Animal &
Plant Health
Agency

Rapid risk assessment on incursion of High Pathogenicity Avian Influenza (HPAI) H5N1 into housed or not housed poultry flocks and captive birds 2 August 2022

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Overview

This is an update of the rapid risk assessment (RRA) dated 23 November 2021 (and subsequently updated on 7 February 2022, 22 March 2022 and 22 April 2022) in response to detection of high pathogenicity avian influenza (HPAI) H5N1 in captive birds (confirmed on 27 October 2021) with detection in wild birds in November. Since then, there have been unprecedented numbers of findings of HPAI H5N1 in poultry, captive birds and wild birds in the UK. For the first time, HPAI H5N1 has been present in wild birds, mainly breeding seabird colonies, around the UK throughout the summer. All updates made on 2 August are shown in red for ease of reference.

Previous versions of this report focussed on the effect of the housing order which was lifted on 29 May 2022. Currently no housing order is in place, although an Avian Influenza Protection Zone (AIPZ) is still in place across the GB. This report focusses on the factors supporting lowering the risk of exposure to poultry with poor biosecurity from medium to low at the end of July 2022 in the face of multiple wild bird events.

A request was made in November 2021 to review the evidence for the effect of implementing housing orders for poultry and captive birds on the number of outbreaks of HPAI across GB. In the past few years, a housing order has been put in place twice (2016/17 and 2020/21), triggered by an increase in risk of infection of poultry from contact with (infected) wild birds. An opinion by the European Food Safety Authority (EFSA) in 2017 (EFSA 2017) used expert opinion to assess the effectiveness of various biosecurity measures in preventing outbreaks, as there is no experimental evidence base. The opinion concluded that housing alone is not able to completely prevent all outbreaks, and other biosecurity measures are equally or more effective. Previously the number of outbreaks reported in the 2016/17 and 2020/21 epizootics was compared against the predicted protective effect of housing:

- Predictions based on the expected fold reduction of outbreaks and the number of captive bird/poultry outbreaks reported last year (2020/21 season) concluded that implementing the housing order on 14 December 2020 prevented 12 outbreaks across GB. By starting the housing order at the very beginning of the epizootic (03 November 2020) and continuing it for 16 weeks (ending 23 February 2021) only a further 2.5 outbreaks would have been prevented. Outbreaks were still occurring after 23 February, and extending the housing order to 21 weeks could have prevented a further two outbreaks (i.e.16.5 outbreaks in total). However, extending the housing order to 21 weeks does represent law of diminishing returns, saving only an additional two outbreaks, for the uncalculated costs of extending beyond the 16 week grace period for free range birds. Housing measures have been in place for the current outbreak since 29 November 2021.
- Of the 12 outbreaks prevented across GB by the 14 December 2020 housing order, two would have been in Scotland, one in Wales and nine in England. Therefore, on

the basis of the distribution of outbreaks in 2020/21, the housing order had a greater return in England than in Scotland and Wales.

Here the assessment for the current HPAI risk levels is updated, based on current biosecurity levels and the infection pressure for different areas of GB from wild bird abundance and HPAI prevalence. The GB national risk levels changes during the 2021/22 HPAI season in the UK, to 02 August 2022 as follows:

1. From early October 2021, there was an increase in risk of an incursion of HPAI H5Nx to the UK through wild birds based on the wild bird events occurring across Northern, Eastern and Central Europe and outbreaks in poultry in Netherlands, Italy, Czech Republic, Finland and Germany. In early October 2021, the risk of HPAI H5 incursion in wild birds in GB was increased to **MEDIUM**.
2. Following this, the first confirmed events of HPAI H5N1 in GB since July 2021 were identified in a wild bird rescue centre in Worcestershire (AIV 2021/07) and a backyard chicken flock in Wrexham (AIV 2021/08) on 26 October and 1 November, respectively. Five other wild bird events were also reported from areas of Southport, Preston, Fife, Edinburgh and Wrexham. **Therefore, the risk level was increased to HIGH for wild birds on the 29 October 2021 with LOW and MEDIUM risks of exposure to poultry, depending on biosecurity.**
3. The risk of HPAI H5N1 incursion through movements of migratory wild waterfowl was increased to **VERY HIGH on 22 November 2021** as a result of the increasing infection pressure in Europe, including western Europe and initial reports of HPAI H5N1 in wild birds in all three GB administrations. The risk level to poultry was also increased from **MEDIUM** to **HIGH** (where biosecurity is poor) and from **LOW** to **MEDIUM** (where there is good biosecurity).
4. An Avian Influenza Protection Zone (AIPZ) was declared in England, Wales and Scotland on 3 November 2021, and in Northern Ireland on 17 November 2021, such that personnel working with poultry and hobbyists should take additional biosecurity measures. Additional housing measures came into force from 29 November 2021. This meant that all bird keepers in GB (whether they have pet birds, commercial flocks or just a few birds in a backyard flock) were required by law to take a range of biosecurity precautions, including housing their birds (except in very specific circumstances).
5. To 02 August 2022, HPAI H5N1 has been confirmed at 121 poultry and captive bird premises in Great Britain; 105 in England, 11 in Scotland and five in Wales.
6. Up until May 2022 there was a pattern of spread consistent with previous disease epidemics in which wild bird transmission was a factor (EFSA 2021). There was overwhelming evidence for spread of HPAI H5 to UK poultry by wild waterfowl migrating through northern Europe to their wintering sites in the UK as has happened in previous epizootics.
7. However unusually high wild bird infection pressure remained well into late April 2022 (week 17) after which it started to decrease. During April, the migratory wild waterfowl population significantly reduced, although wild bird events continued at 20 to 40 events per week. Bridging species still played a role in fomite spread, but this

