania where it remained stable at 100% of the country's territory, and declined in Bulgaria and Poland.
- The size of restricted zones II + III remained stable or increased in all countries except Lithuania, where a slight decrease was observed.

3.3.2. Impact on domestic pigs

The impact of ASF on domestic pigs in affected countries has been assessed by the areas restricted due to the disease presence (as discussed before), the numbers and size of the outbreaks, the incidence, and number of pigs directly lost either due to ASF or to the control measures implemented (Table 4).

In Poland and Romania, the numbers of ASF infected establishments decreased by 82% and 80%, respectively from 2021 to 2022. In the same period, the numbers of establishments registered with the presence of at least one pig, also decreased in both countries by approximately 30%. However, the registered numbers of pigs decreased in less extent (by only approximately 12% in Poland and 20% in Romania), indicating that many of the establishments that closed in this period were small establishments with fewer than 100 pigs (Table A.2 in Appendix A). The reasons behind the closure of such big numbers of small pig establishments are more complex than ASF, including the global economic crisis and the price of cereals and energy among others.

Bulgaria had few outbreaks among domestic pigs in both years, but still saw a decrease, from six to two outbreaks from 2021 to 2022. Importantly, while in 2021 three outbreaks occurred on establishments with more than 100 pigs, in 2022 all outbreaks were reported from very small

establishments. This indicates that the outbreaks among domestic pigs are sporadic, as a result of introductions from wild boar. In Bulgaria, the number of establishments decreased by approximately 15% between the 2 years, while the number of pigs decreased by only 3%, reflecting the measures implemented to close small size pig establishments.

A decreased number of outbreaks among domestic pigs was also observed in Slovakia, from 11 to 5 outbreaks in 2021 and 2022, respectively, still with a slight increase in the proportion of the country in restricted zone III. The number of establishments increased in Slovakia by 12%, while the number of pigs slightly decreased. In Latvia and Lithuania, an increase was observed in the number of outbreaks as well as in the affected proportion of these countries in restricted zone III. In both countries, the numbers of establishments decreased by 15–20%, while the numbers of pigs decreased by 7%.

Only one outbreak was observed in Italy (2022) and one in Estonia (2021). Consequently, the impact of the disease in pig sector was not evaluated.

Overall, it is important to note that the estimated losses in the domestic pig sector do not cover the losses indirectly caused by the disease. For example, in Italy, only one outbreak was notified in domestic pigs, but in the newly affected territories where ASF infection was notified in wild boars, domestic pig establishments were depopulated as a preventive measure, and it was forbidden to be repopulate for several months. For other countries, similar preventive culling is reflected in the reduced numbers of establishments and pigs. However, these figures are, as mentioned above, highly influenced by other factors as well.

During 2022, 93% of the outbreaks (348 outbreaks out of 374 total) notified in domestic pigs in the EU occurred in establishments with maximum 100 pigs, 2% (8 outbreaks) in establishments from 101 to 1,000 pigs and 5% (18 outbreaks) in establishments with more than 1,000 pigs. The location of ASF outbreaks in domestic pigs by size of the outbreak can be found in Figure 17c. Most of the outbreaks notified in establishments bigger than 1,000 pigs (73%) and all outbreaks with more than 10,000 pigs occurred in Romania, which whole territory is under restricted zone III.

For all countries, the numbers of pigs lost due to ASF (infected, found dead or culled) varied between years, reflecting whether larger commercial establishments were infected or only smaller establishments. Overall, the percentage of domestic pigs lost due to ASF was limited in all countries, varying from < 0.01% to 0.5% in most countries, except Romania, where 5% of the pig population was lost due to ASF in 2022 (Table 4).

Table 4: Summary statistics of the domestic pig population (number of establishments and pigs) and the impact of ASF on those by country for the year 2022. (–) data not reported. NA: not applicable

	Country	First outbreak date[a]	Establishments									Domestic pigs					
			Restricted area[b] (% of country)		No. of establishments[c]		No. of outbreaks[d]			Farm incidence (%)[e]		No. of pigs[c]		No. of pigs dead or culled due to ASF (Losses)			
			2021	2022[e]	2021	2022	2021	2022	Total from first outbreak	2021	2022	2021	2022	2021	2022	Total from first outbreak	Losses 2022 (%)
EU Member States	Estonia	21/7/2015	0	0	–	97	1	0	28	–	0	–	269,359	1,769	0	32,708	0
	Latvia	26/6/2014	1	2	3,752	2,965	2	6	75	0.1	0.2	306,413	330,369	2,114	1,512	33,068	0.5
	Lithuania	24/7/2014	2	4	6,432	5,584	0	16	157	0	0.3	538,097	501,375	0	2,257	58,178	0.5
	Poland	23/7/2014	9	6	79,996	55,384	124	14	502	0.2	< 0.1	10,032,723	8,911,683	42,253	2,989	147,159	< 0.1
	Germany	15/7/2021	1	0	–	–	4	3	7	–	–	–	–	4,225	2,903	7,128	–
	Czechia[f]	NA	0	0	–	5,449	0	0	0	NA	NA	–	1,339,460	0	0	0	NA
	Slovakia	24/7/2019	6	7	2,684	3,018	11	5	44	0.4	0.2	543,427	496,827	32,496	525	33,614	0.1
	Hungary[f]	NA	0	0	–	–	0	0	0	NA	NA	–	–	0	0	0	NA
	Romania	31/7/2017	100	100	446,639	288,446	1,660	327	5,944	0.4	0.1	3,486,016	2,823,948	666,338	144,170	1,480,862	5.1
	Bulgaria	31/8/2018	46	11	1,568	1,348	6	2	72	0.4	0.1	634,413	616,049	236	2	205,819	< 0.1
	Italy	9/6/2022	0	0.1	–	83,141	0	1	1	NA	< 0.1	–	8,577,010	0	9	9	< 0.1
Non-EU countries	Moldova	20/3/2020	NA	NA	–	–	2	15	19	NA	NA	–	–	82	31,926	32,017	NA
	North Macedonia	6/1/2022	NA	NA	–	4,456	0	30	30	0	0.7	–	140,767	0	1,124	1,124	0.8
	Serbia	31/7/2019	NA	NA	–	–	32	107	173	NA	NA	–	–	42	334	858	NA
	Ukraine	7/1/2017	NA	NA	–	–	13	7	314	NA	NA	–	–	25,286	248	172,998	NA

