Department
for Environment
Food & Rural Affairs

Qualitative risk assessment on the likelihood of incursion of African swine fever to Great Britain from European Union Member States via human-mediated routes

April 2022

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Acknowledgements

Expert opinion and peer review were provided by the Animal and Plant Health Agency (APHA), the Department for Environment, Food and Rural Affairs (Defra), Welsh Government, Scottish Government and the Department for Agriculture, Environment and Rural Affairs (DAERA).

This document is an update based on a previous risk assessment which contained expert advice from Epidemiology, Population health and Infectious disease Control (EPIC), The Pirbright Institute and feed manufacturers.

This document was completed by the APHA's International Disease Monitoring team on behalf of the UK Office for Sanitary and Phytosanitary Trade Assurance, Defra.

Executive summary

African Swine Fever Virus (ASFV) is a highly pathogenic virus in domestic pigs and the Eurasian wild boar, with multiple cases identified across Europe in recent years. A qualitative risk assessment conducted in 2018 concluded that the annual risk level for the entry of African Swine Fever (ASF) into the UK was medium.

In this report we revisit the 2018 entry assessment and update it for the current situation as of April 2022. As Northern Ireland has remained part of European Union's (EU) Sanitary and Phytosanitary (SPS) area since EU exit, this risk assessment focusses on the likelihood of entry to Great Britain.

The situation with African swine fever (ASF) in the European Union (EU) has changed since 2018 with several new geographic areas in Bulgaria, Poland, Romania, Germany, Hungary and Slovakia reporting the disease and the recent spread to wild boar in Italy. The ASFV circulating in Europe and south-east Asia is still represented by genotype II, with little strain variation, and it is difficult to differentiate between the strains with limited sequencing.

The virus persists for long time periods in the environment and in fresh, frozen and preserved meats. The rate of spread within herds is variable depending on virus, host and environmental factors, and is usually days to weeks via direct contact with infected animals, their secretions or ingestion of contaminated feed, products or contact with contaminated surfaces.

However, larger geographical 'jumps' of ASF have occurred in recent years in Europe, usually being detected in the wild boar population, as reported in eastern Germany in September 2020 and in northern Italy in January 2022. This is not unexpected, as ASF has previously spread over long distances to wild boar in the Czech Republic and Belgium, where the disease has since been eradicated.

These 'jumps' have been associated with human-mediated routes such as moving infected animals or contaminated meat products and discarding them in areas where wild boar can access them. The origin of contaminated pork products is often unknown and therefore the source of infection is often only a suspicion.

Of particular note, high levels of movement of people around conflict regions and a lack of biosecurity and controls for backyard and free-range pig populations contributed to disease spread across the Caucasus region and into the Russian Federation in 2007, where it is now endemic in wild boar. It is still too soon to tell if the recent conflict in Eastern Europe and movements of large numbers of people and equipment will impact ASF spread in wild boar and domestic pigs in the region.

The risk of an ASF incursion to Great Britain is dependent on the robustness of official controls and effective education and awareness of the risk posed by unofficial movement of porcine products of animal origin (POAO). Following UK exit from the EU, the UK performs limited checks on animal products coming from the EU.

However, further checks on goods moving from the EU are expected to come into effect once Great Britain has implemented full Border Force operability. Until this is fully operable, it should be noted that Great Britain remains reliant on the EU's production standards and export controls.

This updated risk assessment concluded that the overall annual likelihood of entry is considered to be **medium** because of the combination of the pathways for introduction. In particular, the individual route for personal imports of POAO was considered to have a **medium** likelihood. A medium likelihood is defined, in this instance, as "the ASF virus may be regularly introduced into Great Britain".

An introduction of the virus does not necessarily cause a disease outbreak unless a pig is exposed to the virus and subsequently becomes infected. Controls within Great Britain, particularly the swill feeding ban, mean that this is a much less likely scenario than the virus entering Great Britain.

In terms of exposure, the highest likelihood for exposure was for free-living swine, backyard, smallholder and pig farms with poor biosecurity. The most likely route to these pig populations was through imported POAO, and the likelihood was **low**. A low likelihood is defined, in this instance, as "an ASF outbreak is rare but does occur".

The spread into the commercial pig sector will probably depend on how long disease has been present but undetected in the country, but should it get in, the spread would be expected to be substantial. With regards to the consequences, ASF is not considered a public health threat, but the animal health, social, economic and trade impacts mean that the consequences are assessed as **major**. Even one reported case in free living pigs or domestic pigs could lead to a trade ban and there would be significant costs involved in any eradication effort.

The medium likelihood of entry implies that risk managers should consider more options for risk reduction. This is the same level of risk found in 2018. Since 2018, various mitigations have been implemented such as improved communications with Border Force officers, increased intelligence around illegal trade, enhanced communication around the risks of importing products of animal origin (POAO) and the use of dogs to detect POAO in some airports. However, given the ongoing, epidemiological and socio-political situation since 2018, mitigations that were implemented in response to the previous assessment may not be sufficient to prevent future increases in the likelihood of entry.

Background

African swine fever virus (ASFV) is a double stranded DNA virus of the *Asfarviridae* family and is the only DNA virus known be transmitted by arthropods (ticks). The natural hosts of the virus are the soft tick *Ornithodoros moubata*, warthog and bush pig, in which there is no clinical disease, but disease occurs when ASFV infects wild boar and domestic pigs.

Several genotypes of ASFV exist, and their virulence varies considerably. African swine fever (ASF) is a disease of pigs, wild boar and other suids and is endemic in wild suids in Sub-Saharan Africa and, more recently, has become established in wild boar populations in parts of Europe.

The continued presence of ASF in EU member states, and the spread of the disease into new territories, means control measures must be continually assessed to establish if they are sufficient to prevent the incursion of disease into Great Britain through human-mediated routes.

As such, this report details an update of a qualitative risk assessment originally conducted in 2018 to address the risk question:

- what is the annual likelihood of introduction of African swine fever virus from European Member States into Great Britain?

As Northern Ireland has remained part of the single market since EU exit, this risk assessment focusses on the likelihood of entry to Great Britain only.

The current European outbreak started in 2007 when ASFV genotype II was introduced into the Samegrelo region of Georgia. The similarity of the ASFV isolate to those found in Mozambique and Madagascar, and the proximity to the port of Poti on the Black Sea, suggested that catering waste from ships was the most likely source of infection (Rowlands 2008). It spread rapidly through the country and had high virulence in domestic pigs and wild boar, with case mortality approaching 100%.

This is not the first incursion of ASF into Europe. A different strain of the virus (genotype I) was introduced to Portugal in 1957 and 1960 where it spread throughout the Iberian Peninsula where it was endemic until eradication in 1995. During this time sporadic ASF outbreaks were reported and eradicated in surrounding Western European countries. It was also reported in Brazil, Dominican Republic, Cuba, and Haiti. The Mediterranean Island of Sardinia in Italy has been endemically infected with ASFV genotype I since 1978.

Genotype I has relatively low pathogenicity and leads to persistent infection in some recovered pigs for up to 30 days or even longer (European Food Safety Authority (EFSA), 2010). Neutralising antibodies do not eliminate disease, therefore seropositive animals may still be virus carriers.

High levels of movement of people around conflict regions and a lack of biosecurity and controls for backyard and free-range pig populations contributed to disease spread across the Caucasus region and into the Russian Federation in 2007, where it is now endemic in wild boar. The disease spread further to Ukraine and Belarus before it entered the European Union in 2014. In 2014, ASF was reported in wild boar in Lithuania, Latvia, and Poland close to the Belarus border, followed by Estonia in the same year.

The disease continued to spread in wild boar populations in the Baltic states and Poland, while sporadic outbreaks in domestic pigs were controlled. Outbreaks of ASF in wild boar in the Czech Republic in 2017 and Belgium in 2018 occurred hundreds of kilometres from the nearest known ASF-affected area but were successfully eradicated.

Since our last risk assessment in 2018 (Defra, 2018), European outbreaks of ASF in domestic pigs or wild boar or both have been reported in Bulgaria, Germany, Greece (since resolved), Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia, Moldova, North Macedonia, Ukraine, Russia, and Serbia.

The same variant of ASFV emerged in China in 2018, and outbreaks have continued to occur across Asia in Mongolia, Myanmar, Indonesia, Laos, Papua New Guinea, the Philippines, Vietnam, Cambodia, Timor-Leste, North Korea, South Korea, India, Malaysia, and Thailand. In 2021, ASF outbreaks were reported in the Americas in the Dominican Republic and Haiti, which was also the genotype II variant.

In January 2022 ASF was reported in wild boar in mainland Italy for the first time, (the ASF genotype I has been endemic in the Italian island of Sardinia since 1978, but this is not thought to be linked to the other European cases as genotype I has not been found outside Sardinia for decades).

These mainland detections were approximately 800 Kilometres (km) away from the nearest case in wild boar in Germany and are suspected to have been introduced by human-mediated transport of contaminated products or equipment. Read our guidance on African Swine Fever in pigs and boars in Europe.

It is still too soon to tell if the recent conflict in Eastern Europe and movements of large numbers of people and equipment will impact ASF spread in wild boar and domestic pigs in the region.

In EU member states in 2021, there were 1,807 ASF outbreaks in domestic pig premises and 9,414 cases in wild boar reported to the World Organisation for Animal Health (OIE) (see Table 1). Of the outbreaks in domestic pigs, 1,681 (93% of outbreaks) were in Romania, 117 (6.5% of outbreaks) in Poland, 4 in Germany, 3 in Latvia and 2 in Bulgaria.