was also decreasing as environmental contamination decreased during late spring. On 22 April, the risk of HPAI H5N1 incursion in wild birds was reduced to **HIGH** (from **VERY HIGH**).

8. Given the decreasing infection pressure from wild birds, the downward trend in confirmed Infected Premises (IPs), and changing environmental conditions, we considered the risk of exposure of poultry across the whole GB to be reduced to **LOW (with high uncertainty)** where good (stringent) biosecurity is applied, but **MEDIUM (with high uncertainty)** where biosecurity is poor (suboptimal). This is considering an Avian Influenza Protection Zone (AIPZ) and housing order are in place, therefore personnel should be taking additional biosecurity measures. There are a number of risk pathways for the introduction of disease to domestic birds, and contact, whether direct or indirect, with infected wild birds is the most important one, especially with respect to a primary introduction to domestic birds. Secondary spread when disease control measures and keeper awareness are high is a rare event in the UK; only two proven events of secondary spread of HPAI prior to this winter season have occurred, and that was in 2007 and 2017, where spread between two units of the same business occurred through shared workers. Nevertheless, in 2021/22, there has been an unprecedented number of outbreaks in commercial farms in some areas and the source of infection (lateral spread, separate incursions from wild birds or from a heavily contaminated environment) is still under investigation.
9. The wild bird risk was reduced from HIGH to **MEDIUM** on the 23 May 2022.
10. From week 24 (13 June 2022), however, wild bird events increased to over 140 per week with multiple outbreaks in seabirds around GB. For the first time HPAI H5 was present in breeding UK birds over the summer. This was also observed in seabirds in northern Europe including Netherlands, France, Germany and Denmark. Despite reducing the sensitivity in surveillance in week 25 (with the threshold increased from just one dead bird to three dead birds of the same species found dead in the same location), wild bird events continued at 40 to 60 per week. It should be noted that in each wild bird event only a few wild bird carcases are submitted and tested and the actual numbers of infected birds is typically much higher than three.
11. The risk of poultry exposure is considered to be decoupled from that in wild birds during July/August 2022 reflecting both the species of wild bird affected (seabirds) and their locations (coastal breeding colonies). Thus the connectivity between poultry farms and HPAIV in wild birds is uncoupled because most poultry farms are inland and not generally located on coastal sites with high seabird densities.
12. Thus while the wild bird risk is currently MEDIUM, the risk to poultry with sub-optimal biosecurity has been reduced from MEDIUM to **LOW** (albeit **with high uncertainty)** and that for poultry with stringent biosecurity is maintained at **LOW** (**with low uncertainty**). Viral residues in the environment will be decreased during the summer months, particularly during the recent heatwaves, due to increased inactivation rates at higher temperatures and due to longer hours of more intense sunlight.

Risk Assessment

Hazard identification

The hazard identified is the high pathogenicity avian influenza (HPAI) virus H5N1 subtype, as this is the dominant subtype isolated from the UK during the current season with just a single confirmed report of HPAI H5N8 in a mute swan found in Wiltshire in November 2021.

Further detailed genomic analyses of 103 H5N1 HPAI viruses from poultry and wild birds in the UK (detected in late 2021 to 2022) supports that all viruses belong to clade 2.3.4.4b 2 and can be distinguished in the haemagglutinin gene between outbreak seasons (2020 to 2021 versus 2021 to 2022). Whilst the 2021/22 H5N1 viruses are related to those detected during 2020 to 2021, three UK genotypes (AIV07, 08, 09) have been identified that can be distinguished based on their genetic composition.

Genetic analysis of the viral sequences obtained from the first (and multiple others) poultry outbreak in the UK confirmed that it was highly similar to the clade 2.3.4.4b B1 H5N1 lineage (observed previously in northern Europe and the UK in summer 2021 in wild birds and associated with the majority of H5N1 European detections during the 2020 to 2021 H5Nx epizootic) and has subsequently been referred to as the AIV07 genotype. It is hypothesised that the AIV07 genotype was re-introduced into the UK in late 2021 via Russia and eastern Europe, due to relatedness to sequences from this region detected in late 2021. Whilst it is most plausible that this virus was brought in with migratory waterfowl, it cannot be excluded that the source of some of these viruses was from local wild bird populations.