(a): First outbreak date in domestic pigs notified to ADIS.
(b): Km^2 under restrictions, i.e. registered as restricted zone III, as displayed in Figure 15.
(c): Number of establishments /pigs reported from each country to EFSA though the data collection framework. Establishments not registered as farms or pasture (e.g. abattoir, market, etc.) are not included, neither are establishments with zero pigs registered.
(d): Outbreaks notified in ADIS, as reported in Table 2.
(e): Outbreaks notified in ADIS divided by number of establishments. For 2021 estimates, the population data from 2021 were used as the denominator.
(f): Czechia and Hungary never experienced outbreaks among domestic pigs, but are included for consistency.

The incidence of ASF on domestic pig establishments at NUTS 3 level (number of establishments affected in the NUTS 3 area/number of establishments present in the NUTS 3 area) is represented spatially in Figure 17a for all affected countries that reported pig populations data. A low between farm incidence of maximum 1% was generally observed in most of the affected regions, while very few areas had a higher incidence (up to a maximum of 5%). Most often these were areas with many observed wild boar cases. As an example, in Latvia, the observed incidence was higher in the eastern and western regions of the country. In the western region, the observed incidence was higher than in the eastern region, but this could be an artefact of fewer establishments being located in the western region. In both regions, many wild boar cases were observed.

In four EU countries (Latvia, Lithuania, Slovakia and Romania), a higher incidence was observed on larger establishments (≥ 100 pigs) than on small establishments (< 100 pigs) (Appendix A, Table A.1). This is in accordance with previous observations from Estonia (Nurmoja et al., 2020), where herds with > 100 pigs were shown to have a higher risk of infection. However, considering the very limited number of large establishments in those countries, the incidence is highly influenced by a few outbreaks (e.g. one outbreak was registered in Latvia in one establishment with more than 100 pigs, out of 67 establishments of this size in the whole country, Appendix B, Table B.2), and should be carefully interpreted. Establishments with > 100 pigs are not necessarily commercial establishments. However, as in previous years, outbreaks have been reported in very large commercial establishments (especially in Romania), emphasising the importance of constantly keeping the level of biosecurity high in these establishment types. Further studies are necessary on the impact of herd size.

Similarly, the proportion of pigs lost due to ASF per NUTS 3 region (pigs died or culled due to ASF/ number of pigs reported for that region), was generally low (1%) for the regions affected (Figure 17b). Nevertheless, in Romania two regions showed a loss of 50% of their pigs due to ASF outbreaks in 2022. Note that in these NUTS 3 regions, as well as some of the highlighted regions in Latvia and Lithuania in Figure 17b, one or two outbreaks in large establishments (Figure 17c) drove the high proportion of pigs lost.

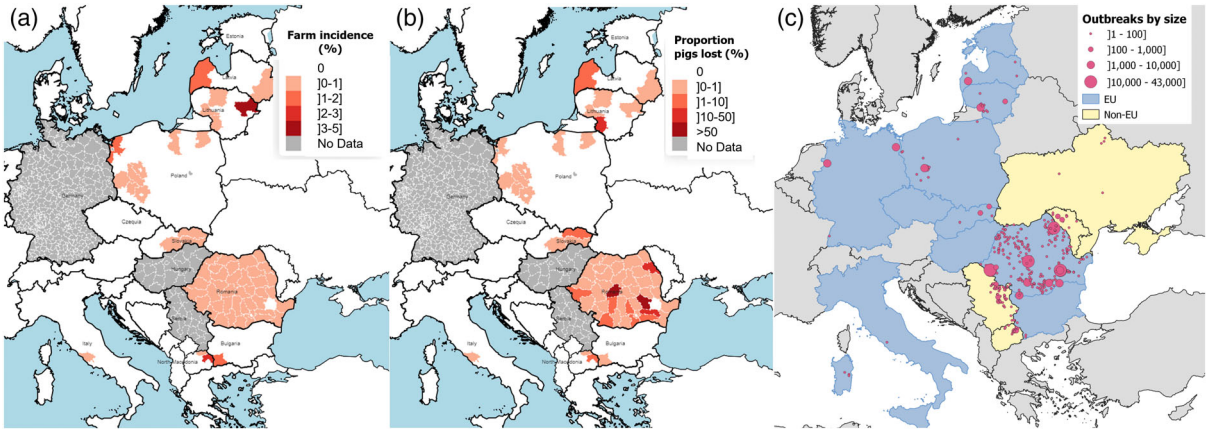


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Figure 17: Spatial distribution of the impact of ASF in 2022. (a) Incidence of ASF per affected establishment per NUTS 3 region. (b) Proportion of pigs lost due to ASF per NUTS 3 region. (c) ASF outbreaks in domestic pigs by size of the establishment affected during 2022. *Note:* the domestic pig population is calculated using the data on pig population submitted to the data collection framework. The reporting countries were asked to report a snapshot of the pig population at a time of the year they consider the most representative

Highlights

- A substantial decrease in numbers of outbreaks was observed in Poland and Romania.
- In many countries such as Poland, Romania and Bulgaria, the number of establishments and, more specifically, of small establishments (< 100 pigs) decreased.
- It is hypothesised that this decrease in the number of establishments might be the consequence of ASF and associated control measures but also of the global economic situation.
- The between farm incidence of ASF was generally very low in the affected NUTS 3 area (1%), with few regions reaching only a maximum of 5%.
- The proportions of animals lost to ASF per NUTS 3 region in 2022 reached 50% in a few regions of Romania, while it remained very low (generally 1%) in the rest of the affected regions.