According to OIE reports, in 2018 there were 1,224 outbreaks in domestic pigs in the same countries except Germany (1,102 in Romania, 109 in Poland,10 in Latvia and 3 in Bulgaria) and 3,275 in wild boar. The number of outbreaks in domestic pigs in 2021 appears similar according to data reported to OIE although outbreaks in Romania have increased.

The increased number of outbreaks reported in wild boar is due to the spread of disease in wild boar within previously ASF-affected countries and increased surveillance efforts, for example, confirmed cases in wild boar in Poland doubled by 220% from 2,199 in 2018 to 4,841 in 2021, and in Hungary increased from 104 in 2018 to 2,744 in 2021.

Table 1: Number of outbreaks in domestic pigs (and in wild boar) according to OIE (note that some countries may not report all cases to OIE, as demonstrated by the absence of Estonia and Lithuania

Country of outbreak	2018	2019	2020	2021	Total cases in country
Belgium	0 (136)	0 (410)	0 (3)	0	0 (549)
Bulgaria	1 (4)	36 (113)	16 (2)	3	56 (175)
Czech Republic	0 (28)	0	0	0	0 (28)
Latvia	10 (673)	1 (300)	3 (310)	2 (368)	16 (1,651)
Poland	109 (2,199)	42 (1,887)	103 (1,935)	117 (4,841)	371 (10,862)
Romania	1,102 (131)	1,331 (570)	1,002 (824)	1681 (1,044)	5,116 (2,569)
Hungary	0 (104)	0 (1,354)	0 (3,803)	0 (2,744)	0 (8,005)
Slovakia	0	11 (7)	0 (17)	0	11 (24)
Germany	0	0	0 (188)	4 (417)	4 (605)
Greece	0	0	1 (0)	0	1 (0)
Yearly total	1,222 (3,275)	1,421 (4,641)	1,125 (7,082)	1,807 (9,414)	5,575 (24,468)

Risk question

The specific risk questions addressed are:

1. What is the annual likelihood of introduction of African swine fever virus from European Member States into Great Britain?
2. What are the subsequent exposure routes to domestic or feral pigs and consequences to Great Britain?

To answer these questions, the risk assessment follows the OIE framework of release (or entry), exposure and consequence assessment.

Hazard identification

The hazard has been identified as: African swine fever virus genotype II

Specifically, the hazard is the introduction of ASFV to the Great Britain's borders. The virus can be maintained in domestic pig populations by direct or indirect transmission between domestic pigs, and ingestion of infected pig products.

As well as the domestic pig transmission cycle, ASFV causes disease in wild boar and transmission can occur by direct or indirect contact, through infected carcases and contaminated habitat.

Ticks of *Ornithodoros* species can have a role in maintaining a virus reservoir and the soft tick *O. erraticus* has previously been shown to be part of the transmission cycle for genotype I in parts of Spain and Portugal, although so far has not been explicitly linked for the current genotype II outbreak in Europe.

The virus is highly resistant to environmental conditions, particularly to low temperatures and is present in blood, faeces, saliva and urine of infectious animals. The average incubation period (time between being infected and showing clinical signs of ASF) is between 5 and 15 days, and diagnostic tests for the virus (PCR tests) can be positive after 3 days post infection, in experimental tests.

Pigs infected with ASFV genotype II are infectious for 4 to 10 days post infection. The latent period (time between being infected and becoming infectious) is around 2 to 6 days for some strains of ASFV (Bellini et al., 2016 and Guinat et al., 2014) or using inferences from mortality records of outbreaks in Russia, the mean latent period is 6 to 10 days, and sometimes as high as 13 days (Guinat et al., 2017).

According to EFSA (2017) the basic reproductive number for within pen transmission is 5.0 to 6.1 and between pens is 0.5 to 2.7 for the genotype II strain.

Therefore, the rate of spread through a pig herd can take many days, unless all pigs are exposed at the same time, to the same source of virus. Early detection relies on actively testing dead pigs. Preventing spread relies on swift removal of any carcases. The median time for detection of ASF on pig farms is 13 days, with a likely maximum of 23 days (EFSA 2021a).

The virus is very resilient to environmental challenge. Estimates of survival time (maximum number of days infectious virus was detected) for various products of porcine origin, excreta and other conditions are shown in Appendix A.

The strain which has been isolated in the east European outbreaks is Genotype II and is not the same as that found on the Iberian Peninsula in the 1970s to 1980s outbreaks (and which is still present in Sardinia). There is no vaccine available. The strain circulating in Eastern Europe is a relatively new incursion (from 2007) into a naïve population and shows a high degree of virulence.

Although case fatalities can approach 100% in affected populations, a proportion of infected animals can recover from the infection and survive. In north-east Estonia in 2015, healthy antibody positive wild boar were identified in hunting bags suggesting a moderately virulent isolate was circulating in the region leading to a greater number of animals surviving, and experimental infection of this virus in 10 wild boars resulted in one survivor (Nurmoja et al., 2017). However, there is no evidence that surviving animals act as carriers of ASFV (Ståhl et al., 2019).

Transmission routes most commonly involve direct contact with infected pigs or wild boar, either oral, nasal, subcutaneous, or ocular or through consumption of contaminated products such as infected meat. The infectious dose in products is low, while aerosol transmission is less likely.

For indirect transmission (such as contact with people, vehicles, or fomites), a larger virus load is required than for direct transmission (such as blood transmission) or transmission is less efficient with the lower pathogenicity strains, due to strain variation (EFSA, 2010 and Lamberga et al., 2020).

There are still questions surrounding the role of biting flies in mechanical transmission of ASF over short distances, while the soft bodied ticks are responsible for persistence of infection in some areas (including the Iberian Peninsula) and are less likely to be involved in long distance movement of infection. It is not known whether ticks are endemic in Eastern Europe and Russia can transmit ASFV.

Epidemiological investigations in ASF-infected counties in Romania found that early outbreaks often occurred near water (especially near the Danube River) and virus spread increased in the period following rain (EFSA, 2018). Therefore, ASF transmission through blood-feeding insects (for example, mosquitos and flies) and contaminated water is suspected, although this has not been confirmed.

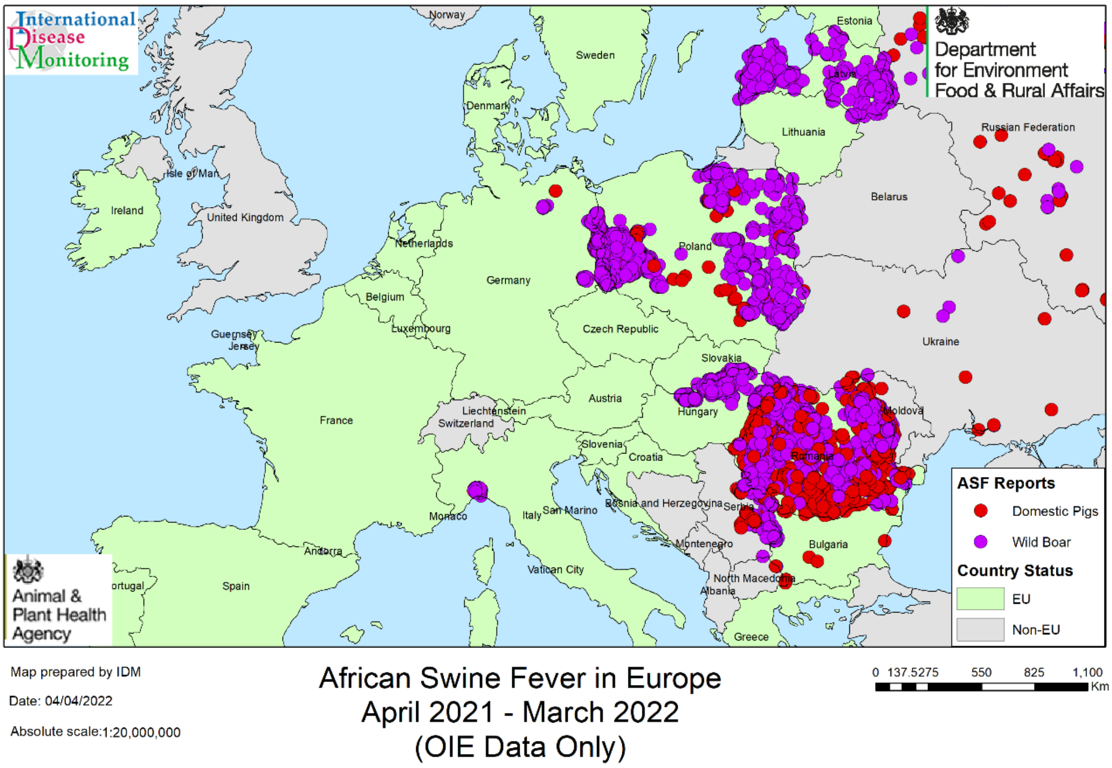
Under EU Legislation, ASF controls include a ban on the movement of wild boar and the restriction of movements of domestic pigs and products of animal origin, including germplasm from restricted zones (Commission Delegated Regulation (EU) supplementing Regulation (EU) 2016/429 and Commission Implementing Regulation (EU) 2021/605). Products of animal origin for human consumption can be processed, according to Articles within the legislation.