The AIV09 genotype shares a high degree of similarity to the AIV07 genotype, but possesses the HA from the B2 H5N1 lineage, along with novel PB2 and PA genes. The PB2/PA genes are related to those from low pathogenicity avian influenza viruses (LPAIVs) detected in European wild birds. The third genotype AIV08 is a minor variant population and derived via reassortment of AIV07 B1 viruses with another avian influenza virus, inheriting a different PB2 gene.

Therefore, many of the UK H5N1 wild bird event and poultry outbreaks in 2021/22 epizootic are due to viruses that may have their origins in migratory waterfowl that arrived in the UK in late 2021 (some of these can be distinguished genetically from viruses over-

summering in northern Europe), but which themselves likely separated into further genotypes following reassortment with other influenza viruses in wild birds.

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

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 May 2022 from direct and indirect contact with wild birds?

This is amended to set out the reasoning of reducing the risk to poultry despite the current high number of events of HPAI H5N1 in seabirds around GB.

Terminology related to the assessed level of risk

For the purpose of the risk assessment, the following terminology will apply (OIE, 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

Entry Assessment

Probability that HPAI H5 is still present in wild birds in GB

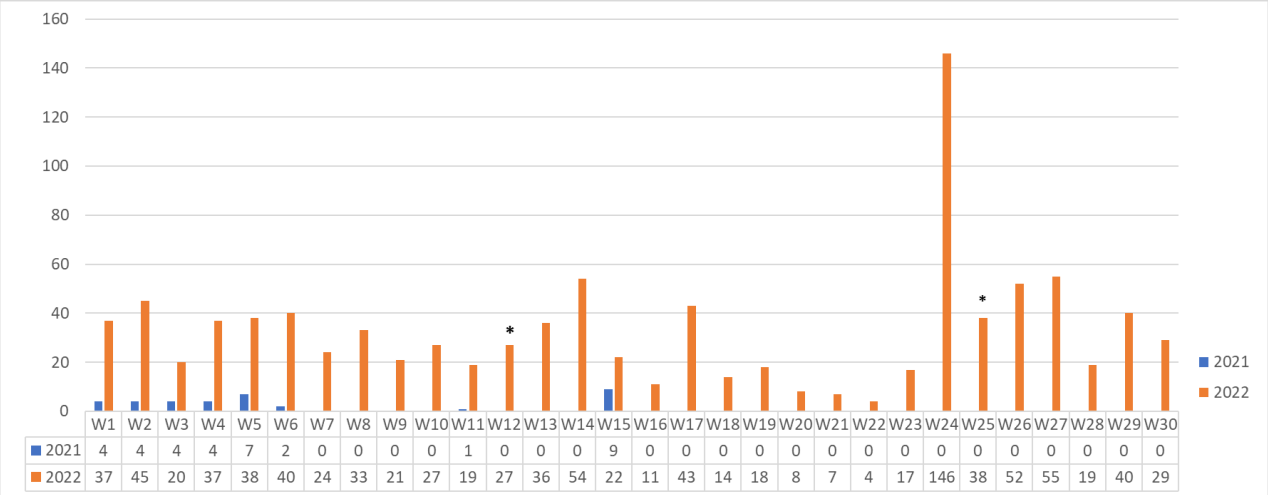
The probability of entry of HPAI H5 virus into GB is negligible during the summer as few birds fly into the UK from Europe except for early returning waders. It is in the autumn months when migratory ducks, geese and swans are arriving in the UK from Europe that entry is a key consideration.

At this stage of the season (early August), all those wild migratory ducks and geese which brought the HPAI H5 virus into GB in October have long since departed the UK for their breeding grounds at higher latitudes.

There is a system for wild bird surveillance in the UK, whereby found dead birds from target species are reported either by wardens at reserves and wetland sites, or by the public for testing at the NRL. Once positive birds have been reported at a site, more findings will not be tested until two weeks have passed. Furthermore, there have been mass die-offs involving thousands of birds, particularly in seabirds in coastal breeding colonies.

The wild bird surveillance system in place across GB is still detecting HPAI H5N1 in wild birds, with a higher number observed overall when compared to the 2020/21 season (Figure 1). During April 2022 the number of detections was considerably lower than in the winter period, particularly week 47 (end of November 2021) when the risk level in wild birds was raised to **very high**, and up to mid June 2022 (week 24) there had been a general downward trend (with some fluctuation, possibly due to movement caused by return migrations) observed since the winter peak.

Figure 1 Wild bird HPAI H5N1 positives per week across Great Britain: January to August 2021 and 2022. Asterisks denote changes in surveillance sensitivity[1] For earlier data from both HPAI seasons, see our previous outbreak assessment.



