



Animal &
Plant Health
Agency

Scientific opinion on the incursion of High Pathogenicity Avian Influenza (HPAI) H5N1 into housed or not housed poultry flocks and captive birds

Date: 31 January 2023

Summary

The scientific opinion for the risk of incursion of highly pathogenic avian influenza (HPAI) H5N1 into housed and non-housed birds (domestic poultry and captive birds) in Great Britain from direct and indirect contact with wild birds in winter 2022 to 2023 is updated here to accommodate the wild bird cases and poultry outbreak reports to 31 January 2023. This scientific opinion was previously updated in October 2022 in response to an increase in the number of findings of HPAI H5N1 in poultry and wild birds and the beginning of the migratory waterbird season. The epidemic curve for the 2022 to 2023 season started earlier in Great Britain than in previous years with much higher numbers of reports in poultry, captive birds and wild birds in early autumn. This is consistent with the virus circulating in wild birds including seabirds over the summer and spilling into resident wild waterbirds in the early autumn with amplification as they gathered at their wintering sites. A housing order came into force across the whole of [England on 7 November 2022](#) and then across [Wales on 2 December 2022](#).

It is not possible to directly measure the effect of housing poultry on the reducing the risks of exposure to HPAI from wild birds. It has previously been estimated by expert opinion that housing of poultry gives a **two-fold** reduction in the risk of exposure of poultry to virus from wild birds increasing to a **six-fold** reduction if the unhoused birds previously had access to environmental water bodies in the absence of any biosecurity. Furthermore, by applying routine biosecurity to poultry premises there is a further **four-fold** reduction in risk while high biosecurity leads to a further **44-fold** reduction in risk. This highlights the importance of maintaining high biosecurity at all times to protect poultry.

Housing orders have been put in place three times since 2016 (in the 2016 to 2017, 2020 to 2021 and 2021 to 2022 seasons) as a preventative measure to the estimated increased risk to poultry from wild birds. The [European Food Safety Authority \(EFSA\) in 2017](#) used expert opinion to assess the effectiveness of various biosecurity measures in preventing outbreaks. Expert opinion was utilised as there was insufficient published evidence to assess the efficacy of housing or biosecurity on the prevention of HPAI. The opinion concluded that housing as a standalone measure (that is in the absence of other biosecurity measures such as foot dips, cleaning equipment, preventing access to wild birds and rodent control) is likely to reduce the number of outbreaks and estimated a two-fold reduction in risk but is not able to completely prevent all outbreaks. It recommended that a suite of biosecurity measures should be implemented, alongside appropriate

training. Nevertheless, the paper did highlight that outdoor poultry holdings bear an increased risk of avian influenza incursions and the applicable biosecurity measures are more limited where birds are not confined to housing.

Here the assessment for the current (31 January 2023) HPAI risk levels in Great Britain is updated, based on current control measures and the infection pressure for different areas of Great Britain from wild bird abundance. The key points relating to the current situation are:

1. The outbreak in 2021 to 2022 was unprecedented with HPAI H5N1 being identified in wild birds and holdings with kept poultry in Great Britain over the summer months of 2022. As such the risk levels in the 2021 to 2022 season never dropped below **LOW** for poultry (with **high uncertainty** for premises with poor biosecurity and **low uncertainty** for premises with stringent biosecurity), or below **medium** for wild birds.
2. In the 2021 to 2022 season (1 October 2021 to 30 September 2022) there were 152 infected premises (IPs).
3. Since the start of the 2022 to 2023 season (1 October 2022 to 31 January 2023), there have been 167 confirmed IPs of poultry, with 144 in England, 20 in Scotland and three in Wales.
4. HPAI H5 wild bird detections continued across Great Britain throughout the summer and into the 2022 to 2023 season, with 146 detections from 1 October 2022 to 24 October 2022. The majority were found in England (124), followed by Wales (19) and Scotland (3).
5. Following the high number of HPAI detections in wild birds and IPs in October 2022, the risk level was increased to **VERY HIGH** for wild birds on 21 October 2022 and the risk levels to poultry were increased to **HIGH** (with low uncertainty) where biosecurity is sub-optimal and increased to **MEDIUM** (with high uncertainty) where biosecurity is stringent (practicing the highest standards of biosecurity) on 14 October 2022.
6. Avian Influenza Prevention Zones (AIPZs) were declared in [England, Scotland, Wales, and Northern Ireland on 17 October 2022](#). The AIPZ requires keepers and personnel working with poultry to take additional biosecurity measures. The AIPZ in England is additional to the AIPZ which was declared in [Norfolk, Suffolk and parts](#)

[of Essex on 27 September 2022](#), following an increase in the number of HPAI IPs with domestic poultry in the region and additional housing measures came into force for [Norfolk, Suffolk, and parts of Essex on 12 October 2022](#). This means that all bird keepers in these areas (whether they have pet birds, commercial flocks or just a few birds in a backyard flock) are required by law to take a range of biosecurity precautions, including housing their birds (except in very specific circumstances). Following an increase in the number of Infected Premises in England, and ahead of the peak migration period, housing measures came into force across the whole of England on 7 November 2022 and on 2 December 2022, additional compulsory biosecurity and housing measures came into force across Wales. This means that all bird keepers in these areas (whether they have pet birds, commercial flocks or just a few birds in a backyard flock) are required by law to take a range of biosecurity precautions, including housing their birds (except in very specific circumstances).

7. There are a number of risk pathways for the introduction of HPAI from wild birds to domestic birds. Transmission between infected wild birds and kept birds can occur as a result of direct transmission (beak to beak contact) or indirect transmission (wild birds contaminate objects (fomites) and the environment which kept birds then come into contact with).
8. Spread of HPAI between premises when disease control measures and keeper awareness are high has been rare in the UK. Two proven events of secondary spread of HPAI prior to this winter season have occurred in 2007 and 2017 when spread between two units of the same business occurred through shared workers. Nevertheless, in the 2021 to 2022 season, and so far in the 2022 to 2023 season, there has been an unprecedented number of poultry outbreaks and the source of infection (lateral spread, separate incursions from wild birds or from a heavily contaminated environment) in commercial farms is still under investigation.
9. Since October 2022, infection in resident wild bird species including waterfowl and gulls (such as mute swans, Canada geese, greylag geese and black-headed gulls) has continued to be reported, as well as infection in a smaller number of migratory waterbird species (mainly whooper swans, pink-footed geese and barnacle geese). Pheasants and several raptor species including common buzzard and sparrowhawk have also been reported.