3.3.3. Impact on wild boar

As previously described in the temporal dynamics, the number of ASF cases in wild boar followed an important decline in 2022, although some differences were observed between countries (see Section 3.2.2.1). However, the proportion of areas affected by ASF in wild boar (i.e. restricted zones III+II) remained stable or increased slightly in 2022 in all of the affected countries, except Lithuania where a slight decrease was observed. The number of reported wild boar lost due to ASF (i.e. the cumulative number of individuals reported as dead and killed in ADIS showed a decreasing trend and greater variation between the countries (Table 5).

In most countries, the number of reported wild boar lost due to ASF decreased from 2021 to 2022 with an average l decrease of 50%, ranging from −13% (Estonia) to −80% (Hungary). A notable increase in the number of losses were observed in Latvia (+184%), Lithuania (+75%) and Serbia (+218%). In Italy and Czechia, which did not report ASF in 2021, the numbers of wild boar lost to ASF in 2022 were low. The apparent proportion of losses in relation to wild boar population size in the affected countries was relatively low and did not exceed 1% in most countries, except Lithuania and Latvia where proportion of losses was 1.4% and 2.7%, respectively. Higher proportions of losses in those countries can be attributed to high number wild boar lost to ASF in 2022 and lower population densities caused by ASF in previous years.

However, overall low proportions of wild boar lost to ASF among the affected countries can be considered an underestimation because of (i) under-detection of carcasses (potentially heterogeneous between countries) and (ii) an additional or increased wild boar harvest as an ASF control measure (i.e. a reduction of the population density). While the latter does not represent a direct impact of the virus on wild boar populations, it is indirectly related to the presence of ASF and as such could be added to ASF-induced mortality.

Table 5: Summary statistics on the wild boar population (wild boar density) and the impact of ASFv Genotype II by country for the year 2022

	Country	Area affected in 2022 (diff. from 2021)	Data of first confirmed case in wild boar	Wild boar density (individuals/km²)[(c)]	Notified number of wild boar cases[(a)]		Notified number of wild boar losses[(b)]		
					In 2022 (diff. from 2021)	Total since introduction	In 2022 (diff. from 2021)	Total since introduction	Apparent proportion of losses in 2022
EU Member States	**Estonia**	97% (+0%)	8/9/2014	0.6	53 (−29%)	2,960	77 (−13%)	4,208	0.3%
	Latvia	98% (+4%)	26/6/2014	0.7	913 (+148%)	5,367	1,274 (+184%)	7,255	2.7%
	Lithuania	96% (−2.5%)	24/1/2014	0.7	307 (+26%)	4,478	670 (+75%)	8,264	1.4%
	Poland	44% (+1.7%)	17/2/2014	1.4	2,113 (−34%)	15,306	2,572 (−45%)	23,147	0.6%
	Germany	3 (+1.4%)	10/9/2020	2.2	1,600 (−37%)	4,554	1,600 (−41%)	4,714	0.2%
	Czechia	0.34%	26/6/2017 2/12/2022	1.8	1 (NA)	231	1 (NA)	231	<0.1%
	Slovakia	52% (+3.7%)	8/8/2019	1.9	561 (−66%)	2,634	778 (−74%)	4,522	0.8%
	Hungary	39% (+0%)	21/4/2018	1.3	568 (−78%)	8,899	698 (−80%)	12,504	0.6%
	Romania	100% (+0%)	29/5/2018	0.7	449 (−57%)	3,278	737 (−61%)	7,559	0.5%
	Bulgaria	100% (+0%)	23/10/2018	4.6	305 (−28%)	1,453	436 (−34%)	3,029	0.1%
	Italy	1%	7/1/2022	2.9	268 (NA)	268	269 (NA)	269	<0.1%
Non-EU countries	**Moldova**	NA	24/2/2020	ND	3 (NA)	33	4 (NA)	101	ND
	North Macedonia	NA	21/3/2022	4.5	10 (NA)	10	20 (NA)	20	< 0.1%
	Serbia	NA	3/1/2020	1.4	146 (+240%)	258	108 (+218%)	194	0.1%
	Ukraine	NA	3/1/2020	ND	2 (−33%)	99	3 (0%)	207	ND

(a): Wild boar cases refer to ASF cases in wild boar as notified to the Animal Diseases Information System (ADIS).
(b): Losses include the number of wild boar found dead, cases and killed as reported to ADIS.
(c): Based on the modelled density of wild boar as published by the ENETWILD Consortium (2022).
NA: Not applicable for those countries with no data comparison for the previous year as ASF was not present.
ND: No data, as restricted zones do not apply to non-EU countries.

Unfortunately, the information available from the Member State does not permit a quantitative estimate of the scale of this surplus mortality. Six out 11 Member States reported applying some kind of ASF-induced cull (see Table A.2 for additional detail). Those measures, aimed at reducing the wild boar population, are applied regionally inside and/or around the restricted zones (Estonia, Italy, Poland, Germany) or across the entire territory of the country (Hungary, Bulgaria, Italy).

Differences in surveillance efforts among countries and the estimated sizes of wild boar populations highly influence the estimated wild boar losses. The affected Member State also reported the activities performed on the systematic carcass search, e.g. on transects, with drones or dogs (see Table A.3 in Appendix A). Drones or trained dogs were reported to be used routinely for the search of wild boar carcasses in Germany supported by helicopters, and sporadically in Bulgaria, Italy and Poland. In Lithuania, an active search is performed after detection of ASF in wild boar once a week for 1 month or until no new positive carcasses are detected. In other countries, (Poland and Bulgaria), there is an active search after a detection among domestic pigs, in the area surrounding the affected pig holdings, coupled with sanitary shooting and incentives in the case of Bulgaria. While in other countries

(Slovakia and Hungary), the search for carcasses is done by hunters in the whole territory, at a local level depending on the epidemiological situation (Romania) or in the restricted zones (Czechia).