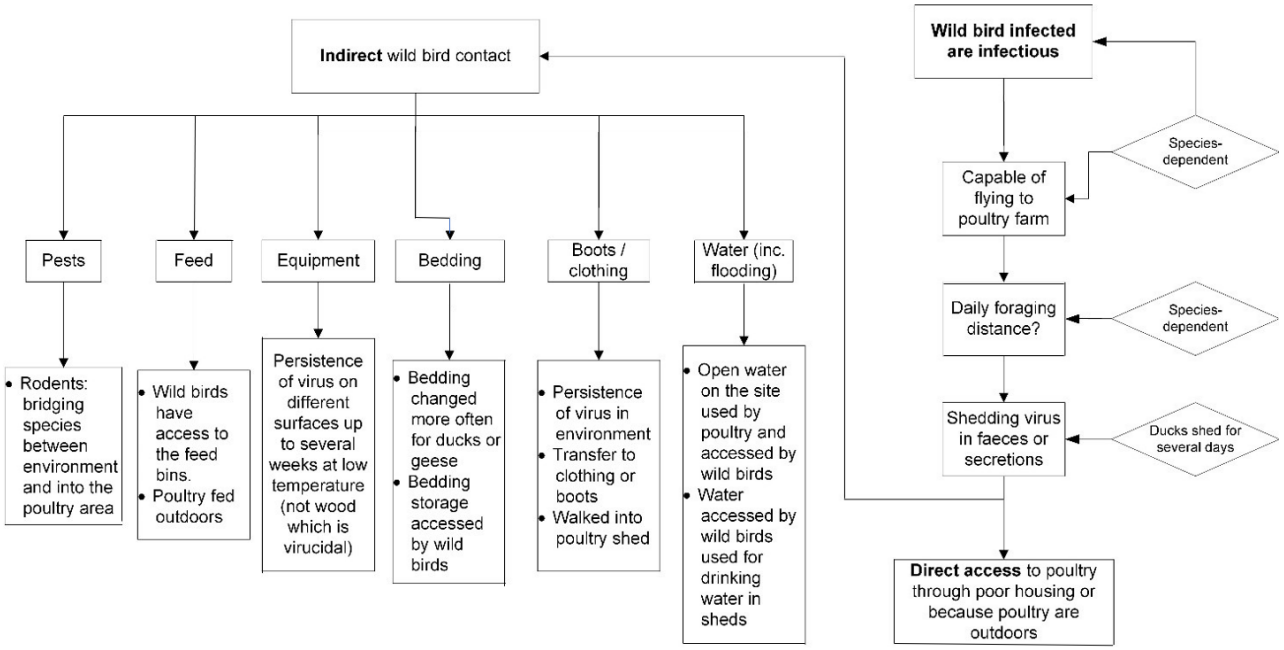
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30
2021	4	4	4	4	7	2	0	0	0	0	1	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	37	45	20	37	38	40	24	33	21	27	19	27	36	54	22	11	43	14	18	8	7	4	17	146	38	52	55	19	40	29

In an unprecedented event starting in mid June (Figure 1), the HPAI H5N1 virus has been circulating in seabird nesting colonies around the coast of GB. This has continued throughout the summer. The species affected include great skuas, gulls, gannets, terns and auks. There are some 8 million seabirds nesting in GB and these have become a reservoir for sustained transmission of HPAI H5N1 over the summer. On this basis, there is no evidence to lower the risk level in wild birds, and due to the relatively small number of events in wild birds inland over the summer, the wild bird risk has therefore been maintained at MEDIUM. It is argued that the few inland wild bird events currently reported are due to residual infectivity in the environment rather than sustained transmission between wild birds inland.

[1] According to the 2021 WOAH definition of poultry: Terrestrial Code Online Access - WOAH - World Organisation for Animal Health

Exposure Assessment

Figure 2 Exposure pathways for poultry from contact with wild birds



There are multiple pathways for the exposure of poultry to influenza viruses causing notifiable avian diseases via aerosol, direct or indirect contact.

These include:

- Contact with infected poultry such as live birds, hatching eggs and day-old chicks of poultry
- Contact with live infected wild birds, particularly waterfowl
- Contact with poultry products and by-products of infected poultry,
- Contact with contaminated feed, water, bedding, equipment, vermin or clothing / footwear of people in contact with infected birds or contaminated environment.
- Contact with contaminated environment, e.g. contaminated flood water.

For the purpose of this risk assessment, the pathways associated with trade in live poultry or poultry products (including domestic moves: points 1 and 3 above) will not be considered. There have not been any records of the legal trade in poultry or poultry products giving rise to an outbreak of HPAI in GB.

As LPAI viruses circulate constantly in wild birds, there is a constant low risk of incursion of a notifiable disease into poultry. Therefore, biosecurity advice which poultry keepers should practice at all times are often focused on the pathways involving wild birds and contaminated fomites. 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 also concluded 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 reduced **44-fold** by applying high biosecurity measures (which is difficult to implement and does not reflect the majority of the industry).