10. HPAI H5N1 also continues to be reported in wild birds and poultry across northern Europe throughout the winter of 2022 to 2023. However, unlike in the autumn months, detections of HPAI in wild birds in Europe at this time of year (end of January) are of less relevance to future risks to Great Britain because all the over-wintering migratory ducks, geese and swans have now arrived in Great Britain from Europe.
11. The risk levels for Great Britain have remained unchanged (as at time of writing 31 January 2023) at **VERY HIGH** for wild birds, **HIGH** (with low uncertainty) where biosecurity is sub-optimal and **MEDIUM** (now with medium uncertainty) where biosecurity is stringent (practicing the highest standards of biosecurity).
12. Over the first few weeks of January 2023 the numbers of wild bird cases, both reported and testing positive have fallen, although with 19 cases in the third week of January, the risk in wild birds is still considered **VERY HIGH**. From a risk assessment perspective at least, the poultry risk levels should remain unchanged until the wild bird risk shows some sign of decreasing. The number of poultry IPs continues at around one to six per week over the first few weeks of January 2023 but markedly down from the 27 and 26 IPs in the second and third weeks of October 2022, respectively. To increase the sensitivity of detection of any changes in the wild bird risk, the surveillance threshold for swans and geese has been dropped from five dead birds to three dead birds found at the same site in England at the end of January 2023. This drop means that more HPAI wild bird events are recorded because only three dead birds need to be found at a site whereas previously five were needed.

Introduction

In an unprecedented 2021 to 2022 season, HPAI H5N1 persisted in Great Britain over the summer months of 2022, with the virus maintained in breeding wild birds (including colony breeding seabird populations and gulls). In early autumn 2022, detections shifted to resident waterbirds (Canada geese, greylag geese, mute swans and gulls) prior to the arrival of the autumn migratory waterbirds. Farmland and woodland bird species were also affected including 60 Common buzzards and 44 pheasants. The arrival of the migratory waterbirds during November and December did not seem to markedly increase the number of wild bird detections with most cases still in the resident species, although it should be noted that the surveillance threshold for swans and geese was increased from

three to five in England on the 12 December 2022, thus potentially reducing the number of wild waterbird submissions. This has since been reduced from five to three in January 2023 to increase sensitivity of detections in wild birds at this later stage of the epizootic. During October 2022 the wild bird risk and infection pressure on poultry in Great Britain rapidly increased such that the national risk level for HPAI H5 in wild birds was raised to **very high**. The risk to poultry with sub-optimal biosecurity was raised to **high** with **low uncertainty** and the risk for poultry with stringent biosecurity was raised to **medium** with **high uncertainty**, following an increase in the number of Infected Premises (IPs). Subsequently, with the availability of more data showing that the rate of IPs with stringent biosecurity was not increasing, risk for poultry with stringent biosecurity was changed to **medium** with **medium uncertainty**.

Housing orders have been utilised in Great Britain and also in several EU countries during previous outbreaks of HPAI. The effectiveness of housing orders on reducing exposure of poultry to virus is difficult to assess. In the 2021 to 2022 and 2016 to 2017 seasons in Great Britain it is most likely that there would have been a higher number of outbreaks without the housing order in place. However, it is difficult to estimate how many flocks would have been exposed to the virus if the housing order had not been in place, and therefore how many were prevented as a result of the housing order.

EFSA carried out a comprehensive review of the outbreaks of HPAI H5N8 in 2016 to 2017 to assess the risk of introduction of virus into poultry from migratory and residential wild birds (EFSA, 2017). The opinion concluded that once virus is introduced to a wild bird population, a critical population size is required before virus amplification and further wild bird-associated geographical spread of the virus can take place. Therefore, there is an increased likelihood of incursion into poultry farms most closely located to large gatherings of wild birds (including but not exclusively waterfowl) during the waterbird migration season. Once the migratory birds leave (from late March onwards) the risk of poultry outbreaks in Europe and Great Britain usually reduces but in cases where non-migratory birds are still testing positive, there will be a continual, albeit lower, risk. The risk is anticipated to be lower because the large gatherings of wintering resident birds will have dispersed to their breeding sites, the migratory waterbirds will have departed and the warmer temperatures and longer day lengths will reduce virus survival in the environment. The sustained transmission of HPAI H5N1 in breeding seabirds as was observed over the summer months of 2022 in Great Britain and northern Europe was unprecedented.

Through the EFSA (2017) expert opinion, the impacts of various sanitary control measures were estimated. The relative risk reduction for entry of the virus from wild birds to poultry was estimated to be **three-fold** by preventing access of poultry to water bodies. It was estimated by expert opinion that housing of poultry gives a further **two-fold** reduction, and by applying routine biosecurity to poultry premises there is a further **four-fold** reduction in risk while high biosecurity leads to a further **44-fold** reduction in risk.

A further supporting document to EFSA opinions on the risk of introduction of HPAI into poultry farms in general (EFSA, 2017a) was a systematic review of previous outbreaks to identify risk factors and concluded that the main risk factor for introduction is contact with wild birds or fomites contaminated with wild bird faeces. Other important risk factors were poultry species (waterfowl and turkeys are higher risk), the production system, where outdoor systems are higher risk than indoor, and the presence of biosecurity flaws.

This scientific opinion is aimed assess whether the continued implementation of housing of poultry is likely to reduce the number of outbreaks in Great Britain in February 2023 to aid policy decisions.

Risk assessment

Hazard identification

The hazard identified is the high pathogenicity avian influenza (HPAI) virus H5N1 subtype, as this is the only subtype isolated from the UK during the current season which started on 1 October 2022. Indeed, apart from where the virus has been untyped, all the wild bird cases in Europe since 1 October 2022 have been H5N1 with the exception of H5N5 in a great black-backed gull in Norway in October.