The current situation in the EU

Figure 1 shows the geographic locations of outbreaks of ASF in Europe between April 2021 and March 2022. Figure 2 shows outbreaks in 2018 for comparison.

In the last year Romania has had multiple outbreaks in wild boar and domestic pigs whereas the majority of outbreaks in Poland and Latvia have been in wild boar. There are a small number of wild boar outbreaks in Germany and Italy.

Figure 1: African swine fever cases in wild boar and outbreaks in domestic pigs reported in European Member States between April 2021 and March 2022.



African swine fever cases in 2018

Latvia and Poland had multiple outbreaks in wild boar. There are a small number of wild boar outbreaks in Hungary, Belgium, Czech Republic and Romania. Domestic pig outbreaks are present in Romania and Poland.

Figure 2: A map showing the geographical location of African swine fever cases in wild boar and outbreaks in domestic pigs reported in European Member States in 2018

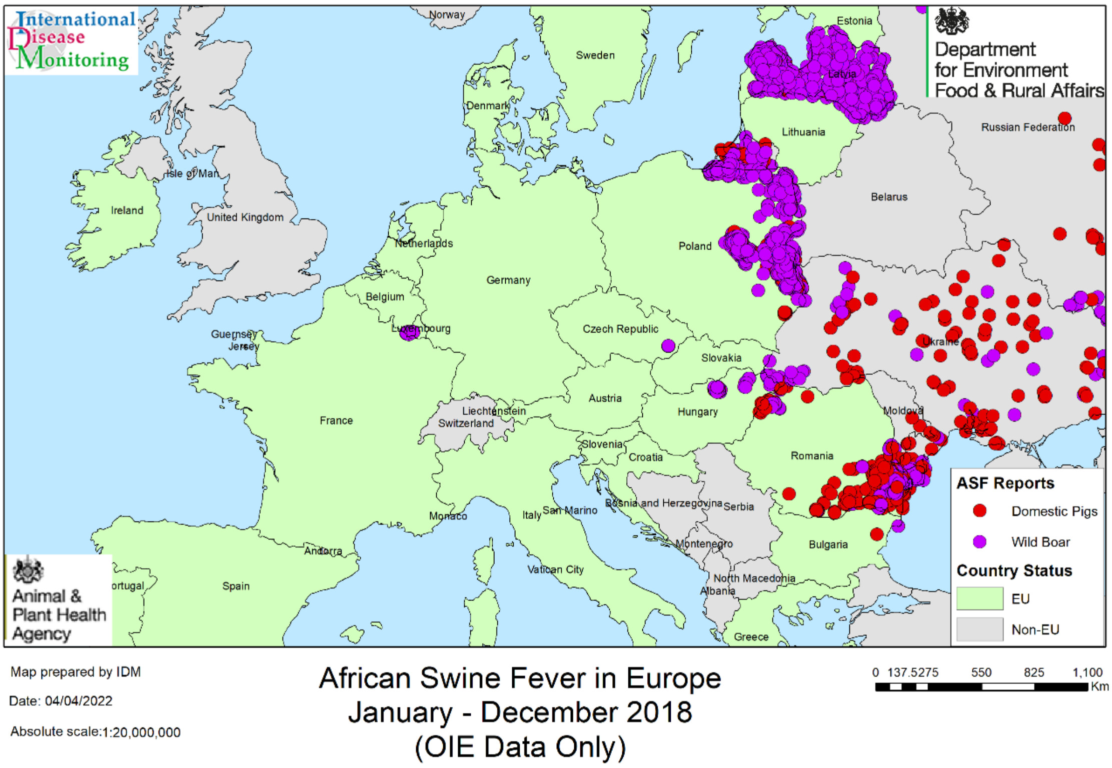
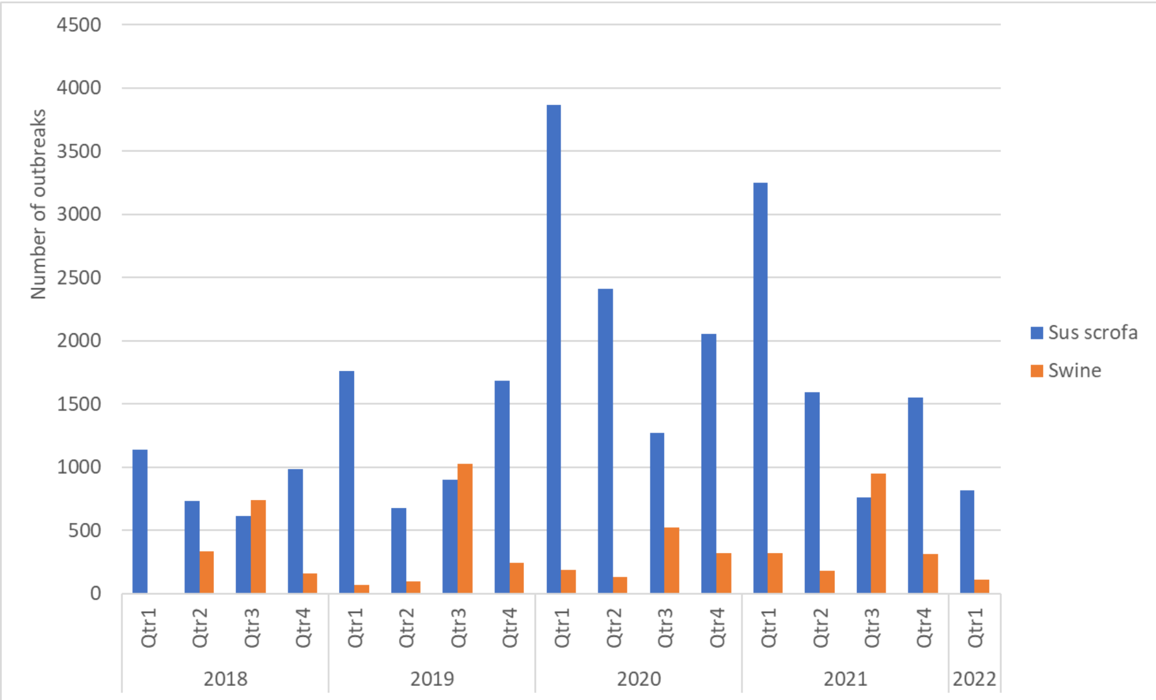


Figure 3 shows the quarterly cases in wild boar and pigs across the EU from January 2018 to December 2021, according to World Organisation for Animal Health (OIE). Some outbreaks reported to the EU's Animal Disease Information System (ADIS) are yet to be reported by OIE, in particular outbreaks in domestic pigs and wild boar in Estonia, Lithuania, and Slovakia.

In each year, the number of cases in wild boar exceeded the number of outbreaks in domestic swine. The number of cases in wild boar increased from 1,000 in the first quarter of 2018 to 1,500 in the first quarter of 2019, 3,500 in the first quarter of 2020 and 3,000 in the first quarter of 2021.

Figure 3: African swine fever cases in wild boar (Sus scrofa) and domestic pigs in EU member states between 2018 and 2021, according to OIE



In most EU member states (MS) cases of ASF in wild boar are the more frequently detected, with fewer outbreaks in domestic pig establishments. Overall, spread of ASF in wild boar in Eastern Europe has been slower than expected (Schulz et al., 2019), although there have been occasional 'jumps' in geographical distribution into discrete areas, most likely caused by human-mediated transmission routes.

In contrast, in Romania, there are a substantial number of outbreaks occurring in backyard domestic pigs with fewer outbreaks in wild boar. Risk factors for these outbreaks and commercial pig farm outbreaks include proximity to other outbreaks, wild boar cases and visits by professionals working on farms (Boklund et al., 2020).

There are large numbers of backyard premises in the country, many of which operate seasonally, and biosecurity is poor compared to commercial premises. The number of wild boar cases detected will depend not only on the prevalence of ASF infection, but also the intensity and effectiveness of surveillance strategies.

The spread of disease to wild boar in Germany in 2020, along with the 4 outbreaks in domestic pig premises in 2021, are of particular concern since Great Britain imports large amounts of swine POAO from Germany annually compared to other EU member states.