Contact with live infected wild waterfowl:

The likelihood of contact with wild waterfowl will be dependent on the number of such species in the near environment and how attractive the site is to such birds. The presence within the poultry premises of a pond or open feed bins are two well-known factors which make the direct contact with wild waterfowl more likely for poultry with access to the outside environment. Therefore, housing birds will eliminate the direct contact with wild waterfowl, and reduce the contact with contamination from outdoor soil, ponds, feed, waterers, feeders and roosting areas contaminated with wild bird secretions. It will not prevent any of the other pathways through which disease may enter a poultry premises. Other biosecurity measures will be more important.

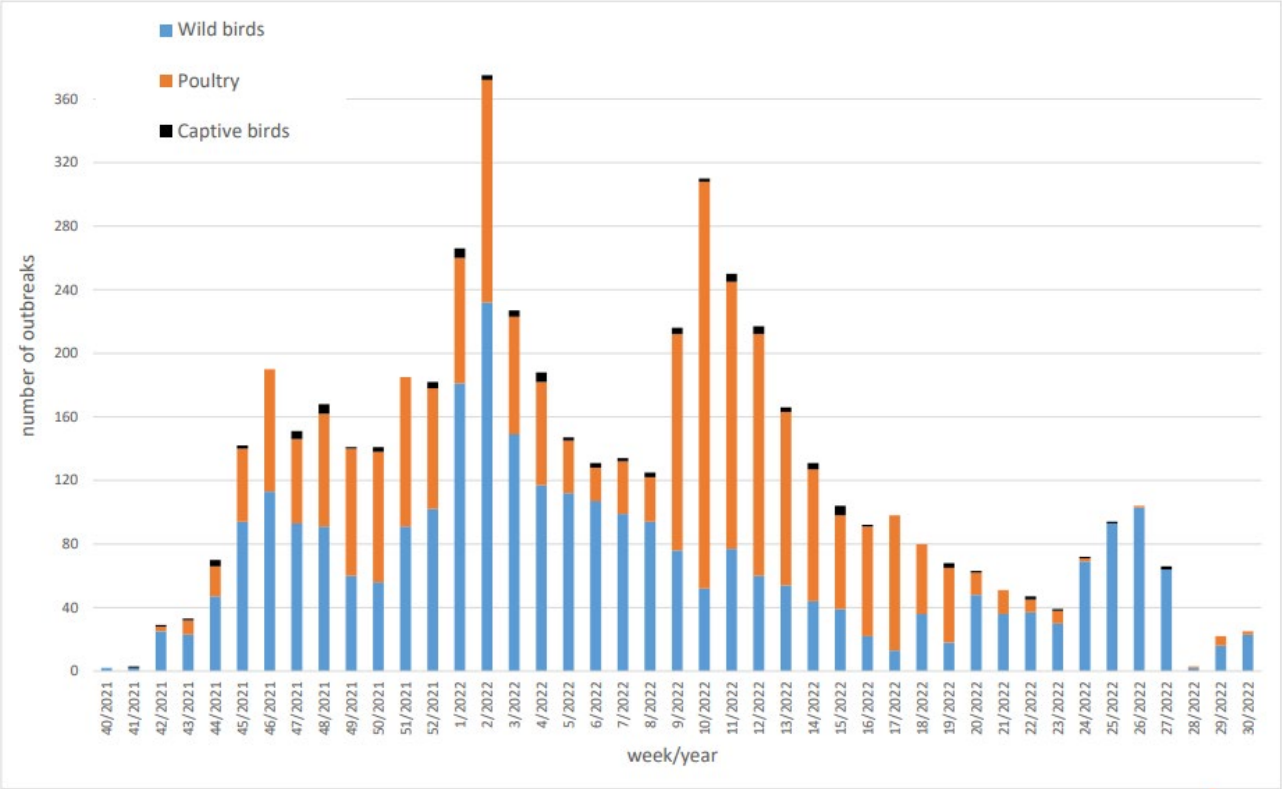
Expert opinion is that the virus will retain infectivity in the environment at low temperatures, for up to 55 days at 4ºC (Ian Brown, EURL, Pers. Comm.). At the higher temperatures during the recent heatwave in GB, together with increased sunlight intensity and longer day length in the summer months, virus survival in the environment will be minimal further reducing exposures to poultry through virus residues in the environment. .