Risk question:

“What is the risk of incursion of HPAI H5N1 into housed and non-housed birds (domestic poultry and captive birds) in England, Scotland, and Wales in February 2023 from direct and indirect contact with wild birds?”

Terminology related to the assessed level of risk

For the purpose of the risk assessment, the following terminology will apply (WOAH, 2021):

- **Negligible:** event is so rare that it does not merit consideration
- **Very low:** event is very rare but cannot be excluded
- **Low:** event is rare but does occur
- **Medium:** event occurs regularly
- **High:** event occurs very often
- **Very High:** event occurs almost certainly

Assumptions and uncertainties in H5N1 transmission in wild birds in Great Britain over the winter 2022 to 2023

- Most if not all migratory wild birds that over-winter in Great Britain have arrived peaking in the last two months (December and January). This assumption does not affect the wild bird risk level which is already at **very high**, although were more waterbirds to fly in to Great Britain in February from western Europe (Netherlands, Belgium, Germany) where cases of H5N1 in wild birds are still being detected, there would be further entry of the virus. Reducing the uncertainty in this assumption would not alter the risk.
- The 2022 to 2023 season is epidemiologically distinct from previous years not only because HPAI was present in resident birds in Great Britain before the migratory wild waterbirds arrived but also because the majority of wild bird cases over the autumn and winter are in resident species (Mute swans, Canada Geese and greylag geese with some raptor species and pheasants). The increase in wild bird cases in autumn 2022 started some four weeks earlier than in autumn 2021 with high numbers of cases in wild birds (35 to 61 per week) reported each week in October 2022. Despite the high numbers of wild bird cases recorded weekly over the autumn months in 2022 and into December 2022 there has been a progressive fall in the number of wild bird cases recorded each week over the month of January 2023. This may reflect reduced reporting of waterbird species and difficulties in recovering carcasses due to limited accessibility during the cold weather which froze many inland waters. In contrast wild bird cases did not fall significantly in January 2022. The progression and epidemiology of the current outbreak are different from previous years and it is not clear for example what effect the

departure of the migratory waterbirds in late March and early April will have on the risk. It is anticipated that dispersion of wintering aggregates of resident waterfowl to their breeding sites together with higher temperatures and longer day lengths will reduce the risk in wild birds. This assumption does not affect the current wild bird risk level which is at **very high** but would impact more on the expected wild bird risk level over the coming weeks.

- Other wild bird species including resident waterbirds (as opposed to migratory waterbirds) may be more important for the transmission of this virus in the 2022 to 2023 season than in previous years. The role of pheasants is not clear, with 44 cases reported this season. The 18 sparrowhawk and six kestrel cases suggest H5N1 is also in the resident wild bird passerine population. This assumption was of more importance in assessing the wild bird risk level at the beginning of the season in the autumn prior to the arrival of migratory waterbirds. The current **very high** risk level for wild birds takes into account the presence of virus in resident birds.
- The patterns of movement of gulls are more complex than waterfowl. It is noted that a large number (40 in January 2023) of H5N1 cases in black-headed gulls has been reported in northern Europe particularly Belgium and France recently. This has not occurred in previous years. Some gull species (but not all) aggregate at night-roosts (usually large waterbodies such as reservoirs) but forage and loaf across the wider landscape, often in wet pasture or tilled fields, exploiting opportunities on farms and also at anthropogenic sites where food may be abundant (sewage treatment facilities, landfill sites, food production facilities, commercial and tourist sites). Therefore, these should not be ignored as potential sites of concern where in proximity to poultry farms. To date this season, some 43 cases of HPAI H5N1 have been reported in gull species in Great Britain, including 17 black-headed gulls and 13 herring gulls. This is consistent with the increased number of wild bird cases in 2022 to 2023 compared to previous seasons and the current **very high** wild bird risk.
- The evidence for the economic benefits and dis-benefits of housing birds is not part of this assessment.

Entry assessment

Probability that HPAI H5 is present in Great Britain currently

The 2022 to 2023 season began officially in Great Britain on 1 October 2022. Figure 1 shows that the number of IPs started to increase in the first week of October with not only a higher peak compared to autumn 2021 but also a longitudinal shift in the peak by about one month reflecting the presence of virus in resident wild birds over the summer. Since 1 October 2022 and as of 31 January 2023, there have been 167 confirmed Infected Premises (IPs) in Great Britain, with 144 in England, 3 in Wales and 20 in Scotland (Figure 2).

Figure 1: Bar chart showing the number of infected premises in Great Britain in the 2020 to 2021, 2021 to 2022 and 2022 to 2023 seasons. Each season starts on the 1 October. The orange and red solid lines represent the start of the AIPZ and housing order, respectively, and the dashed lines represent their respective lifting. The housing order starts are not shown for 2022 because there was variation across Great Britain with the East Anglia, England and Wales housing orders starting on the 12 October, 7 November and 2 December 2022 respectively. Note that weeks 37 to 52 are repeated.