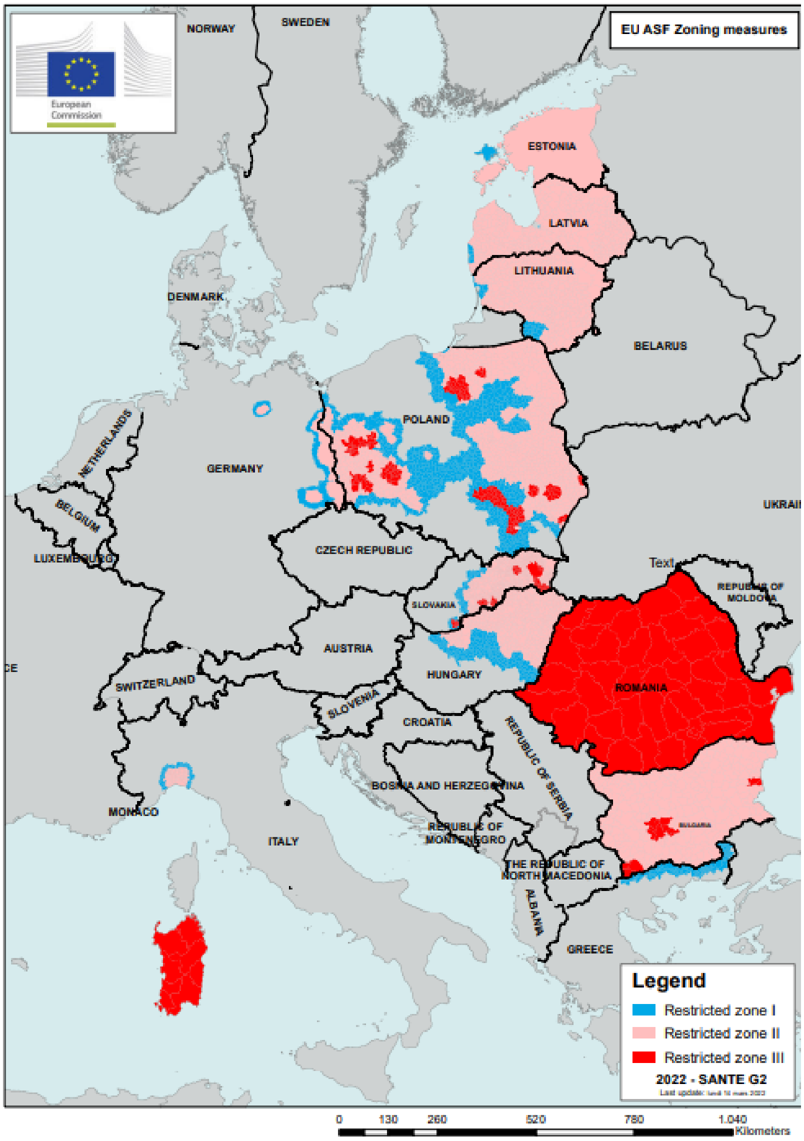
The most recent long distance 'jump' of ASF into wild boar in northern Italy is also concerning as it highlights that spread of ASF in areas distant to known outbreaks is possible despite EU requirements to mitigate ASF spread.

As part of ASF control measures within the EU, under EU Commission Implementing Regulation 2021/605, restriction zones are implemented in areas where ASF has been detected in wild boar (zone II) and the domestic pig population (zone III) and higher risk zones for disease spread (zone I): the most recent EU Restriction Zones are shown in Figure 3.

As required in Commission Delegated Regulation 2020/687 supplementing 2016/429, as ASF is a category A disease, around each new outbreak in domestic pigs, 3km protection and 10km surveillance zones are applied, with associated measures for surveillance and standstills.

Romania and Sardinia are in restricted zone 3. The majority of Estonia, Latvia, Lithuania and Bulgaria are in restricted zone 2. There are a range of different zones in Poland, Slovakia, Hungary, Germany and Italy.

Figure 4: European Union zoning measures for African Swine Fever outbreaks according to Commission Implementing Regulation (EU) 2021 / 605. Romania



In addition, in April 2021, the Commission Implementing Decision (EU) 2014/709 setting out ASF control measures and restriction areas was repealed and replaced with a new EU Commission Implementing Decision 2021/605. This sets out new special control measures for ASF for EU MS wishing to continue trading with other EU MS and exporting pigs and/or pig products to third countries, outside of the EU. These have some similarities with measures in Commission Implementing Decision (EU) 2014/709 and were developed with learning from the eastern European countries, Belgium and Germany that have been affected by ASF outbreaks in wild boar and domestic pigs.

As highlighted in Figure 3, Commission Implementing Regulation (EU) 2021/605 brings in additional measures to those laid out in Commission Delegated Regulation (EU) 2020/687, including the introduction of 3 types of restricted zones (RZs): RZI, RZII, RZIII (Commission Implementing Decision (EU) 2014/709 have 4 types of restricted zone described as Part I, Part II, Part III, and Part IV – the new restricted areas although similar to these are not directly comparable).

It also details the prohibitions and safe derogations applicable to the dispatch of commodities such as live pigs, pork, and germinal products from these areas, as well as the information and training obligations, public awareness, and reinforced biosecurity measures.

The RZs designate distinct regions in the proximity of the ASF incursion and are differentiated by the epidemiological situation of ASF and the level of risk, with RZIII allocated to areas with the highest level of risk for disease spread from POAO and live pigs and has the most dynamic disease situation in domestic pigs as it relates to outbreaks. Definitions for each RZ are as follows:

- RZI: Areas where no outbreak of ASF has been confirmed and that borders an area with confirmed ASF cases in kept or wild porcine animals
- RZII: Areas where an outbreak of ASF in wild porcine animals has occurred
- RZIII: Areas where an outbreak of ASF in kept porcine animals has occurred

The regions in the restriction areas are updated regularly at the meetings of the EU Standing Committee for Plants, Animals, Food and Feed (SCOPAFFs). A map of the latest update can be found on the EU website.

Any kept porcine animals, whether domestic pigs or wild boar, kept in RZs I, II and III are prohibited from moving outside those zones. Additionally, germinal products, animal by-products (ABPs) and fresh meat, meat products (including casings) obtained from porcine animals kept in RZs II and III are prohibited from moving outside those zones. However, there are special risk mitigating methods applied to processed meat products.

The competent authority may apply exemptions to these prohibitions to:

1. Porcine animals kept in RZ I for movements to establishments within the same Member State (MS).

2. Fresh meat and meat products from porcine animals originating in RZ I and RZ II provided they are accompanied by an animal health certificate with attestation about the zone. RZ III fresh meat must only move direct to processing and treatment.
3. Fresh meat and meat products from pigs slaughtered in RZ I, II or III provided they are obtained from porcine animals kept outside the RZs and are accompanied by an animal health certificate.
4. Processed meat products (including casings) from porcine animals kept in RZ I, II and III that have undergone the relevant treatment in accordance with Annex VII of Commission Delegated Regulation (EU) 2020/687 and are accompanied by an animal health certificate.
5. Processed meat products (including casings) from porcine animals kept outside RZ I, II and III and processed within RZ I, II or III that have undergone the relevant treatment in accordance with Annex VII of Commission Delegated Regulation (EU) 2020/687.
6. ABPs of category 2 and category 3 obtained from porcine animals kept in RZ II and III provided accompanied by an animal health certificate.
7. ABPs obtained from porcine animals kept outside RZ II and III that are slaughtered in slaughterhouses in RZ II and III, provided conditions on separation are met.

Certain movements of live porcine animals, meat and other porcine products may be allowed if conditions laid out in Commission Delegated Regulation (EU) 2020/687 and Commission Implementing Regulation (EU) 2021/605 are met. These include designating routes and destination establishments, regular visits by official veterinarians, a risk assessment, residency at an establishment for 30 days, a clinical examination within 24 hours prior to movement, PCR testing of dead animals and adherence to biosecurity requirements.

Providing these conditions are met, live porcine animals in RZ I may move outside that zone. Live pigs in RZ II may move outside that zone within the same MS and may move to a RZ II region in another MS for immediate slaughter. Live porcine animals in RZ III may move outside that zone within the same MS in exceptional circumstances and for immediate slaughter, or to RZ II in the same MS to complete the production cycle.

As the disease has continued to spread, so these restriction areas have been increased in size to compensate (see Figure 3). However, there continue to be large geographical ‘jumps’ which cannot be explained by the natural movement of wild boar. This raises the concern that the controls are not sufficient to prevent spread of disease through human mediated movement of contaminated or infected products which are abandoned in areas where wild boar live (Guinat et al., 2016).

The controls applied in RZ I regions will limit the movement of live porcine animals to other member states, and of live porcine animals from RZ II and RZ III into RZ I, only where risk mitigating conditions are applied.

However, fresh, and frozen meat may move from RZ I and therefore these restrictions rely on the boundaries being in the right place, and that all the Hazard Analysis and Critical

Control Points (HACCP) processes are undertaken at slaughterhouses and processing plants, including the requirements for ante and post-mortem inspections. These zones are continually changing as the disease continues to spread and 'jump' into new establishments.

Following UK exit from the EU, the UK performs limited checks on animal products coming from the EU. However, further checks on goods moving from the EU are expected to come into effect once Great Britain has implemented full Border Force operability. Until this is fully operable, it should be noted that Great Britain remains reliant on the EU's production standards and export controls. Moreover, measures laid out in the Northern Ireland Protocol dictates that there will not be border checks between the Republic of Ireland and Northern Ireland. This risk assessment will assess the likelihood of an incursion into Great Britain.

Risk assessment terminology

For the purpose of the risk assessment, terminology is used as defined in Table 2, Table 3 and Table 4.

Table 2: Terminology and definitions used for qualitative risk assessment (EFSA 2006, Bessel et al., 2020 and De Vos et al., 2020)

Probability	Definition from EFSA	Expanded description
Negligible	Event is so rare that it does not merit to be considered	The chance of the event occurring is so small it does not merit consideration in practical terms, or it is not expected to happen for many years, if at all
Very low	Event is very rare but cannot be excluded	The event is not expected to occur (very rare) in the next few years, but it is possible
Low	Event is rare but does occur	The event may occur occasionally (rare) but could occur in the next few years
Medium	Event occurs regularly	The event is possible within the next year
High	Event occurs very often	The event is expected to occur within the next year
Very high	Event occurs almost certainly	The event will almost certainly occur within the next year

Table 3: Ratings used to describe the level of uncertainty (EFSA, 2015)

Name	Explanation
Low	No or limited information or data are lacking, incomplete, inconsistent or conflicting. No subjective judgement is introduced. No unpublished data are used.
Moderate	Some information or data are lacking, incomplete, inconsistent or conflicting. Subjective judgement is introduced with supporting evidence. Unpublished data are sometimes used.
High	The majority of information or data are lacking, incomplete, inconsistent or conflicting. Subjective judgement may be introduced without supporting evidence. Unpublished data are frequently used.