Temporal trends in the size of wild boar populations (approximated by the hunting bags) among the affected countries are presented in Figure 18. In all of the affected countries, wild boar numbers show an increasing trend since 2000, with some inter-annual fluctuations. In some countries, the wild boar populations continued to grow or did not show a significant change after the ASF introduction (Poland, Germany, Hungary and Slovakia), while others experienced a very sharp decline in wild boar numbers (Estonia, Latvia, Lithuania, Romania and Bulgaria), which occurred 1–2 years after the introduction of the disease. It is worth noting that the declining trend was reversed after 5 years in the Baltic states, but continues in Romania and Bulgaria where ASF was introduced more recently. However, this could depend on the proportional area affected by ASF in the country, as later described in Figure 19.

In addition, hunting data are not easy to interpret, as hunting numbers are highly influenced by many other factors not related to the abundance of the populations but with management decisions. Recently, the use of camera traps has demonstrated its utility to monitor wild boar populations in ASF-affected areas, using the newly infected regions of the north of Italy as an example (Palencia et al., 2023).

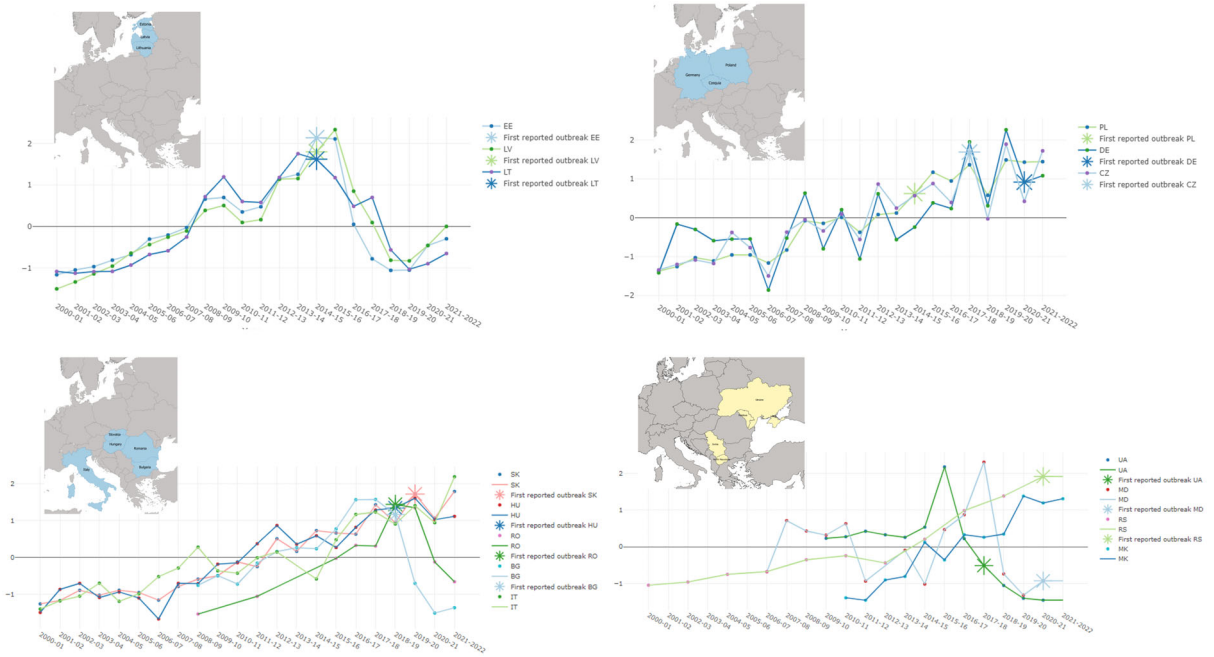

Figure 18: Standardised annual hunting bag in the European ASF-affected countries. Standardised hunting bag was calculated by *z*-score calculation (subtracting the average of the country over the hunting seasons from each data point and dividing by the standard deviation)

It appears that different numerical responses of wild boar populations to ASF introduction are related to the surface area of the country affected by the disease. Figure 19 shows a negative relationship between the proportion of the country under restricted zones II + III (proxy of wild boar affected area) and wild boar hunting bags in a given year. This relationship can have two, non-mutually exclusive, explanations. Firstly, ASF introduction can impose some temporal or spatial restrictions on hunting and thus lead to lower harvest rates. Secondly, high ASF virus-induced mortality can have a large impact on wild boar abundance, as described above, and this impact should be proportional to the size of the affected area in the country, leading to population decline in countries with widespread ASF. Both of these mechanisms (and possibly others, e.g. hunting effort) can contribute to the country-level patterns of population dynamics and it is difficult to ascertain their relative contribution. Nevertheless, it is quite clear that countries with the highest coverage of restricted zones (90–100%) experienced significant declines in the numbers of harvested wild boar, while in the countries with moderate or low coverage of restricted zones (< 50%), population decline was not observed.

However, this decline can reverse after several years of ASF presence, as previously observed in the Baltic states (Figure 18). Some of the reasons behind that rebound on wild boar populations in those areas could be the demotivation of hunters, which leads to compulsory hunting bag numbers not reached. This decrease in hunting pressure, probably due to fatigue, coupled with the high reproductive potential of the wild boar, could have led to this rebound. However, other factors should be investigated and considered carefully.