Contact with live infected seabirds:

The sustained transmission of HPAI H5N1 in seabirds over the summer and the continued MEDIUM risk of HPAI H5H1 in wild birds in GB raises the question of the implications for the risks of exposure to poultry particularly those with poor biosecurity. It is generally assumed that the poultry risk is directly coupled to the wild bird risk, albeit with a lag time. Moreover, at this time of year (July/August) and particularly in the event of the recent heatwaves in GB, the higher temperatures and long hours of sunlight will inactivate virus residues in the environment greatly reducing exposure to poultry through access to the range. Many seabird species, including gannets, most sea tern species, auks and skuas will not come inland. They remain at their coastal breeding colonies and typically obtain food from the sea. The exception is gull species including black-headed gulls and herring gulls which breed at coastal sites (and have been detected as infected through the

2021/22 season). Although they come inland, this behaviour is more likely during the autumn and winter than the summer months. It is therefore likely that the current medium wild bird risk is decoupled from the risk of exposure to poultry, even those poultry with sub-optimal biosecurity. This is borne out by the fact that although seabird events increased rapidly at the end of June, this has not yet filtered through into poultry outbreaks. It is interesting to note that a similar increase in wild bird events again mainly seabirds, has been reported in north-west Europe starting at the same time as that in the UK (Figure 3). This also has not initially translated into an increase in poultry outbreaks in Europe. However, over the 18 day period from 15 July 2022 to 2 August 2022 there were nine poultry outbreaks (five in Germany, three in the Netherlands and one in France) in countries with high numbers of wild bird events (IZSVe 2022). It is not clear at this stage whether this represents evidence for a small spill-over from seabirds into poultry in north-west Europe but underpins the high uncertainty in our low risk for poultry in GB with sub-optimal biosecurity.

Figure 3: Number of HPAI positive events reported in poultry, captive and wild birds each week in Europe from October 2021 to 01 August 2022 (IZSVe, 2022)



<u>Contact with contaminated feed, water, bedding, equipment, vermin or clothing / footwear of people in contact with infected birds or contaminated environment including flood water:</u>

Contamination of feed, bedding and water by infected wild birds during an outbreak is expected on a poultry farm unless access is prevented. For Anseriformes poultry which require daily bedding changes, moving potentially contaminated straw into the poultry house is a source of infection. For poultry fed outdoors, feed may be accessed by wild birds (or rodents acting as fomites). Using drinking water from a local pond or reservoir may also introduce virus to the poultry. It is not always possible to estimate the infectious dose present on contaminated feed or in water as the dilution factor will be important, nevertheless during the winter months, when wild bird food is scarce, if poultry are fed outdoors it is quite likely wild birds will be attracted to the site. The presence of a pond on a poultry farm where gallinaceous poultry are kept, is not necessary for the birds' welfare but will attract wild waterfowl. 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 (i.e., 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 waterfowl by removing or covering any ponds on site, 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 cleansing and disinfection appropriately. This will be particularly important where birds are housed, as personnel contact with the birds is 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 also be recorded for security. Other important biosecurity practices are to ensure wild birds are separated from flocks, such as 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/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, securely built to prevent regular 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 GB poultry sector 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. 58% of UK production. For broilers, the

proportion is a lot lower, at 3-5%. For ducks around 30% are outdoor and for geese, the majority are raised outdoors.

Captive birds

Captive birds, such as those held in collections, zoos or approved bodies are already semi-housed and should be kept separate from wild waterfowl. 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 waterfowl access. There were outbreaks in captive birds in Europe (in zoos) in 2016/2017 and 2020/2120 and a derogation exists in GB domestic legislation 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, but the susceptibility of such birds to this virus is not known at present. Ratites are often refractory to HPAI infection from other viruses. However, there has been a case in Germany of an emu showing clinical signs in a zoo and therefore these birds should also be considered susceptible.

Game birds

The majority of game birds have already been released for the shooting season and therefore are considered wild birds and outside the scope of a prevention order around housing. However, the process of gathering up was completed by early March, whereby those game birds that were not shot are collected for breeding purposes. Some will still be kept in pens and could not be housed due to welfare issues; therefore, the pens themselves would need to be netted as the birds will often be able to fly out of the pens and forage locally.

Captive birds used as decoys would be at risk of increased contact with wild waterfowl. If they remain at one place for the duration of the fowling season, then they will not come into contact with domestic poultry. However, if the birds are moved around to other sites or spend any time at a premises where domestic poultry are kept, this is an increased risk for the poultry. 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.

Implications

As stated above, the probability of HPAI H5 still being present in wild birds in GB in August 2022 is **MEDIUM**. In the previous report (April 2022) it was anticipated that weekly

detections would continue to fall with an eventual reduction in the wild bird risk to LOW. This has not happened due to the unprecedented spread and sustained transmission in the GB seabird population which spend the summer breeding at coastal colonies. There are some 8 million seabirds breeding around the UK coasts.

In the previous report in April 2022, the likelihood of *at least one outbreak* being detected in the month of May in GB was reduced to **MEDIUM** (occurs regularly) **with high uncertainty** where biosecurity is poor, and **LOW** (rare but does occur) **with high uncertainty** where good biosecurity is applied. That assessment took into consideration the Avian Influenza Protection Zone (AIPZ), Housing Order, and assumed that bird keepers are taking the additional biosecurity measures required. The Housing Order was lifted on 29 May 2022 after the uncertainties in the poultry risks were reduced to low.