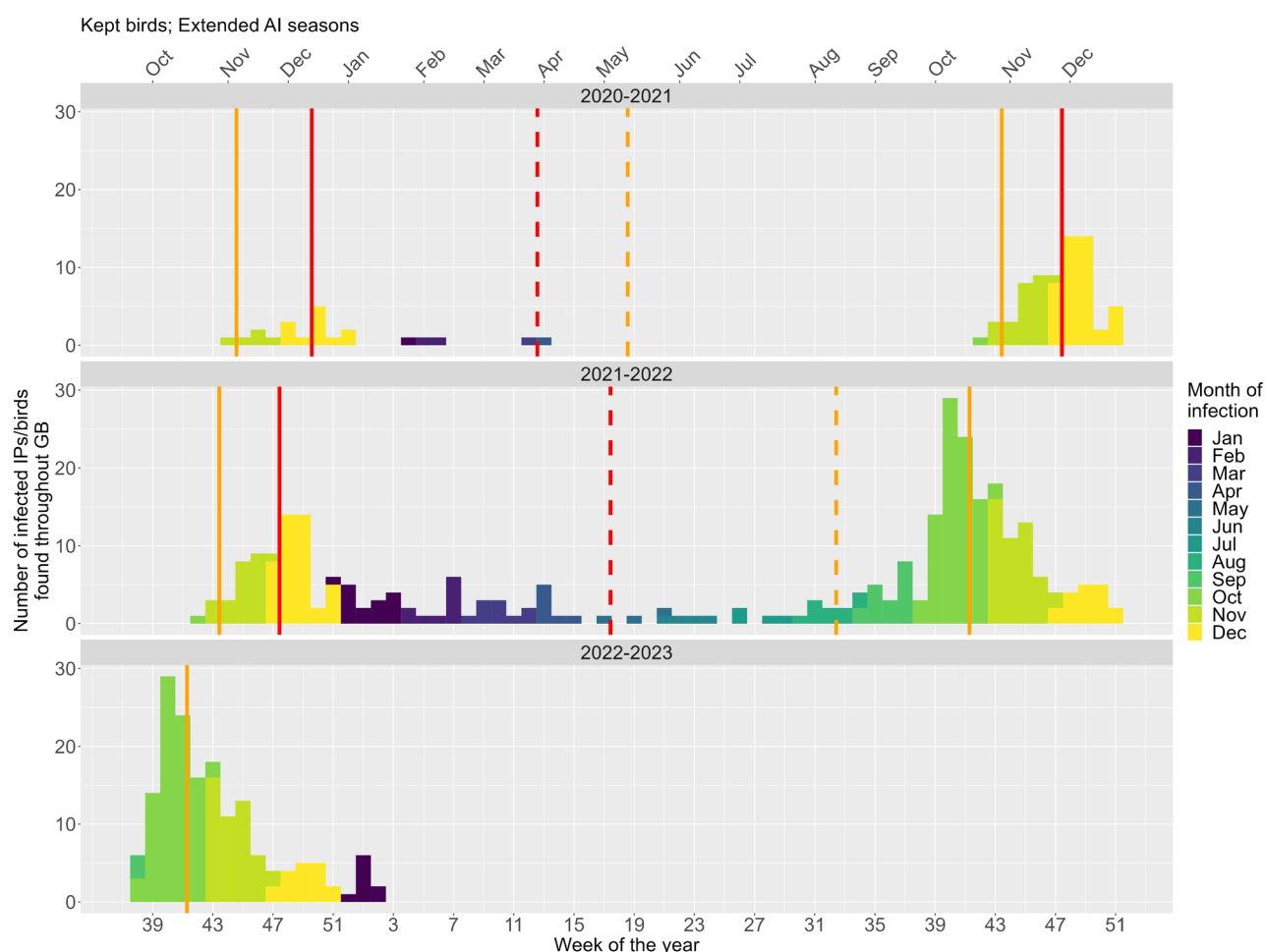
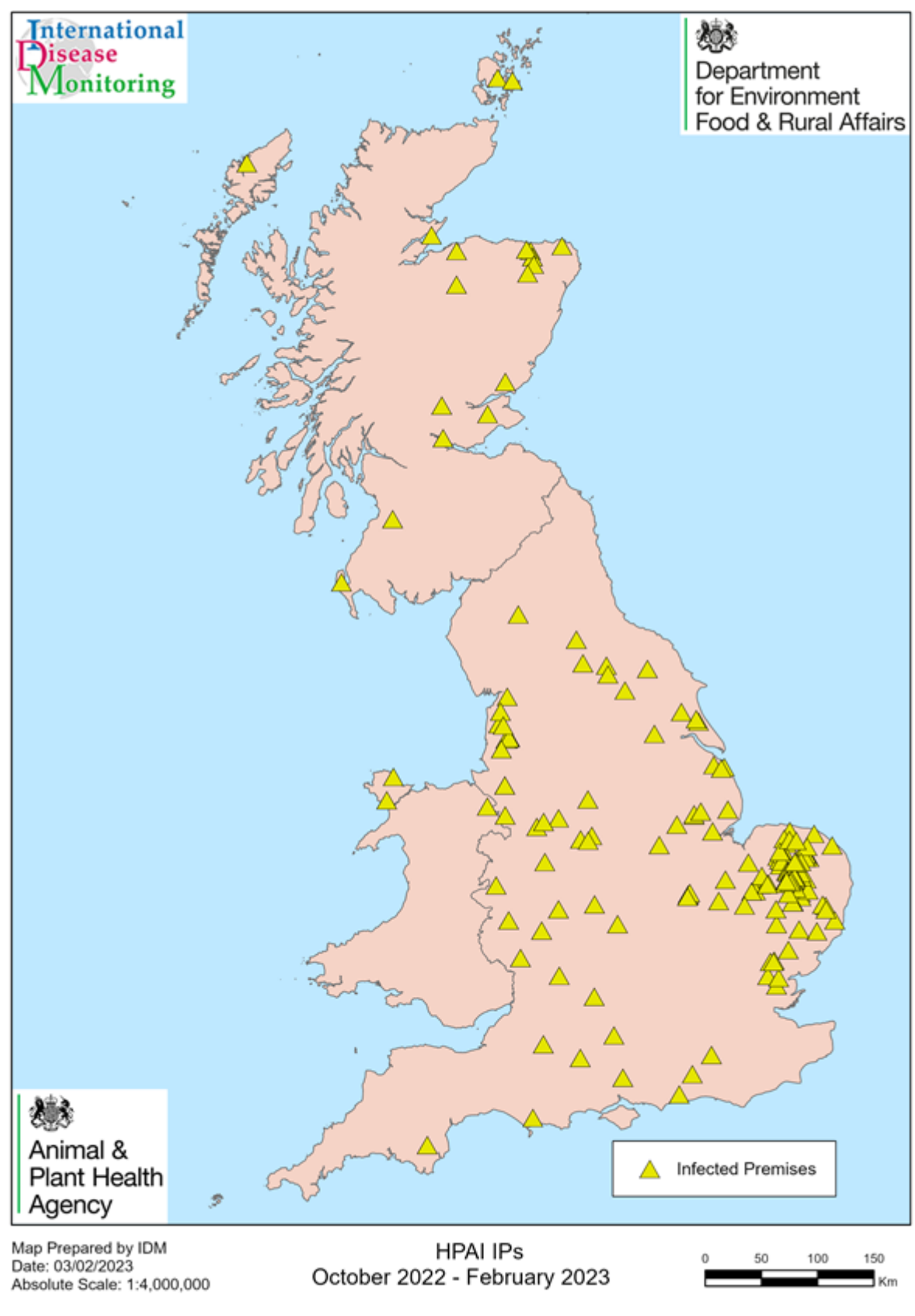


Figure 2: Outbreaks of HPAI H5N1 in domestic poultry and captive birds (as of 31 January 2023) in Great Britain from 1 October 2022.