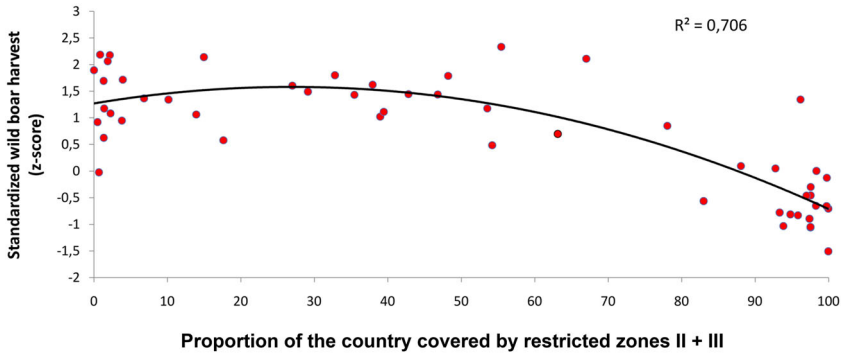

Figure 19: Proportion of the country in a restricted zone II + III against the standardised wild boar harvest. Each point represents one country for one year

Highlights

- The number of ASF cases in wild boar and apparent wild boar losses due to ASF followed an important decline in 2022, although differences were observed between countries.
- The declining trend in wild boar populations (approximated by the hunting bags) in the Baltic states reversed after 5 years, while continued in Romania and Bulgaria, where ASF was introduced later.
- In other countries where ASF is restricted to certain areas (Poland, Germany, Hungary, Slovakia), the countrywide wild boar populations continued to grow or did not show significant change after ASF introduction.
- A negative relationship was observed between the proportion of the country with restricted zones due to ASF in wild boar and wild boar hunting bags in a given year.

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Abbreviations

ADIS	Animal Disease Information System
ASF	African swine fever
ASFv	African swine fever virus
DCF	data collection framework
ELISA	enzyme-linked immunoassay
IPT	immuno-peroxidase test
PCR	polymerase chain reaction
WGS	Whole genome sequencing

Appendix A – Countries responses to the questionnaire

Table A.1: Countries responses to the questions regarding active surveillance activities carried out on domestic pigs

Country	Test healthy pigs before movement	Test pigs at slaughter	Test healthy pigs randomly on establishments
Estonia	NA	NA	Targeted sampling (testing) of live pigs is done on establishments in ASF restricted areas (I, II and III). Those establishments are visited and inspected a minimum of twice a year. Once a year, blood samples from pigs over 60 days old are taken for virological (PCR) testing. Samples are taken from all units at the establishment, depending on the number of pigs kept, so that 10% prevalence within the unit was detectable with 95% confidence. Pigs from the following target groups should be sampled: sick or anorectic pigs; recently purchased pigs from confirmed outbreak or suspected outbreak areas; pigs kept in subunits recently visited by unauthorised persons; pigs that have been tested but the results of tests do not exclude the presence of ASF, and pigs exposed to them; pigs that have recently been ill and recovered.If pigs of targeted groups are not present in sufficient number, in addition randomly selected pigs are picked for sampling to reach the defined sample size.
Latvia	NA	NA	NA
Lithuania	NA	NA	NA
Poland	NA	Within the ASF restricted zones II and III to detect a 10% prevalence with 95% confidence.	NA
Germany			
Czechia	Only on the establishments where is no passive surveillance, in accordance with Regulation (EU) 2021/605 Art. 16 point 1(c), establishments in restricted zones I and II, virological examination of a certain number of animals.	NA	NA
Slovakia	Healthy pigs are tested virologically (PCR from blood samples) before movement (transport) from a restricted area to another district.	We take samples (spleen) at slaughterhouses from pigs coming from a restricted area. We also take pig samples (spleen and blood) at the domestic slaughter from infected and protection zones.	NA

Country	Test healthy pigs before movement	Test pigs at slaughter	Test healthy pigs randomly on establishments
Hungary	All healthy pigs for transport from Restricted Zone II and healthy pigs for transport to other Member States have to be sampled (blood) and tested (PCR) within 15 days before movement with 95% confidence/10% prevalence. Half of the samples have to be taken from the unit from where pigs will be transported and the other half from other units of the establishment.	NA	NA
Romania	We inspect the holdings and conduct clinical examinations of each consignment of pigs before movement and we perform additional passive surveillance by testing a minimum of two dead pigs per week per production unit.	NA	NA
Bulgaria	Strict laboratory, clinical surveillance and supervision on the pig establishments are in place as follows: – clinical examinations and biosecurity checks by official veterinarians; – clinical examinations of each consignment of pigs before movement; – weekly sampling and testing of dead pigs/blood samples 7 days (option up to 15 days) before movement.	It was enforced in the past. At the current time, testing at the slaughterhouse is not taking place.	Described in 'test healthy pig before movement'.
Italy	NA	NA	NA

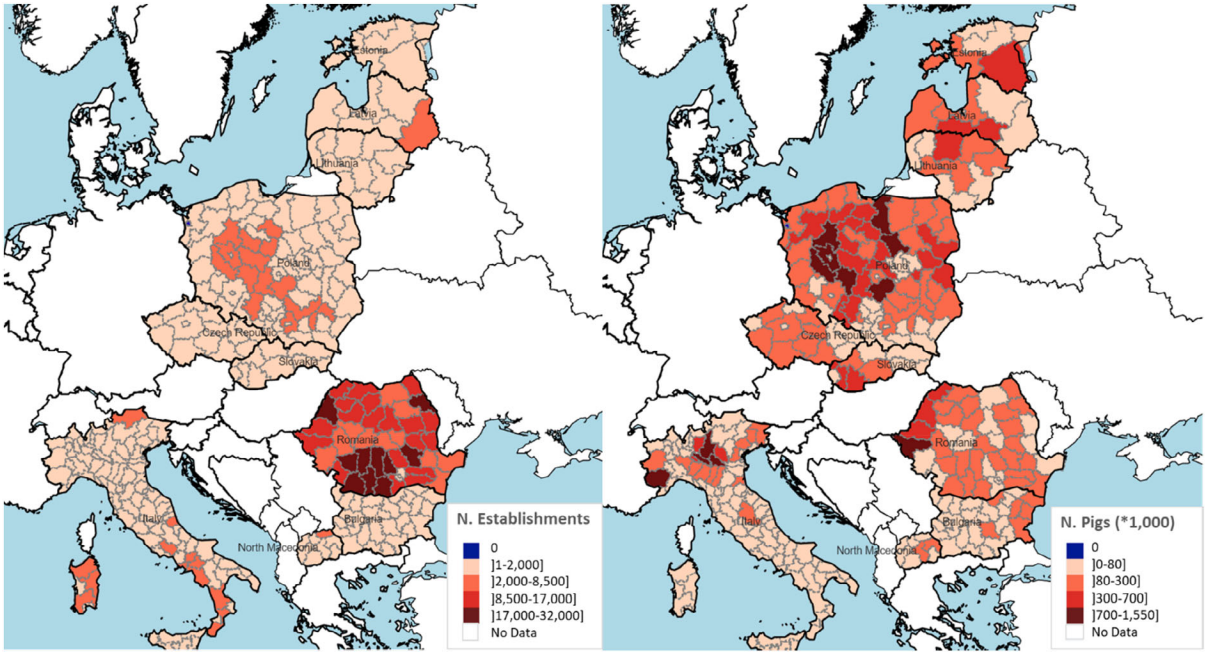
Table A.2: Country responses to the questions related to wild boar management strategies