Table 4: Terminology used to describe the consequence assessment (Food and Agriculture Organization (FAO) and World Health Organisation (WHO), 2021)

Level	Descriptor	Expanded description
1	Insignificant	Insignificant impact; little disruption to normal operation; low increase in normal operation costs
2	Minor	Minor impact for small population; some manageable operation disruption; some increase in operating costs
3	Moderate	Minor impact for large population; significant modification to normal operation but manageable; operation costs increased; increased monitoring
4	Major	Major impact for small population; systems significantly compromised and abnormal operation, if at all; high level of monitoring required
5	Catastrophic	Major impact for large population or complete failure of systems

Entry assessment

The entry assessment considered 8 key areas:

1. Commercial trade in live animals
2. Commercial trade in products of animal origin
3. Personal imports of products of animal origin
4. Illegal imports of live animals
5. Passengers transporting fomites
6. Vehicles
7. Vectors
8. Animal feed, bedding, and crops

A summary of results of each pathway in the entry assessment is given at the end of this section in Table 6.

1. Commercial trade in live animals

Live pigs are approved for trade between EU Member States in accordance with EU Regulation 2016/429 (2016) requiring animals to come from a holding and area which are not under restriction for any notifiable disease of swine (including ASF) and requiring veterinary certification.

Similar legislation applies to imports to Great Britain from an EU MS under the UK Statutory Instrument 2020/1462. Derogations for the movement of live pigs out of an ASF restriction zone (the PZ and SZ) are allowed under EU Commission Delegated Regulation 2020/687 supplementing EU Regulation 2016/429 following a veterinary risk assessment and additional controls, such as negative PCR testing at the individual level.

However, the movement would not be allowed to another Member State, and this is only applied to pigs destined for slaughter. Under EU Regulation 2020/687 and 2021/605 further control zones are applied in the event of an ASF outbreak or case being reported, which again only allow the movement of live pigs as a derogation.

No live pigs have been legally dispatched to Great Britain from affected regions or countries in the last 5 years (see Table 5).

Table 5: Number of pigs imported into the UK from EU member states 2016 to 2021. Note that these data are for UK imports and not just Great Britain. Source: Her Majesty's Revenue and Customs (HMRC).

Country	2016	2017	2018	2019	2020	2021
Denmark	673	467	327	421	500	512
Ireland	529,834	487,238	522,889	335,893	484,496	432,136

Country	2016	2017	2018	2019	2020	2021
Grand total	530,507	487,705	523,216	336,314	484,996	432,648

Other suids which may be dispatched for trade to Great Britain include exotic pig species or captive wild boar destined for approved premises such as zoos or exhibitions, but these are subject to disease control measures under UK legislation retained from 92/65/EEC.

Such moves are rare and, in Great Britain, involve non-domestic ('exotic') pig species moved between approved premises for captive breeding programmes. Pet pigs are still legally considered to be livestock, rather than pets, and so should still be subject to UKSI/2020/1462 certification.

Wild boar or feral pigs (pigs which are not raised in a holding or under control of an operator) may not be dispatched for trade.

There has been no recent direct trade in live animals from the affected regions of Bulgaria, Estonia, Germany, Hungary, Latvia, Lithuania, Poland, Slovakia, and Romania. Furthermore, annual numbers of live pigs imported from EU MS unaffected by ASF have been consistently lower than in 2018. There are also certification requirements for the disease-free status of live pigs and clinical examination prior to travel. However, in the past few years there has been ASF spread into new areas, demonstrated by the changing boundaries of RZs over time, and it is possible that imports could arrive from newly infected areas before disease is detected.

The median time for detection of ASF on pig farms is 13 days, with a likely maximum of 23 days (EFSA, 2021a). For these reasons, this pathway is considered to have an annual likelihood of **very low** (**low** uncertainty).

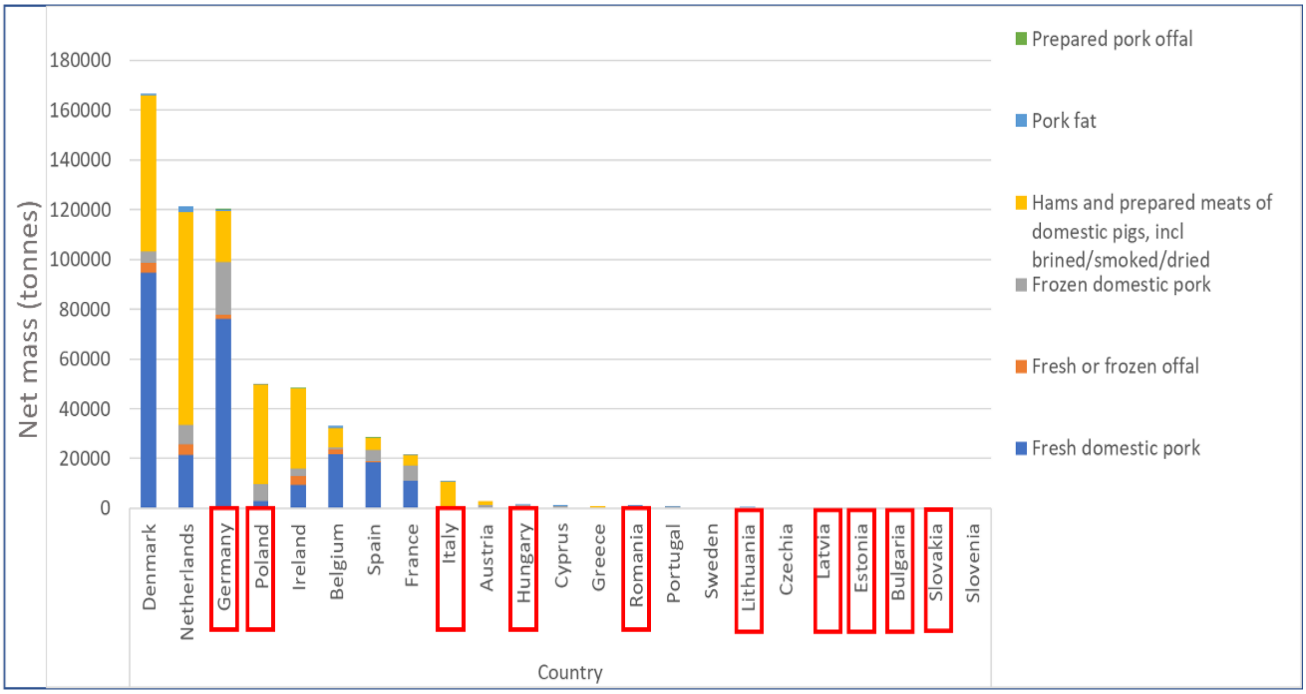
2. Commercial trade in products of animal origin

Great Britain imports substantial commercial porcine POAO from the EU, though this has reduced from around 800,000 tonnes in 2018 to around 600,000 tonnes in 2021.

Most POAO (excluding sausages) imported into the UK from the EU in 2021 came from Denmark, Netherlands, Germany and Poland. Germany and Poland both currently have African Swine Fever outbreaks as shown in Figure 4.

There are specific requirements for various pig products, fresh and frozen pig meat for all the RZ regions, and approval requirements for slaughterhouses and cutting plants. Treated products are allowed to be moved for trade from all RZs.

Figure 5: Net mass (tonnes) of UK imports of pork products of animal origin (excluding sausages) from EU member states in 2021. Current ASF-affected countries are highlighted in red. Note that these data are for UK imports and not just Great Britain. Source: HMRC Trade Data



In RZ I regions, only the meat of feral pigs and wild boar is prohibited (unless the animals are tested and the meat is marked and it is only destined for dispatch to within the same MS), otherwise all fresh and frozen meat and untreated products may still go to intracommunity trade.

In RZ II regions, fresh meat of domestic pigs slaughtered in RZ II may be dispatched to other MSs provided the pigs originated in areas outside RZ II or III. Fresh meat of domestic pigs kept in RZ II may be moved to other MSs or third countries provided the premises pigs are kept at comply with conditions laid out in Regulation (EU) 2020/687 and 2021/605. These include designating routes and destination establishments, regular visits by official veterinarians, a risk assessment, residency at an establishment for 30 days, a clinical exam within 24 hours prior to movement, PCR testing of dead animals and adherence to biosecurity requirements.

In RZ III regions, fresh and frozen pig meat and products of porcine origin may not be moved to other MSs and must be produced in accordance with certain measures to be moved within the same MS: domestic pig origin meat or products must test negative for ASF or show 30-day residency and on farm biosecurity requirements, be health marked and only be dispatched with a veterinary health certificate. All domestic pig origin meat and products must be processed (heat treatment), marked and be dispatched with a veterinary health certificate.

There are also derogations to allow the movement of animals for immediate slaughter from RZ III to approved slaughterhouses in other areas, provided the pigs have tested negative and been resident for 30 days. Swine kept outside of RZ I, II and III may be slaughtered within these RZs and fresh meat and meat products then allowed to move outside RZ I, II and III, within the same MS and to other MSs, providing such products are accompanied by an animal health certificate and in certain cases are subject to treatment.