Although HPAI H5N1 is present in seabird colonies around the coast, it is considered that the wild bird risk is now sufficiently decoupled from the risk of exposure to poultry (given the reasoning throughout this report), such that the risk of exposure to poultry with sub-optimal biosecurity can be reduced from MEDIUM to **LOW**, albeit with **high uncertainty**.

The main concerns for GB this autumn are sevenfold:

1) H5N1 still circulating at main coastal sites around the UK. Currently, these reports are in seabirds, many of which such as the auks will disperse and fly out to sea quite soon, although gannets, skuas and gulls may remain into September. Therefore, there may be significant residual infectivity at coastal sites to infect brent geese and other geese arriving here in late September/October.
2) H5N1 and H5N5 reports in seabirds (great skuas, glaucous gulls) in Svalbard and northern Norway. Barnacle geese that winter on the Solway will be coming from these areas with many immunological naive juveniles.
3) The virus is still present in northern Germany/Netherlands and Denmark; many ducks, geese and swans will be passing through on their way to the UK. The wild bird events run from Normandy along the English Channel east through Belgium and the Netherlands into northern Germany, southern Sweden and further east still into Lithuania and southern Finland.
4) The virus is present in poultry in western Russia, east of Ukraine and Belarus; ducks and geese will be coming through those areas into eastern Europe.
5) The virus has been reported on the Faroes and Iceland this summer, several goose species and whooper swans coming through this route to GB every autumn.
6) In addition to birds infected on migrating through Iceland, there may be some mixing of European birds with birds from the USA in northern Greenland. For example snow geese from the USA breed in north-west Greenland and may overlap with light-bellied brent geese that winter in Ireland.
7) Mass die-offs of gulls infected with HPAI H5N1 have been reported in central China in early July and Taiwan in May and may serve as a source for birds coming to Europe this autumn.

Conclusions

The detailed consequence assessment of this outbreak will not be considered in this document. Nevertheless, any outbreak of notifiable avian disease has a significant impact on GB poultry industry, through the trade and economic impacts on the producer and the sector. Total costs may be between £2 and £4 million per infected establishment, depending on the type of birds involved and time taken to complete secondary cleansing and disinfection (C&D) and return to disease free status.

All the wild ducks, geese, and swans which may have brought HPAIV H5N1 into the UK in the autumn 2021 have departed (April 2022), and the number of wild bird events slowly declined during the early summer. However, in an unprecedented sequence of events, infection spread to seabird colonies around the coast with mass die-offs observed. This is ongoing although the auks have already started to disperse and gannets and skuas will follow over the coming months. With the exception of a few inland moorhens and raptors, the events in wild birds are confined to coastal areas and the risk of HPAI H5 infection in wild birds in GB is therefore maintained at **MEDIUM** for June/July 2022.

The risk of exposure to poultry has now been reduced from MEDIUM to **LOW** (with **high uncertainty)** for premises with sub-optimal biosecurity) and maintained at **LOW** (with **low uncertainty)** for premises with stringent biosecurity. The high uncertainty for poultry with poor biosecurity reflects the unprecedented events in breeding UK birds over the summer and that we recognise that there may well be sporadic Infected Premises confirmed.

The risk of exposure to poultry has now been reduced from MEDIUM to **LOW** (with **high uncertainty)** for premises with sub-optimal biosecurity) and maintained at **LOW** (with **low uncertainty)** for premises with stringent biosecurity. The high uncertainty for poultry with poor biosecurity reflects the unprecedented events in breeding UK birds over the summer and that we recognise that there may well be sporadic Infected Premises confirmed.

The main route of exposure to poultry is through environmental contamination. Higher environmental temperatures, together with increasing sunlight (intensity and day-length) are likely to reduce environmental levels of HPAIV H5 and the associated risks. The lower levels of prevalence in the wild bird population inland will also reduce viral load present in the environment, although high levels may be maintained at coastal sites.

The 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 by only housing birds. Events in poultry continue to be reported, with a greater number than observed in previous epizootics when lower numbers over a longer time period has been observed in terms of continued poultry outbreaks.

Direct evidence of the impact of housing suggests a two-fold reduction in risk, which is significant in terms of the number of outbreaks potentially prevented given the large number of outbreaks so far reported. The effect of housing may be underestimated because it also includes removing access to ponds which may have an additional three-

fold effect. That the majority of the outbreaks happened after introduction of the housing order in already housed birds is not necessarily evidence that the housing order has not been effective. First, it is only predicted to reduce the risk by a factor of two (which would be significant given the large number of outbreaks this season) and second there are other routes of transmission other than from wild birds, for example fomite transmission from one premises to another. 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 will be much more effective compared to when poultry have access to their ranges with wild birds able to visit their fields, water, feed and roosting areas. If good (stringent) biosecurity is applied, the risk to poultry is substantially reduced and housing of poultry will further reduce that risk.