	Is hunting permitted in restricted areas?	Are depopulation measures (surplus culling in addition to regular management plan) in place? Please specify the areas
Estonia	Yes, in all zones	Yes, in some cases if ASF PCR-positive wild boar has been detected then hunters will try to hunt all wild boar in that area or from the same group
Latvia	Hunting is not restricted	No
Lithuania	Yes, over the entire country in all areas	No
Poland	Yes, in the 'blue zone'. Individual hunting is preferred	Depopulation around the area adjacent to the 'blue zone'
Germany	Yes, in all EU legislative zones. But in the German legislative core areas within the restricted areas only trapping is allowed after establishment	Yes, in restricted areas and the high-risk zone along the Polish border
Czechia	Hunting was permitted in restricted zone I.	Only hunting
Slovakia	Yes, Restricted zone II - only individual hunting, Restricted zone I and buffer zone - individual and collective hunting. Hunting in the whole country is not limited.	
Hungary	Restricted zone I: individual wild boar hunting is allowed	The main strategic goal is to reduce the wild boar density to 0.5 wild boar/ km^2 by 28.02.2025 for the whole country
Romania	The entire territory of Romania is an infected area older than 1 year. Hunting is permitted by all allowed methods, respecting the biosecurity measures.	No
Bulgaria	The entire territory of the country is covered by restricted zones II or III. In the both zones hunting activities are allowed for the purpose of wild boar population reduction. Hunted wild boar are subject to compulsory testing, and they can be used for personal consumption in the same restricted zone only if negative.	Only maintaining the wild boar density below 0.3–0.5/100 ha is applied
Italy	According to the National Law in force (Ordinance n.4/2022 of Extraordinary Commissioner), hunting activities in restricted zone II are not allowed, although by way of derogation, hunting activities for wild boar population control may be authorised, under specific conditions (fencing and biosecurity); in any case, all found-dead, trapped or culled wild boar should be tested and destroyed. In restricted zone I, hunting activities are allowed for wild boar population reduction measures; hunted wild boar should be tested, and they can be used for personal consumption in the same restricted zone only if negative. Particular rules have been adopted by the individual regions as a derogation from the Ordinance. Currently, in Piedmont and Liguria regions, hunting activities are allowed in restricted zones I and II by derogation, although the adverse opinion of the Central Authority and of Experts; all hunted wild boar are tested for ASF. In Lazio, hunting activities are in place for restricted zone I since the epidemic curve has turned down, and hunted wild boar are tested randomly.	In the free areas, PRIU (regional plans for urgent measures for the management, control and eradication of ASF in farm pigs and in the wild boar population) requires to depopulate at least the 80% of the estimated population. In the affected areas, wild boar population control is allowed by hunting with low-impact techniques in order to create a white zone around the infected area.

Table A.3: Country responses to the question on performing a systematic search for wild boar carcasses

Estonia	No
Latvia	No
Lithuania	After the detection of a positive wild boar, according to the national legislation (Order of the Director of State Food and Veterinary Service), the hunting unit managers (hunters) are obligated to actively search at least once a week for 1 month for carcasses. An official veterinarian might be present or not during such a search. If after 1 month post-confirmation no carcasses are detected, an active search for carcasses is not required; however, after the detection of a positive carcass again, a one-month search obligation is valid again.
Poland	An active wild boar search is organised around the area of a recent ASF outbreak. Similarly, at the moment of detection of a new outbreak among domestic pigs, the actions aiming at active search for wild boar carcasses around the pig holding are intensified. Finding a wild boar carcass anywhere in the country must be reported for local veterinary inspection.
Germany	Systematic searches for carcasses are carried out after the first case has been detected in the total of the provisional restricted zone in order to define a core area and, above all, its exact extent. The established core areas are systematically searched on a regular basis in the further course of the outbreak in the local area. The search, also along transects, is supported by dogs, drones and helicopters. Furthermore, an active search is established in the high-risk zone along the Polish border.
Czechia	We do not systematically search for wild boar carcasses in the whole territory of Czechia. Hunters know that if they find a wild boar dead/hit by a car, they should take samples and send them for examination. At the same time, the obligation to examine for ASF all wild boar found dead/hit by a car is stipulated in our national legislation in the 'Methodology of animal control' and vaccination is prescribed for the given year. We did a systematic search only after determining the infected zone in the part of infected zone. Currently, a systematic search of carcasses is planned only in restricted zone II in areas with positive cases.
Slovakia	Hunters are searching for wild boar carcasses from all parts of the country for ASF and classical swine fever.
Hungary	Entities permitted to hunt must continuously search for wild boar carcasses in the whole country. The location, route, time and duration of the search must be documented.
Romania	We do not systematically search for wild boar carcasses, but at the local level depending on the epidemiological situation, the Local Centre for Disease Control can decide the frequency of the search.
Bulgaria	In addition to the hunting measures for the wild boar population, other measures are still enforced in relation to the domestic pig, including: intensive searching for wild boar carcasses in the 20 km zones around industrial holdings under the control of the regional Executive Forestry Agency (EFA) bodies; intensive sanitary shooting/individual hunt in the 20 km zones around industrial holdings under the control of the regional EFA bodies; financial incentives for hunters for culled wild boar; financial incentives for found wild boar carcasses.
Italy	Systematic wild boar carcasses search are carried out routinely only in the restriction zones: after ASF confirmation in a new territory, firstly in the bordering area/RZI and, after the positive cases have been turned down, also in the RZII. Therefore, in the free territories belonging to other regions but bordering the affected areas, regions can increase active carcasses search for the purpose of early detection.