Following UK exit from the EU, the UK performs limited checks on animal products coming from the EU. However, further checks on goods moving from the EU are expected to come into effect once Great Britain has implemented full Border Force operability. Until this is fully operable, it should be noted that Great Britain remains reliant on the EU's production standards and export controls.

The overall likelihood for this pathway depends on the disease status of EU MSs, the robustness of surveillance and the volume of POAO imports from affected MSs. In 2021, the UK imported over 300,000 tonnes of domestic swine POAO from EU MSs that currently have ASF outbreaks (including Italy and Hungary, which have never had genotype II ASF outbreaks in domestic pigs) and less than 800 tonnes of POAO from non-domestic swine.

There were around 1,000 tonnes of POAO imported from Romania (under RZ III) to the UK, Commission Implementing Regulation (EU) 2021/605 states that pigs kept outside RZ I, II and III can be slaughtered in RZs and POAO exported from derogated premises or treated products can be exported.

ASFV can survive in all POAO for extended periods of time (see Appendix A), but generally survives for less time in heat-treated, dried, cured, or salted POAO compared to fresh and frozen POAO. The UK imported just under 100,000 tonnes of fresh and frozen pork from Germany in 2021 and around 20,000 tonnes of treated pork. The UK also imported around 50,000 tonnes of POAO from Poland, around 80% of which was treated meat.

While both Poland and Germany have reported large numbers of ASF cases in wild boar, Germany has reported substantially fewer outbreaks in domestic pigs. In both countries outbreaks in domestic pigs are well-contained with few, if any, secondary outbreaks.

We consider this pathway, provided there is a stable disease situation in the area and all the correct biosecurity measures are in place, to be an annual likelihood of **very low** (**moderate** uncertainty).

This is because according to HMRC, there are few consignments to Great Britain from many ASF-affected areas and where there are high volumes of imports of POAO, there are robust wild boar surveillance systems and outbreaks in domestic pigs have been contained.

However, the demonstrable spread of ASF outside RZ boundaries means it is possible that imports arrive from newly infected areas before disease is detected. The likelihood can apply to other countries with a low volume of trade, robust surveillance and adherence to restriction zones in place. This may increase if the number and geographic distribution of outbreaks in domestic pig premises increases in countries which Great Britain imports high volumes of POAO.

3. Personal imports of products of animal origin

Compared to commercial imports, there are varying uncertainties in certification, traceability, and biosecurity of these personal imports. Therefore, they are considered a separate risk pathway. Since leaving the EU, the personal movement of POAO from the EU into Great Britain has become illegal under UK Statutory Instrument 2020/1462.

However, the legislation is currently (as of June 2022) suspended for goods from the EU and EFTA countries, the Faroe Islands and Greenland during the Transitional Staging Period, and therefore is not being enforced. There has been evidence of personal imports of porcine POAO at the Great Britain border where certification is absent, their origin is unclear and biosecurity during transportation are poor.

Recent evidence from inspections at Great Britain ports suggest that there are several vehicles bringing pork meat into Great Britain from some regions of the EU affected by ASF. Some of these instances involved large quantities of porcine POAO which appear to be home-slaughtered and arrive in Great Britain from an undisclosed origin as a self-declared personal import, with poor levels of biosecurity and food hygiene.

Since the previous risk assessment was commissioned in 2018, various risk mitigations have been implemented to target this route such as improved communications with Border Force officers, increased intelligence around illegal trade, enhanced communication around the risks of importing products of animal origin (POAO), targeted operations and the use of dogs to detect POAO in some airports.

Despite these efforts, incidents are being detected at least once a month. Although these types of imports are of relatively low volume compared to commercial imports, the incidents that are detected are likely to be an underestimate of the true volume. Moreover, results from the enhanced intelligence work have shown that personal POAO imports are coming into Great Britain from various ASF affected EU countries through door-to-door parcel delivery companies.

Personal imports pose a particular challenge for traceability as the origin of the POAO cannot be ascertained without appropriate veterinary certificates. However, there is evidence that the individuals, vehicles, and parcels involved, originate from countries where ASF is either present or the country has little surveillance.

As such, we consider this pathway to have an annual likelihood of **medium** (**high** uncertainty). This takes into account the number of units imported annually each with very low likelihood of being infected. The high uncertainty is a result of unknown origin of

POAO, the ASF infection status of the country of origin, and unknown adherence to biosecurity requirements of the premises of origin. This likelihood may be lowered with a reduction in the volumes imported via this route.

4. Illegal imports of live animals

The illegal movement of live pigs, live wild boar or live ‘pet’ pigs from continental Europe to Great Britain cannot entirely be ruled out but is believed to be **very low** annual likelihood (**moderate** uncertainty).

5. Passengers transporting fomites

The ASF virus can be carried on clothing and on footwear that has not been cleansed and disinfected. The virus can persist for several days, particularly if protected by organic matter (Bellini et al., 2016). Therefore, anyone with contact with an infected area, such as walkers, hunters, and farm workers visiting or returning to Great Britain could, in theory, carry contaminated items with them.

There were over 50,000 visits to EU member states from Great Britain in 2019, around 23,000 of which are to ASF-free France and Spain (Office for National Statistics). These numbers decreased significantly during 2020 and (and likely also 2021) due to the SARS-COV-2 pandemic, so the figures for 2019 are more likely to be representative of usual passenger numbers, although these numbers are not representative of increased numbers of visits by military personnel to the Eastern Europe because of the conflict in Ukraine.

In 2019, there were over 2,700 holiday visits to ASF-affected countries in the Baltic states and Eastern Europe, and over 1,800 business visits. There were comparatively more visits in 2019 to Germany and Italy, where ASF is less widespread.

In 2019, there were over 2,800 holiday visits and over 1,600 business visits to Germany. There were over 4,700 holiday visits and over 700 business visits to Italy in the same year. It is unclear how many of these visits might involve activities where people are likely to come into contact with ASF, such as hunting or farm activities, before returning to Great Britain. However, this is likely to only be a small proportion of individuals.

Therefore, the annual likelihood of people arriving in Great Britain with contaminated clothing or equipment is considered **low** (**moderate** uncertainty). The uncertainty is due to the unknown purposes of these visits and potential contact with ASF fomites.

6. Vehicles

6.1. Commercial livestock vehicles

There is very limited trade in livestock from the affected regions. However, there is no information on the number of commercial vehicles (vehicles not moving consignments of POAO) that have moved livestock to and from the affected countries which could have been used to transport products other than livestock to Great Britain. Only livestock vehicles are required to be cleansed and disinfected before entering a commercial pig farm. Whether these livestock vehicles are sufficiently cleaned and disinfected maybe uncertain.

Therefore, given the EU rules about cleansing and disinfection of livestock vehicles, this annual likelihood is considered **very low** (**moderate** uncertainty). The uncertainty is related to the seasonal survival of the ASF virus in cold weather and environmental contamination in areas with high levels of infected wild boar.

6.2. Passenger vehicles

Entry to Great Britain from mainland Europe for road vehicles is via either a ferry or the channel tunnel. These routes do not provide a direct link to a country with a high level of infection, but any road vehicle coming from such countries is likely to use these routes.

There has been a significant rise in road vehicles registered in Eastern Europe travelling through Great Britain ports in the past decade, particularly from Romania, Poland, and Lithuania, although numbers are similar when compared to 2018. Road haulage vehicles from Poland lift the highest tonnage of goods to Great Britain at over 5.7 million tonnes in 2019. Romanian and Lithuanian haulage vehicles account for over 1.6 million and 1.3 million tonnes, respectively, which are the fourth and fifth ranked country for foreign vehicles (data supplied by Department for Transport International Road Freight statistics for 2019).

There are no accessible data for private vehicles, nevertheless we would expect the number to have increased in a similar fashion up to the SARS-COV-2 pandemic, and for these levels to return to pre-pandemic levels.

For this risk pathway, no information is available on passenger vehicles (commercial vehicles, such as buses and coaches). There is little access to high biosecurity commercial pig premises in the EU, but they may pass through an area where wild boar is infected and therefore with high environmental contamination.

The main source of infection is within the backyard pigs and wild boar populations in East Germany and Eastern Europe which means that the virus could be present in the environment and fomite transfer can happen via any vehicle that has travelled within the infected area. There is no requirement for private vehicles to be cleansed and disinfected before entry into Great Britain .

However, the long distance and time of driving between Great Britain and East Germany, Poland, Romania, and the Baltic States where the disease is present will offer some degree of mitigation of the risk, but it would depend on the level of contamination and the degree of cleansing and disinfection carried out (which as mentioned is likely not done for private vehicles).

Vehicles that have been in contact with backyard pig farms and used for hunting pose a greater risk, as these vehicles could have been in contact with swine or used for transporting swine.

It is unknown how many vehicles from Great Britain travel to the region for the purpose of hunting or visiting backyard pig farms and given the large numbers of wild boar cases in Germany, Poland and Lithuania, the backyard pig cases in Romania, and the volume of traffic which could enter Great Britain from these areas, the annual likelihood from this route is considered to be **low** (**high** uncertainty).

6.3. Shipping and other maritime transport

Maritime transport could originate in the affected areas such as tourist cruise ships, commercial ships with cargo and private shipping. However, with the exception of the Baltic states and (importantly) the port of Genoa in Italy, there are few ports within the EU near ASF-affected areas. Crew and passengers may carry POAO, vehicles may be contaminated with virus and catering waste may contain contaminated pig meat.