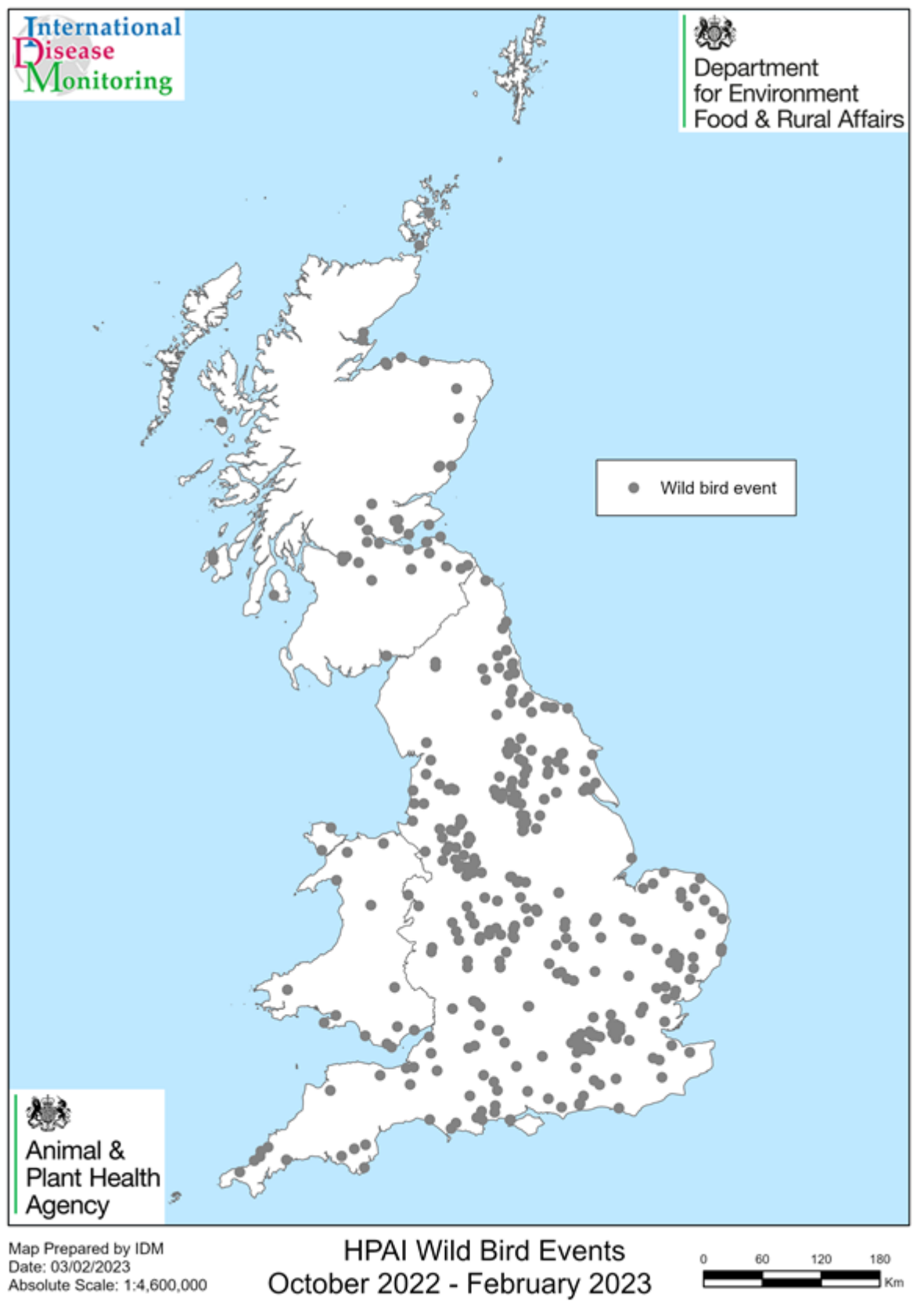


The wild waterfowl population in Great Britain is relatively well understood. Several non-governmental organisations (NGOs) conduct regular surveys for the wild waterfowl at known wintering sites across Great Britain. In particular, the British Trust for Ornithology (BTO), The Joint Nature Conservation Councils (JNCC), the Royal Society for the Protection of Birds (RSPB) and the Wildfowl and Wetlands Trust (WWT) carry out counts of wild birds. There are 53 sites counted each with at least 20,000 birds wintering year after year across Great Britain, though this represents only a portion of wintering sites used by waterfowl in Great Britain.

Recent expert ornithological opinion is that there have been no major differences in the populations of migratory wild waterbirds, the location of the large assemblages or the timing of arrivals of migratory waterbird populations compared to previous years. In terms of migration, the wild migratory waterfowl started arriving as usual in Great Britain from Northern Europe in late August and September with numbers peaking in December and January. While some species, such as swans, will be site loyal from one year to the next, others will be less so, and there will be some mixing between species including resident Great Britain and migratory waterbirds in the large aggregation sites. Outward migration will start again in the next few months between from late March with nearly all migratory waterbirds expected to be departed by early May.

There is a system for wild bird surveillance in the Great Britain, whereby found dead birds from target species are reported either by wardens at reserves and wetland sites, or by the public and then submitted for testing at the National Reference Laboratory (NRL). It is important to note that this system of passive surveillance does not provide complete knowledge of the population. Not all infected birds will die, and the detection of dead birds will vary depending on the species of bird that die (smaller birds are less likely to be noticed than large birds), the location (detection is less likely in remote areas) and the level of awareness of the people who find the dead birds (trained wardens are more likely to report than members of the general public). Once positive birds have been reported at a site, more findings may not be tested until two weeks have passed. Since 1 October 22 and as of 31 January 2023 there have been 736 HPAI H5 detections in wild birds (Figure 3) with the majority confirmed as H5N1, a few where the neuraminidase subtype is still being characterised.