Appendix B – Supplementary material



Disclaimer: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the European Food Safety Authority concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Figure B.1: Number of pig establishments per NUTS 3 region (left) and the number of pigs per NUTS 3 region (right) in 2022 as per the data reported to EFSA's Data Collection Framework

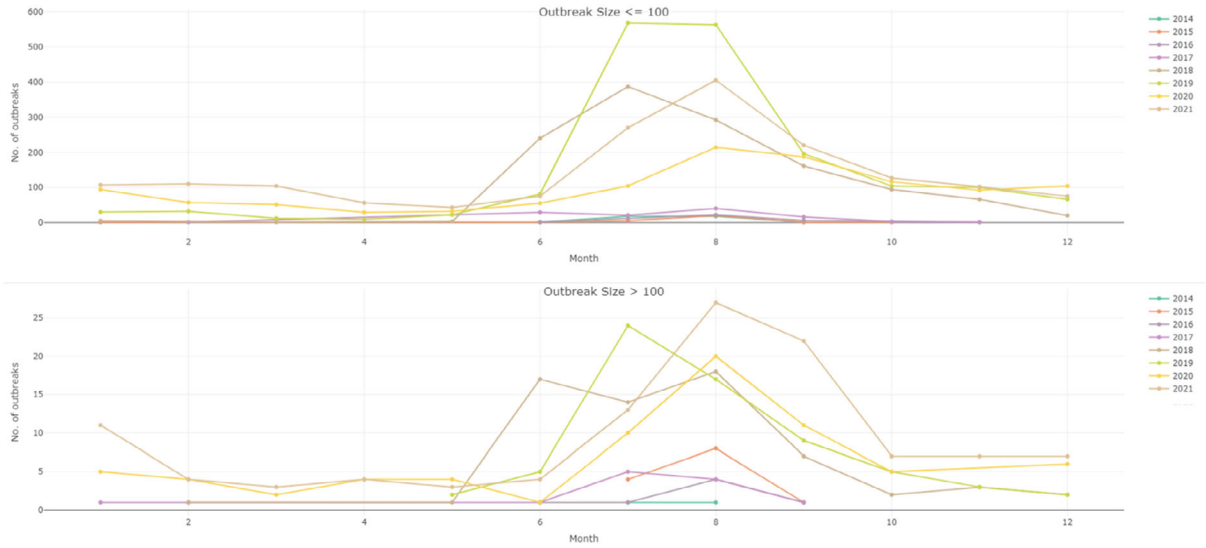


Figure B.2: Temporal distribution of the number of ASF Genotype II outbreaks on domestic pig establishments with fewer than 100 pigs (a) or more than 100 pigs, (b) in the EU Member States by month of confirmation from 2014 to 2021. Note: Only EU countries with outbreaks occurring in on establishments of each category were included in the plot

Table B.1: Average number of potential secondary cases of ASF in wild boar per country in different reporting periods

Country	Date of first notification	In the year after the first notification (95% CI)	Jan–Dec 2021 (95% CI)	Jan–Dec 2022 (95% CI)
Estonia	2014-09-08	3.52 (3.07–3.98)	1.52 (1.28–1.78)	1.86 (1.51–2.26)
Latvia	2014-06-26	2.08 (1.91–2.25)	1.87 (1.74–2.02)	1.93 (1.83–2.02)
Lithuania	2014-01-24	2 (1.65–2.42)	2.63 (2.3–2.99)	1.93 (1.77–2.08)
Poland	2014-02-17	1.61 (1.3–1.91)	2.42 (2.35–2.5)	2.34 (2.25–2.43)
Germany	2020-09-10	6.34 (5.98–6.72)	5.53 (5.3–5.76)	5.46 (5.09–5.85)
Czechia[(a)]	2017-06-26 2022-12-02	NA	NA	NA
Slovakia	2019-07-24	2.33 (2.07–2.6)	2.38 (2.3–2.47)	1.99 (1.88–2.12)
Hungary	2018-04-21	3.22 (3.01–3.45)	2.83 (2.74–2.91)	2.43 (2.28–2.59)
Romania	2017-07-31	1.62 (1.38–1.85)	1.96 (1.87–2.06)	1.77 (1.65–1.9)
Bulgaria	2018-08-31	1.8 (1.49–2.17)	1.88 (1.75–2.02)	1.97 (1.8–2.16)
Italy	2022-01-07	NA	NA	NA
Serbia	2019-07-31	1.96 (1.5–2.5)	2.04 (1.57–2.57)	2.12 (1.84–2.42)
North Macedonia	2022-03-21	NA	NA	NA

(a): Two dates of first notification were included for Czechia, corresponding to the confirmation date of the two introductions.