The risk of exposure of poultry across the whole GB is reduced to LOW (with high uncertainty) where good (stringent) biosecurity is applied, and at MEDIUM (with high uncertainty) where biosecurity is poor (sub-optimal). This assessment takes into consideration the Avian Influenza Protection Zone (AIPZ) and assumes that bird keepers are taking the additional biosecurity measures required.

Housing birds which are not used to housing can cause welfare issues. Making sure their environment is enriched (e.g. with toys), that they have plenty of room to move, access to feed and water, clean bedding and the ability to display natural behaviours are all welfare priorities. For ducks, their bedding must be changed regularly (creating risk if not done in a biosecure manner) 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. Therefore, it is important that the benefits of housing outweigh the disbenefits and with this in mind, this assessment will be regularly reviewed.

The risk of exposure to poultry depends both on the levels of infectivity in wild birds in GB and the residual infectivity remaining in the environment. The following conditions could be used to inform a review of this document to assess when the risk levels to poultry will be reduced over the coming months. Firstly, the time of year as the number of migrant non-breeding waterfowl depart GB and migrate to their breeding grounds outside the UK; secondly, the time lapsed since the last reported case, and; thirdly, if the temperature has increased with higher sunlight levels such that the environmental contamination and transmission would be reduced. These conditions could form part of the “exit strategy” although other factors including the uncertainties listed below need to be considered. As the housing order has been applied, an exit strategy is now required, and this should also be based both on a risk assessment for wild birds and other epizootic considerations such as decay of infectivity in the environment. However, an expectation of no positive wild bird events could be over-optimistic even though the risk is low i.e., one event per week when surveillance sensitivity has been maximised could still represent a low wild bird risk,

particularly with the expected long tail of the epizootic. Furthermore, the surveillance itself is not that sensitive as only dead birds are tested. The housing order was introduced on the basis of numerous wild bird events and several poultry outbreaks and the same criteria in reverse could be used as an exit strategy in addition to using the three scientific conditions above to inform the risk assessment.

Assumptions and Uncertainties

- The wild bird counts for this year are not known and we are using an annual assessment based on previous years. This is likely to be similar year on year and the key point is that many birds have now left and continue to leave, as expected each year.
- Other wild waterfowl species (although this assessment considers the most abundant) may also be important for the transmission of this virus.
- The patterns of movement of gulls are more complex than waterfowl. They prefer to roost around landfill sites and reservoirs. Therefore, these should not be ignored as potential sites of concern for proximity to poultry farms. Frequently, on IPs to date, presence of gulls has been noted.
- The sustained transmission of HPAI H5N1 in seabirds this summer is unprecedented and there is uncertainty in the role of herring gulls that share both coastal habitats and could visit poultry premises especially those close to the coast.
- The evidence for the economic benefits and dis-benefits of housing birds is not part of this assessment.
- While housing may prevent direct contact with wild waterfowl, the birds may be under stress, leading to reduced immune function, more disease transmission and greater likelihood of viral mutation (Abo-Al-Ela et al. 2021).

References

Abo-Al-Ela, H.G., El-Kassas, S., El-Naggar, K., Abdo, S.E., Jahejo, A.R. and Al Wakeel, R.A., 2021. Stress and immunity in poultry: light management and nanotechnology as effective immune enhancers to fight stress. *Cell Stress and Chaperones*, *26*(3), pp.457-472. https://doi.org/10.1007/s12192-021-01204-6

EFSA, 2017: EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), More S, BicoutD, Bøtner A, Butterworth A, Calistri P, Depner K, Edwards S, Garin-Bastuji B, Good M, GortazarSchmidt C, Michel V, Miranda MA, Nielsen SS, Raj M, Sihvonen L, Spoolder H, Thulke H-H, Velarde A,Willeberg P, Winckler C, Breed A, Brouwer A, Guillemain M, Harder T, Monne I, Roberts H, Baldinelli F,Barrucci F, Fabris C, Martino L, Mosbach-Schulz O, Verdonck F, Morgado J and Stegeman JA (2017).Scientific opinion on avian influenza. EFSA Journal 2017;15(10):4991, 233 https://doi.org/10.2903/j.efsa.2017.4991

EFSA, Aznar, I., 2021. '2020 Annual surveillance report/HPAI early warning tool (assessing the risk of introduction via migratory wild birds' [Powerpoint presentation]. Available at https://ec.europa.eu/food/system/files/2021-10/reg-com_ahw_20210922_hpai_annual-surveillance_efsa.pdf. Accessed: 10/02/2022.

IZSVe (2022) IZSVe report - Number of highly pathogenic avian influenza positive events notified by country and poultry category (pdf)

OIE, 2021. Terrestrial Animal Health Code. Available at https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/. Accessed: 10/02/2022.