Figure 3: Map showing HPAI H5 cases in wild birds (as of 31 January 2023), in Great Britain from 1 October 2022



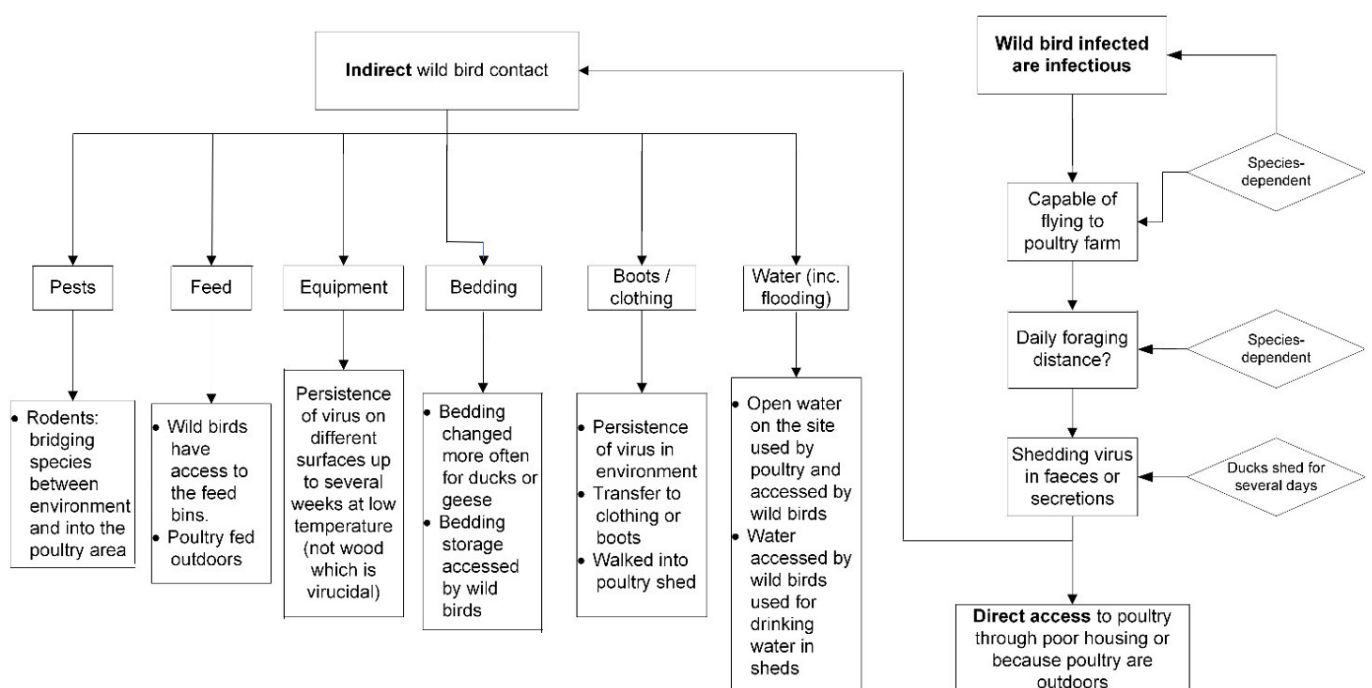
Across Europe since October 2023, HPAI H5N1 infection has been detected in multiple species of wild bird with 884 cases in total and 765 outbreaks in poultry according to data from the World Organisation for Animal Health. Weekly results plotted for the EU27 show the number of poultry outbreaks falling from a peak of around 70 in week 48 of 2022 to around 25 in week 2 of 2023 ([Avian influenza in Europe: updates | EURL avian influenza Newcastle disease \(izsvenezie.com\)](#)). However, the number of wild bird case detections in the EU27 has increased markedly in early 2023 compared to the end of 2022. The reason is not clear although strong second peaks often occur in wild birds in northern Europe at this stage of the epizootic. Since all the migratory waterbirds have now arrived in Great Britain and will soon be departing, the details of cases currently in Europe are of less relevance to Great Britain compared to in the autumn. Two issues, however, are considered further here. The first is the possibility of a cold spell over the next few weeks in western Europe causing more ducks, geese and swans currently wintering in the Netherlands for example to move into Great Britain. The second is the possibility of new strains of HPAI H5 virus coming in. With the exception of one case of HPAI H5N5 in a great black-backed gull in early October 2022 in Norway, all cases of HPAI in wild birds in Europe since 1 October 2022 have been H5N1. Since most of the migratory waterbirds have now been in Great Britain for at least two to three months their impact on bringing HPAI H5N1 or other strains into the country would now have been detected. Therefore, discussions on the species of wild bird infected both in Great Britain and in Europe and their potential impact on the entry of the virus are less important at this stage of the season compared to in the autumn.

It appears that the migratory waterbirds had little impact on entry of the virus into Great Britain in autumn 2022 because the HPAI H5N1 virus was already well established in the resident wild birds before they arrived. Undoubtedly some additional HPAI H5N1 has entered Great Britain in autumn 2022 with those migratory waterbirds and they may have gone onto infect other resident birds to some degree which is currently unknown. Some of those migratory waterbirds would have had immunity from previous exposures either last winter in Great Britain or on their breeding grounds over the summer and would thus not have been susceptible, although immunologically naïve “first winter” birds (that is born in summer 2022) could contribute significant viral loadings to the environment if infected. The anticipated large second peak in wild bird cases and poultry IPs in Great Britain from the arrival of the migratory waterbirds in autumn 2022 has not to date occurred and is unlikely to now, although a second peak could arise through other factors such as drops in

biosecurity or during restocking of poultry in areas where the virus is present. The current virus strain is likely to continue to circulate in wild birds in Great Britain over the coming months, although the prevalence of infection may begin to fall towards spring in line with previous epizootics. It is therefore considered that the likelihood of there being infected wild bird species present in Great Britain in the next month (February 2023) is **VERY HIGH**, and it is expected that more HPAI H5 cases in wild birds will be detected in the next month (February 2023).