For transport within the EU, international catering waste is treated as category 2 ABP which requires a low level of disposal. There are no category 2 level ABP plants in Great Britain and therefore, all waste should be disposed of as category 1.

This pathway is considered to be an annual likelihood of **low** (**high** uncertainty) where the uncertainty is related to the lack of checks on catering waste from the EU or for contamination of containers**.**

7. Vectors

The soft bodied or Argasid ticks, such as *Ornithodoros* spp. are most commonly cited as the mechanical vector for ASF with *Ornithodoros erraticus* the main tick species in Europe and the Mediterranean basin. No Argasid ticks species exist in Great Britain on livestock or wildlife and the climate is not suitable for establishment. It is possible that live animals may carry such ticks to Great Britain, but this is generally considered to have a low likelihood for long distance spread as ticks feed for very short periods and then drop off the host to look for another. It is therefore discounted as a risk pathway for introducing disease to Great Britain.

Biting flies, such as *Stomoxys calcitrans*, the stable fly, have been shown experimentally capable of maintaining viable ASFV in mouth parts after feeding on an infected pig, for up to 2 days (Mellor et al., 1987). The virus titre remained constant in the flies although volume of infected blood taken up varied considerably.

When flies were part fed on infected blood then allowed to continue to feed on an uninfected animal one hour and 24 hours later, the pigs developed clinical signs typical of ASF infection (Mellor et al., 1987). *Stomoxys* flies frequently fly up to 1.5 km a day and for this reason represent less of a risk for long distance spread, but more so for local spread (Kaufman and Weeks, 2012).

There is a high level of uncertainty around the impact of vectors in the transmission of ASF. A recent paper looking at the role of biting flies in Lumpy Skin Disease incursion into France (Saegerman et al., 2018) suggested the movement in trucks of stable flies, *Stomoxys calcitrans*, is possible, more so than Tabanid flies which do not survive long journeys as they are rapidly damaged and die from trying to get out of the truck.

There are several steps in the pathway which are also seasonally dependent, the:

1. insects must bite an infected animal prior to entering the truck or an infected animal should be in the truck
2. journey time must be shorter than the viral survival
3. animals are not unloaded during the journey (for journeys shorter than 8 hours) the truck enters a farm where there are susceptible animals
4. flies bite a naïve animal and transmit an infectious dose

This would realistically only apply to live animals coming from North-Western Europe, as the rest of Europe would be too long in journey time and therefore the annual likelihood of entry is considered **negligible** (**moderate** uncertainty). This would be likely to increase should countries in northern Europe, from which Great Britain imports live pigs, became affected by ASF.

8. Animal feed, bedding, and crops

8.1. Crops, seeds, and feed

An EFSA opinion in 2021 considered the likelihood of transmission from feed materials to be lower than other pathways including live animals and swill feeding but are credible pathways (EFSA, 2021a). Recent information on contaminated crops being fed to pigs in NE EU suggests this is a credible risk pathway (Bellini et al., 2016). One area of interest is the imports for feed during periods of poor forage availability.

There is only limited evidence to suggest this is a credible risk pathway. In the Baltic States, some backyard farms became infected as a result of feeding pigs on grass where wild boar had been found dead, therefore the grass and hay were understood to be contaminated. Wild boar will preferentially spend time in crop fields and therefore if they are infected and die on site and not disposed of carcase remains may be picked up with the grain at harvest and any environmental contamination may contribute to transmission.

At present therefore this cannot be ruled out, although studies involving ASF-spiked cereal grains including wheat, barley, rye, maize, and dried distillers’ grains with solubles found virus survival times of less than one day after storage at room temperature for 2 hours (Dee et al., 2018 and Fischer et al., 2020). Survival times of ASF-contaminated carcase remains are likely to be longer.

8.2. Use of blood or plasma in feed

Production of blood products for animal feed would require operators to process the blood to standards that reduce the risk from hazards to levels that provide an insignificant risk to public and animal health such heat treatment and spray drying. Blood products are not produced from pigs in ASF-affected areas. Blood and plasma in feed have only very limited use in the Great Britain pig market and are not allowed under Red Tractor Farm Assurance scheme (Red Tractor Assurance, 2013).

Pig herds which are part of the pig assurance scheme (which covers 92% of England's pig population) should only be fed purchased compound feed or feed materials from assured compounders or merchants and must only use those, which are permitted under Great Britain and EU law.

In areas newly infected with ASF there could be production from infected animals in the early stages of disease, therefore this remains a credible pathway although the Great Britain pig sector should not be using it.

8.3. Use of soybean

Use of soybean as animal feed is very common and certain methods may involve extracting using solvent, using mechanical processes on dry flakes, or using screw pressing with steam. Although it is not clear whether there could be some contamination of the product with ASFV, experimental spiking of plant-based feed with ASF has been shown to lead to infection at high doses of ASFV (Niederwerder et al., 2019).

Post-processing ASF-contaminated soybean meal stored between 12ºC and 15ºC has been found to test positive for virus after 30 days (Stoian et al., 2019 and Dee et al., 2018). However, most soya imports to Great Britain are from South America and the USA, not from ASF-affected regions.

8.4. Other feed additives

Other feed additives such as vitamins and minerals (for example, chondroitin or glucosamine, vitamin D) may be of animal origin but would be subject to an extraction process expected to mitigate any viral contamination. Similarly, the production processes used to produce compound feeds would be expected to mitigate viral contamination (EFSA, 2021b).

8.5. Raw pet food for European trade

Raw pet food for European trade, all raw pet food should only be made from category 3 ABP. Therefore if, for example, someone was to feed a dog some pork bones as raw pet food, and these were accessible by feral pigs or domestic pigs, this should still be a negligible pathway provided the animal by-product rules are adhered to.

Considering the variety of feeds imported to Great Britain from the EU, this pathway is assessed as having an annual likelihood of **very low** (**moderate** uncertainty).

Information on feed processing can be found on feedipedia.

8.6. Bedding

There is no data on the survival of ASFV in bedding material such as straw and forage, such as grasses and legumes, although local forage has been identified as a risk factor for farm outbreaks in Romania (Boklund et al., 2020). The source of bedding or forage could be a pathway if they were imported from an affected area, particularly if materials originated from fields in which ASF-contaminated carcases have not been disposed of.

Expert opinion about the survival of ASFV on wood suggests it is possible but would depend on the faecal or blood contamination of the material, but anything that has had contact with infected pigs should be thoroughly cleansed and disinfected as part of the disease control measures under EU rules. Therefore, this pathway is considered to be **very low** (**moderate** uncertainty).

Table 6: Summary of pathways for the entry assessment with likelihoods and uncertainty. The total likelihood of entry is calculated using the sum of the risk pathways, and the overall uncertainty is the uncertainty associated with the highest likelihood.

Pathway	Likelihood of entry into Great Britain	Uncertainty
Live wild boar (natural movement)	Negligible	Low
Commercial trade in live animals	Very low	Low
Commercial trade in products of animal origin	Very low	Moderate
Personal imports of products of animal origin	Medium	High
Illegal imports of live animals	Very low	Moderate
Passengers transporting fomites	Low	Moderate
Vehicles	Low	High
Vectors	Negligible	Moderate

Pathway	Likelihood of entry into Great Britain	Uncertainty
Animal feed, bedding, and crops	Very low	Moderate
Total	Medium	High

Exposure assessment

For the purposes of this risk assessment, we consider the exposure of all pathways to each of the 3 sectors to a single incursion:

1. Commercial pig farms with good biosecurity
2. Backyard, smallholder, and pig farms with poor biosecurity
3. Free-living swine

The likelihood of first incursion of ASFV through infected live pigs to animals in any of these sectors is considered very low (low uncertainty) due to no trade in live animals from ASF-affected countries. However, the possibility remains that we could import animals from newly infected areas where disease has not yet been detected.

The most likely pathways for first introduction of ASFV into the Great Britain pig population are animals eating infected products of animal origin or having contact with people or equipment who have come from ASF-affected areas.

Swill feeding is not allowed in Great Britain, and this includes feeding kitchen scraps to free-living swine. Nevertheless, there may be some swill feeding carried out in backyard premises or inadvertent disposal of ASF-contaminated products in areas with free-living swine. There are anecdotal reports of wild boar in the Forest of Dean raiding household food bins, and of pigs in pannage in the New Forest in southern England accessing commercially produced (cooked) sausages. Therefore, the exposure of ASFV to the Great Britain pig population cannot be ruled out.

1. Commercial pig farms with good biosecurity

The majority of Great Britain commercial pig farms are part of the Red Tractor Assurance scheme and farms have good biosecurity in comparison to non-commercial farms. Furthermore, the feeding of swill to pigs is prohibited as specified by The Animal By-Products Order 1999. The annual likelihood of animals on these types of farms coming into contact with infected POAO is considered to be very low (low uncertainty).

While there is no information available on the nationality of people working on commercial pig farms, there is anecdotal evidence of Eastern European citizens from ASF-affected countries being employed in these businesses.

However, good biosecurity premises require workers to have a period of (usually) at least 3 days after travelling or having contact with other pigs before they can return to work, and that clothing and shoes must be changed before entering a premises. Pig keepers in the commercial sector are likely to have a good awareness of the risks of ASF from communications campaigns and the ongoing outbreaks across Europe and Asia.

Experienced pig workers from ASF-affected countries would also be aware of the disease. This awareness should limit the contact that animals on commercial premises have with vehicles and equipment from ASF-affected countries, although data is not available for the numbers of international commercial freight delivering goods to pig farms. Therefore, overall, the annual likelihood of exposure to this pathway is considered **very low** (**high** uncertainty).