Table B.2: Summary statistics for the domestic pig population (number of establishments and pigs) and the impact of ASF on those by country, divided by establishment size (< 100 or ≥ 100) for the year 2022

Country	First outbreak date[a]	Establishments									Domestic pigs					
		Restricted area[b] (% of country)		No. of establishments[c]		No. of outbreaks[d]			Farm incidence (%)[e]		No. of pigs[b]		No. of pigs dead or culled due to ASF (Losses)			
		2021	2022	2021	2022	2021	2022	Total since introduction	2021	2022	2021	2022	2021	2022	Total since introduction	%Losses 2022
EE < 100	21/7/2015	0	0		27	0	0	10		0		347	0	0	50	0
≥ 100					75	1	0	18		0		269,012	1,769	0	32,658	0
LV < 100	26/6/2014	2	2	3,689	2,898	1	5	62	< 0.1	0.2	18,311	16,103	4	52	699	0.3
≥ 100				63	67	1	1	13	1.6	1.5	288,102	314,266	2,110	1,460	32,369	0.5
LT < 100	24/7/2014	3	4	6,358	5,523	0	14	146	0	0.3	24,700	19,497	0	67	609	0.3
≥ 100				74	61	0	2	11	0	3.3	513,397	481,878	0	2,190	57,569	0.5
PL < 100	23/7/2014	10	6	66,324	44,104	87	9	385	0.1	< 0.1	1,467,863	992,767	2,867	261	8,650	< 0.1
≥ 100				13,672	11,280	37	5	117	0.3	< 0.1	8,564,860	7,918,916	39,386	2,728	138,509	< 0.1
DE < 100	15/7/2021	1	0	–	–	2	1	3					6	35	41	–
≥ 100				–	–	2	2	4					4,219	2,868	7087	–
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SK < 100	24/7/2019	6	7	2,405	2,737	6	3	35	0.2	0.1	33,970	38,889	186	153	552	0.4
≥ 100				279	281	3	2	7	1.1	0.7	509,457	45,7938	32,284	372	33,036	0.1
HU	NA	NA	NA	–	NA	0	0	0	NA	NA	–	–A	NA	NA	NA	NA
RO < 100	31/7/2017	100	100	446,281	288,092	1595	300	5,743	0.4	0.1	1,484,858	1,194,900	16,404	2,927	59,823	0.2
≥ 100				358	354	65	15	186	18.1	4.2	2,001,158	1,629,048	649,934	141,228	1,421,024	8.7
BG < 100	31/8/2018	46	11	1,466	1,248	3	2	48	0.2	0.2	8,033	9,313	11	2	858	< 0.1

Country	First outbreak date[a]	Restricted area[b] (% of country)		Establishments							Domestic pigs					
				No. of establishments[c]		No. of outbreaks[d]			Farm incidence (%)[e]		No. of pigs[b]		No. of pigs dead or culled due to ASF (Losses)			
		2021	2022	2021	2022	2021	2022	Total since introduction	2021	2022	2021	2022	2021	2022	Total since introduction	%Losses 2022
≥ 100				102	100	3	0	24	2.9	0	626,380	606,736	225	0	204,961	0
IT < 100	09/06/2022	0	0.1	–	78,941	0	1	1	0	< 0.1		349,898	0	9	9	< 0.1
≥ 100					4,288	0	0	0	0	0		8,227,112	0	0	0	0

(a): First outbreak date in domestic pigs registered in the Animal Diseases Information System (ADIS).
(b): Km^2 under restrictions, i.e. registered as restricted zone III, as displayed in Figure 15.
(c): Number of establishments/pigs reported from each country to EFSA though the Data Collection Framework. Establishments not registered as farms or pasture (e.g. abattoir, market) are not included, neither are establishments with zero pigs registered.
(d): Outbreaks notified in ADIS as reported in Table 1.
(e): Outbreaks notified in ADIS divided by number of establishments. For 2021 estimates, the population data from 2022 were used as the denominator.
BG: Bulgaria; CZ: Czechia; DE: Germany; EE: Estonia; HU: Hungary; IT: Italy; LT: Lithuania; LV: Latvia; PL: Poland; RO: Romania; SK: Slovakia.

Appendix C – Country data sets

Table C.1: Links to the ASF data sets for 2022 by reporting country. All country data sets are available on the EFSA Knowledge Junction community on Zenodo. The countries that submitted data sets on ASF surveillance on the year 2022 are 10 EU Member States and 1 non-EU country

Country	Link to the data set
Estonia	https://doi.org/10.5281/zenodo.7801573
Latvia	https://doi.org/10.5281/zenodo.7821781
Lithuania	https://doi.org/10.5281/zenodo.7821761
Poland	https://doi.org/10.5281/zenodo.7821817
Germany	https://doi.org/10.5281/zenodo.7821689
Czechia	https://doi.org/10.5281/zenodo.7821673
Slovakia	https://doi.org/10.5281/zenodo.7821895
Hungary	https://doi.org/10.5281/zenodo.7821705
Romania	https://doi.org/10.5281/zenodo.7821854
Italy	https://doi.org/10.5281/zenodo.7821724
North Macedonia	https://doi.org/10.5281/zenodo.7821797

Table C.2: Links to the pig population data sets for 2022 by reporting country. All country data sets are available on the EFSA Knowledge Junction community on Zenodo. The countries that submitted data sets on the pig population on 2022 are: 9 EU Member States and 1 non-EU country

Country	Link to the data set
Estonia	https://doi.org/10.5281/zenodo.7801607
Latvia	https://doi.org/10.5281/zenodo.7822004
Lithuania	https://doi.org/10.5281/zenodo.7821978
Poland	https://doi.org/10.5281/zenodo.7822022
Czechia	https://doi.org/10.5281/zenodo.7821958
Slovakia	https://doi.org/10.5281/zenodo.7822055
Romania	https://doi.org/10.5281/zenodo.7822035
Bulgaria	https://doi.org/10.5281/zenodo.7821923
Italy	https://doi.org/10.5281/zenodo.7821968
North Macedonia	https://doi.org/10.5281/zenodo.7822011