Exposure assessment

Figure 1 Exposure pathways for poultry to HPAI H5N1 via contact with wild birds



There are multiple pathways for the exposure of poultry to influenza viruses causing notifiable avian diseases via direct or indirect contact with infected wild birds

These include contact with:

- infected poultry such as live birds, hatching eggs and day-old chicks of poultry
- live infected wild birds, particularly waterfowl
- poultry products and by-products of infected poultry,

- contaminated feed, water, bedding, equipment, vermin, or clothing and footwear of people in contact with infected birds or contaminated environment.
- contaminated environment, for example contaminated ranges or flood water.

For this risk assessment, the pathways associated with trade in live poultry or poultry products (including domestic moves: first and third points above) will not be considered.

Data generated at APHA Weybridge indicates that this H5N1 virus will retain infectivity in the environment at low temperatures, for up to 55 days at 4°C (Ian Brown, APHA, Pers. Comm.). This means the environment could remain contaminated for several weeks in certain conditions.

It is concluded from sequence data that the UK H5N1 virus demonstrates no strong correlations for specific increased affinity for humans.

The EFSA opinion from 2017 used a combination of systematic review of all poultry outbreaks in the EU and expert knowledge elicitation from members of the poultry sectors. Experts were asked to consider four levels of biosecurity: preventing access to waterbodies, housing, carrying out “routine” daily biosecurity (boot washing, limiting visitors, rodent control, clean feed, and water) and high biosecurity as used in compartments (all the above, plus shower in and out, no visitors, reverse air pressure, dedicated staff, and equipment etc). The opinion estimated that the relative risk for entry is reduced **three-fold** by preventing access to water bodies, that housing gives a further **two-fold** reduction, and applying routine biosecurity gives a further **four-fold** reduction. The relative risk for entry is estimated to lead to a further **44-fold** decrease by applying high biosecurity measures as observed in compartment premises ([Defra compartments, British Poultry Council](#)). However, it is recognised that this level of biosecurity is not implemented to the same standard across all poultry premises and that a range of biosecurity plans are in place across Great Britain, with varying levels of efficacy, which will be impacted by the surrounding infection pressure.

In the scientific opinion presented here, we class the level of biosecurity maintained by premises in poultry compartments as stringent. Compartmentalisation is a scheme open to poultry breeding companies in Great Britain. Approval as a compartment is based on the management protocols, biosecurity systems and husbandry practises at a given premises. Depending on acceptance of compartments by importing countries,

compartment status may place a company in a stronger position with regard to resumption of exports following an outbreak of Avian Influenza in Great Britain). In premises in the compartment scheme every effort is made to prevent wild bird access, foot baths and clean equipment are used, bedding is stored undercover and rodent control is applied. The compartment scheme covers those premises with the highest standards of biosecurity, which include air and door locks, shower in – shower out facilities and pristine areas in the poultry sheds. All of these are applied to the “Compartment” breeding and rearing facilities.

Direct contact with live infected wild birds

The likelihood of contact between poultry and infected wild birds will be dependent on their abundance in the locale and how attractive the site is to birds for example, an on-farm pond, uncovered bedding, or poorly managed feed bins are three well-known factors which make the direct contact of free-range poultry with wild birds more likely. Therefore, well-constructed and maintained facilities, aimed at reducing contact between poultry and outdoor areas will reduce the direct contact with wild birds, and indirect contact via contamination of outdoor ranges, ponds, feed, waterers, feeders, and roosting areas with wild bird secretions. It will not prevent all indirect pathways through which disease may enter a poultry premises, and additional biosecurity measures will be required to mitigate those risks.

Contact with contaminated feed, water, bedding, equipment, vermin or clothing and footwear of people in contact with infected birds or contaminated environment including flood water

Contamination of feed, bedding, and water by infected wild birds during an outbreak is possible on a poultry farm unless access by wild birds is prevented. For poultry which require frequent bedding changes, moving potentially contaminated bedding into the poultry house is a possible route of transmission. For poultry fed outdoors, feed may be accessed by wild birds (or wildlife acting as mechanical vectors). Contaminated water sources may also introduce virus to the poultry (for example from a local pond or reservoir). When wild bird food is scarce, if poultry are fed outdoors, it is quite likely wild birds will be attracted to the site. The roofs of poultry sheds may also be suitable loafing sites for gulls or corvids which may act as bridging species.

These pathways can be prevented by sourcing such products from safe sources (such as, where contamination from wild birds was not possible) and keeping such items in containers which no wild birds can access. The site can be made less attractive to wild birds by removing or covering any ponds on site, preventing accumulation of standing water, using drinking water from bore holes or mains water and making sure feeding areas are protected. Contact with contaminated equipment, footwear and clothing can be prevented by making sure all personnel in contact with the birds use dedicated clothes and boots and that cleansing, and disinfection are applied appropriately. This will be particularly important where birds are housed, as personnel contact with the birds may be more frequent, as feed, bedding and water must be brought into the houses and birds must be checked for welfare issues and or eggs collected from inside the houses. Visitors to the farm should be limited, and adequate records of all movements on and off the poultry premises should be kept. Other important biosecurity practices to ensure wild birds are separated from flocks, include feeding birds indoors or under cover, discouraging wild birds from landing, removing wild bird contamination, netting ponds, and draining watercourses, removing feeders and water stations from the range, ensuring good building maintenance and regular inspections for signs of wild bird and rodent access. It is not always possible to prevent flooding at a site, and ingress of flood water has been implicated as a source of virus in past outbreaks, but housing should be wherever possible, built to prevent ingress.

Above all, the EFSA opinion recommended that all personnel are trained in and practice good biosecurity, regardless of whether birds are housed or not, as housing cannot reduce transmission through fomite pathways as a standalone measure.