2. Backyard, smallholder, and pig farms with poor biosecurity

According to 2016 to 2017 estimates, there were over 24,000 smallholding and pet pig premises across Great Britain, which is over 87% of all pig holdings. Pig keepers at these types of farms will vary in their knowledge and livestock management. The survival of ASFV in POAO means there is a credible risk pathway into these types of Great Britain pig farms (and to commercial pig farms with poor biosecurity) should swill feeding or feeding of catering and food waste (whether deliberate or accidental) take place.

The likelihood of this exposure occurring is dependent on the feeding of infected POAO, but due to the large number of these types of premises in Great Britain, unknown biosecurity measures and anecdotal evidence of illegal swill feeding, we consider the annual likelihood of exposure via this pathway to be **low** (**high** uncertainty) for non-commercial and poor biosecurity commercial pig farms.

3. Free-living swine

The term 'free-living swine' applies to wild boar and feral pigs, and to swine free to roam over extensive areas with limited management such as for pannage. The natural movement of free-living swine is not considered a risk pathway for ASF incursion into Great Britain. Legal movements of live pigs are considered a **negligible** likelihood.

There are several discrete populations of wild boar and feral pigs in Great Britain, with the largest population living in the Forest of Dean. A 2021 population survey by the Forestry Commission estimated the number of wild boars in the Forest of Dean at 937 individuals (95% confidence interval: 623 to 1,409), down from the 2018 estimate of 1,635 (95% C.I.: 1,200 to 2,228). There are other pockets of wild boar and feral pigs throughout Great Britain, although exact numbers are unknown (Mathews et al., 2018).

There are also small (but increasing) numbers of premises allowing extensive free range of pigs and wild boar which are usually limited to private estates.

The practice of pannage is limited to discrete areas within Great Britain, particularly in the New Forest although it is practiced in areas outside of this. The pannage season varies depending on the weather and when acorns fall but tends to be in Autumn months.

The exposure of contaminated products to this population is dependent on the access to food waste. There are anecdotal reports of wild boar in the Forest of Dean raiding food waste bins, and food waste bins in the area have been made 'boar-proof.'

The free-living status of this sector means there is opportunity for these swine to access ASF-infected products from waste bins and products that have been inadequately disposed of, although these populations are relatively small and localised in Great Britain. This a credible risk pathway and therefore we consider the annual likelihood as **low** (**moderate** uncertainty).

Consequence assessment

The pig population in Great Britain consists of of around 5 million animals in 2020 with an estimated export of around 350,000 tonnes of pork worth over £567 million in 2021 (Agriculture and Horticulture Development Board (AHDB) 2022). The feral pig population comprised of several hundred animals in isolated populations, the largest of which is the Forest of Dean which is home to around 1,000 feral boars.

In terms of the impact or consequence of ASF infection this is mainly considered for the commercial sector and can be measured in terms of economic impact from high case fatality rates, requirement for culling of affected farms and the significant trade impact, particularly with respect to the valuable third country market (for example, China) as well as EU trade (Table 7).

There would also be considerable animal health and welfare impacts. While there is no public health risk, just one detected case in a free-living feral pig population could lead to a trade ban of pork products, the severity of which will depend on the regionalisation agreements made with each trade partner. This is typically a lengthy and prolonged process.

Given the open border between Northern Ireland and the Republic of Ireland negotiated as part of the Northern Ireland Protocol, an ASF outbreak in either Great Britain or the Republic of Ireland is likely to hold particular challenges in initiating this regionalisation process with a third country.

Table 7: Exports of live pigs and porcine POAO from the UK in 2021. Note that these data are for UK not Great Britain. Source: HMRC Trade Data

Country	Exports (in pound sterling)
China	£243,674,174
Ireland	£106,111,836
Philippines	£37,870,919
France	£23,956,219
United States	£23,544,955
Hong Kong	£18,682,515
Germany	£17,588,576
Netherlands	£11,911,864
South Africa	£9,248,914
Canada	£7,603,273
South Korea	£7,381,462
Australia	£6,753,539
Denmark	£6,290,418
Belgium	£5,856,711
Poland	£4,593,800
Rest of the world	£29,274,792
Total	£560,343,967

The size of the impact is difficult to quantify and would depend on the outbreak size and duration. In 2000, an outbreak of classical swine fever (caused by a virus sharing similar clinical signs and transmission mechanisms to ASFV) on 16 farms in Great Britain, resulted in the culling of 75,000 pigs and cost around £4.4 million in compensation alone (Defra 2014), but this does not include control costs or loss of trade with could amount to over £120 million (expert elicitation, unpublished).

Due to the small discrete populations of free-living feral pigs, we would not expect disease to be maintained in these populations, giving rise to continual reintroductions into the domestic pigs, as seen in Eastern Europe.

Nevertheless, the costs of control in a free-living feral pig population would also be substantial, for example, the cost of ASF in wild boar in Saxony in Germany was estimated at €18 million in 2021 (Pig Progress, 2021). Given the welfare, trade, social and economic impacts of an incursion, we would consider the consequence to be **major** (**moderate** uncertainty).

The uncertainty is due to the lack of previous ASF outbreaks in Great Britain, differences between pig sectors that may be affected and the unknown trade partner agreements that may be implemented.

Conclusions

For the risk of entry of ASF into Great Britain, there are multiple pathways given the number of affected geographic regions in the EU, the potential for fomites, contaminated products and possible infected products entering Great Britain illegally. For the purpose of this document, we have used the standard risk level table of EFSA to describe the qualitative pathways and associated uncertainties.

The entry assessment concluded that the overall annual likelihood of introduction of ASF into Great Britain considering all the pathways was **medium** (**high** uncertainty) because of the combination of the pathways for introduction. In terms of exposure, the likelihood is given for commercial pig farms, backyard farms and free-living swine, and considering the most likely pathways.

Free-living feral swine and backyard, smallholder and pig farms with poor biosecurity are given a **low** score, while assured commercial farms are given a very low score. There is more uncertainty in the scores for feral pigs and non-assured farms or small holders compared with assured commercial pig premises.

The spread into the commercial pig sector will probably depend on how long disease has been present but undetected in the country, but should it get in the consequences are assessed as potentially **major**, depending on the pig sector or sectors affected. Additional risk management measures would therefore be recommended.

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Appendix A: survival time of ASF virus in different products and conditions

Survival time of ASF in different products of animal origin. Adapted from EFSA (2021)

Table 8: Chilled unprocessed meat (4ºC)

Product	Survival time (days)	Reference
Blood	525	Plowright et al., 1967
Whole and ground meat	More than 2	McKercher et al., 1978
Fats	0	Sindryakova et al., 2016
Bones	94	McKercher et al., 1978
Intestines	7	Jelsma et al., 2019

Table 9: Frozen unprocessed meat (-16ºC to -20ºC)

Product	Survival time (days)	Reference
Organs (spleen)	More than 735	Plowright et al., 1967
Organs (heart and liver)	More than 60	Sindryakova et al., 2016
Fats	More than 60	Sindryakova et al., 2016

Table 10: Heat-treated processed meat

Product	Survival time (days)	Reference
Ham brined and heated	0	McKercher et al., 1978
Canned stew pork	0	Sindryakova et al., 2016

Table 11: Non-heat-treated immersion cured products

Product	Survival time (days)	Reference
Corned pork (20 to 25ºC)	16	Sindryakova et al., 2016
Corned pork (chilled or frozen)	more than 60	Sindryakova et al., 2016
Ham brined (chilled)	2	Sindryakova et al., 2016

Table 12: Non-heat-treated dry cured products

Product	Survival time (days)	Reference
Pork belly and pork loin	60 to 83	Petrini et al., 2019
Salami	18	Petrini et al., 2019
Salami sausage	9	McKercher et al., 1978
Pepperoni sausage	8	McKercher et al., 1978
Iberian pork	84 to 112	Mebus et al., 1997
Serrano ham	112	Mebus et al., 1997
Salted pork fatback (chilled)	0	Sindryakova et al., 2016
Salted pork fatback (frozen)	more than 60	Sindryakova et al., 2016

Table 13: Sausage casings

Product	Survival time (days)	Reference
In medium and chilled	7	Jelsma et al., 2019
At room temperature	More than 30	Stoian et al., 2019 and Dee et al., 2018

Table 14: Survival time (in days) of ASF in excreta including faeces, urine and slurry. Adapted from EFSA (2021b), Davies et al., (2017) and Turner and Williams (1999).

Temperature range	Faeces	Urine	Slurry
Chilled (4°C)	5	5	unknown
Cooled (12°C)	5	5	unknown
Room temperature (21°C)	3	5	unknown
Hot (37°C)	1	1	unknown
Heated (53°C for 5 to 7 minutes)	unknown	unknown	0

Table 15: Survival time of ASF in different conditions and matrices. Adapted from EFSA (2010).

Condition	Survival time
Temperature at 50°C	3 hours
Temperature at 56°C	70 minutes
Temperature at 60°C	20 minutes
Less than pH4 or more than pH11.5	minutes
Blood stored at 4°C	18 months
Temperature at 50°C	3 hours
Putrefied blood and bone marrow	15 weeks
Faeces (room temperature)	11 days
Slurry at 65°C	minutes
Contaminated pig pens	1 month
Survival in air	20 minutes half life