Domestic poultry

The poultry sector in Great Britain is complex and seasonally variable. There is a requirement for all poultry keepers in England, Scotland, and Wales with more than 50 birds to be registered with the British Poultry Register. Therefore, any data available will not include all the backyard or smallholder community. In terms of the proportion of the sector which is raised outdoors, for the egg sector, there are circa 25-26 million free-range hens, and 1.5 million organic hens accounting for approximately 63.7% of UK production ([Egg info](#)). For broilers, the proportion is a lot lower, at 3-5% ([BCP](#)). For ducks it is estimated that around 30% are outdoor and for geese, the majority are raised outdoors._

Captive birds (non-poultry)

Captive birds, such as those held in collections, zoos or approved bodies are already semi-housed and should be kept separate from wild birds. For some, it will be difficult to prevent access to their water environment (penguins, pelicans, flamingos etc) but it is unlikely it will be possible to house indoors, so every effort should be made to prevent wild bird access. There were outbreaks in captive birds in Europe (in zoos) in 2016 to 2017 and 2020 to 2021 and a derogation exists domestic legislation in Great Britain which means birds may not have to be destroyed, unless they are in contact with the infected collection.

Ratites

Ratites, such as ostriches, cannot be housed on a long-term basis for welfare reasons, but the susceptibility of such birds to this virus is not well understood. Ratites are often considered refractory to HPAI infection however there have been cases in Germany and USA of emus showing clinical signs in a zoo and therefore these birds should also be considered susceptible.

Game birds

Once game birds are released for the shooting season they are considered wild and outside the scope of a prevention order around housing. Game birds cannot be released in areas under a disease control zone or an AIPZ with housing measures. Any remaining birds will be caught-up in late January.

It is illegal to release by hand captive birds for the purpose of being shot immediately after their liberation, under Part 1, Section 8 of the Wildlife and Countryside Act, 1981.

Therefore, if gamebirds are released and then test positive when they have been shot, they are unlikely to have been infected at the premises of origin and more likely from contact with wild birds.

Summary

The probability of HPAI H5 still being present in wild birds in Great Britain in early February 2023 is **VERY HIGH**. Although the number of wild bird cases has declined week on week in January 2023, the number of positive cases is still very high at 19 in the third week of January, and not sufficiently low to consider reducing the wild bird risk from **VERY HIGH**. While an increase in wild bird cases from the arrival of the migratory waterbirds two to

three months ago has not materialised, continuing high levels of wild bird cases could still occur. The migratory water birds will not depart for several weeks yet, and wintering aggregates of resident birds will not disperse to their breeding sites within Great Britain till March to April. Depending on the number of susceptible wild birds still present to maintain infection, wild bird detections are expected to continue for February 2023 at least. From a risk assessment perspective at least, the poultry risk levels should remain unchanged until the wild bird risk shows some sign of decreasing.

Effective and well-maintained housing reduces the probability of poultry exposure to wild birds and their excretions, but does not completely prevent indirect contact, particularly where HPAI virus can still be carried into poultry houses on clothing, footwear, feed, and bedding.

Plotting the number of IPs over previous seasons following the introduction of a housing order shows a decrease in the number of IPs after housing is introduced, (Figure 1) though this it is difficult to say with any degree of certainty what proportion of this (if any) is due to housing birds alone rather than other factors such as waterfowl migration patterns and the implementation of mandatory, complimentary biosecurity measures as part of the housing order. It is not possible to assess the impact of housing as a protective measure because it would require epidemiological investigations that are not possible during control of a notifiable disease.

Given the continuing infection pressure from wild birds, favourable environmental conditions for virus survivability, and the continuing numbers of infected poultry premises and backyard flocks over the last month, we consider the likelihood of at least one outbreak being detected in the next month in Great Britain to be to **HIGH** (occurs very often) **with low uncertainty** where biosecurity is suboptimal and there are biosecurity breaches, and **MEDIUM** (occurs regularly) **with medium uncertainty** where stringent biosecurity is applied. This takes into consideration the Avian Influenza Protection Zone (AIPZ) and assumes that bird keepers are taking the additional biosecurity measures required. As estimated in the EFSA opinion (EFSA 2017), a two-fold reduction in the number of IPs is anticipated where birds are housed, though this is not recommended as a standalone measure and should be used in conjunction with other biosecurity measures mentioned earlier in this report alongside appropriate training.

As the most likely contact of poultry with wild birds will be in those areas where there are high concentrations of wild birds, where there are no large aggregations of wild birds, the

risk is lower for this particular pathway, but there are still other pathways which could lead to the introduction of any notifiable avian disease. It should be noted that a housing order has a law of diminishing returns towards the end of an outbreak and is most effective when implemented early in the outbreak.

Conclusions

The risk of HPAI H5N1 incursion into poultry premises depends on the level of biosecurity present. There are multiple pathways which can bring infection into poultry, and these are not necessarily prevented when housing is used as a control measure in the absence of any other biosecurity.

Outbreaks in poultry in Great Britain continue to be reported at about three to four IPs per week (January 2023) albeit significantly down from the peak of 27 IPs in the second week of October 2022. Indeed, more IPs were reported in the first 25 days of October 2022 than observed in the whole of the 2020 to 2021 epizootic.

Expert opinion suggests that housing leads to a two-fold reduction in risk, which is significant in terms of the number of outbreaks potentially prevented given the number of premises with poultry in Great Britain and the large number of outbreaks (167 to 31 January 2023) so far reported. The effect of housing may be underestimated because it also includes removing access of poultry to ponds which may have an additional three-fold effect, giving an overall six-fold reduction in risk. The behavioural impact of announcing a housing order may also send a message to poultry keepers that the risk has increased significantly, increasing the uptake of daily routine biosecurity measures.

Housing birds which are not used to housing can cause welfare issues. Making sure their environment is enriched (for example with toys), that they have plenty of room to move, access to feed and water, clean bedding and the ability to display natural behaviours such as dustbathing are all welfare priorities. For ducks their bedding must be changed regularly as they will mess it quickly and they need access to water so they can clean their feathers. If the birds become stressed, they may be more prone to infections or other behaviours which impact on welfare. Certain species cannot be housed for welfare reasons or because they are already considered wild: geese, ratites and gamebirds.

It should be noted that there are studies and expert opinion assessments which confirm that housing is only part of the biosecurity continuum (EFSA, 2017). Housing, in addition to

directly reducing contact with wild birds, also enables the application of more stringent biosecurity measures. For example, a foot bath and change of clothes is likely to be more effective at mitigating indirect transmission when birds are housed, compared to when poultry are let out and wild birds can also access the range, water, feed and roosting areas. If stringent biosecurity is applied, the risk to poultry is substantially reduced and housing of poultry will further reduce that risk.

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