Food and Agriculture Organization of the United Nations

SCIENTIFIC TASK FORCE ON AVIAN INFLUENZA AND WILD BIRDS

STATEMENT - JULY 2023

Scientific Task Force on Avian Influenza and Wild Birds statement on:

H5N1 High pathogenicity avian influenza in wild birds - Unprecedented conservation impacts and urgent needs

July 2023

This statement, from the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Food and Agriculture Organization of the United Nations (FAO) Co-Convened Scientific Task Force on Avian Influenza and Wild Birds ('Task Force'), is released in response to the extensive and large-scale outbreaks and global spread of H5N1 high pathogenicity avian influenza (HPAI) in wild birds. The purpose is to inform stakeholders in governments, disease control, wildlife management, site management, conservation and poultry sectors about HPAI viruses in wild birds and appropriate responses. The statement provides firstly a situation update and secondly recommendations and guidance for those responding to the threat of HPAI to wild birds.

Members of the Scientific Task Force on Avian Influenza and Wild Birds

CMS · Food and Agriculture Organization of the United Nations · AEWA · World Organisation for Animal Health (Founded as OIE) · Ramsar Convention on Wetlands / Convention sur les zones humides / Convención sobre los Humedales · EAAFP · BirdLife International · RVC Royal Veterinary College University of London · EcoHealth Alliance · Wetlands International · CIC · WWT

Cover image: Northern Gannet (*Morus bassanus*) © Sergey Dereliev, www.dereliev-photography.com

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Key Messages

1. H5N1 high pathogenicity avian influenza (HPAI) is currently causing unparalleled mortality of wild birds and mammals worldwide with threats to population levels for some species already under multiple anthropogenic pressures. Before 2005 when HPAI viruses spilled significantly from poultry into wild birds, HPAI in free-ranging wildlife was highly unusual. Now a new phase in the epidemiology of HPAI in wild birds has been entered and this better adapted virus is expected to continue to spread and cause further negative conservation impacts. Notably, important breeding colonies on oceanic islands are at risk.
2. As pressures on biodiversity mount, effective prevention and management of HPAI outbreaks requires a One Health approach to ensure appropriate cross-sectoral attention to human, animal and environmental health and coordination among agencies.
3. Governments are encouraged to see HPAI as a conservation issue so environmental sections of government need to take active responsibility for the wildlife aspects of the disease, plan accordingly, and follow HPAI obligations including those of the multilateral environmental agreements.
4. Lessons learned from countries experiencing significant outbreaks in wild birds include the need for advance cross-sectoral multi-stakeholder contingency planning in terms of both broader risk mitigation plans and emergency response plans. This will help ensure a One Health approach.
5. There remain significant gaps in wild bird HPAI surveillance efforts so absence of reports does not represent absence of cases. Moreover, to date, surveillance has typically sought to evaluate risk to the poultry sector. Biodiversity conservation needs to be an aim of surveillance efforts. This will help minimise losses to wildlife and improve understanding of epidemiology of the disease in wild birds, additionally helping inform risk to other sectors. Understanding HPAI impacts requires research and better data from outbreak situations, improved and standardised recording systems for wildlife settings, greater virus phylogenetic analyses, good population monitoring and research efforts. Government support is required for these aspects of disease monitoring and control.
6. Reducing pressures on the wider environment and wild birds will improve resilience to disease. Further conservation efforts, such as good protection of wild habitats and provision of alternative/additional breeding sites, may also be required as HPAI risk mitigation efforts.
7. Wild birds are both victims and vectors of a virus originating from within a poultry setting. Poultry production worldwide has increased significantly over the last 50 years and HPAI risks are high where production occurs in high-density settings, where there are clear wild bird and poultry interfaces, and where biosecurity is poor or otherwise compromised. Reassessment of the nature and sustainability of poultry production systems is required. High-risk practices such as grazing of domestic ducks in natural wetlands should be addressed.
8. There is no benefit to be gained in attempting to control the virus in wild birds through culling or habitat destruction. Spraying of birds or the environment with disinfectant is considered potentially counter-productive, harmful to the environment and not effective from a disease control perspective.
9. This statement provides guidance and syntheses recommendations from other governmental and non-governmental sources. Those with responsibilities for wildlife are advised to implement actions with urgency.

1. Situation update

The last two years have seen unprecedented impacts of H5N1 high pathogenicity avian influenza (HPAI) on poultry and wild birds on a global scale[1,2,3,4,5,6,7]. H5N1 has now in effect replaced the H5N8 subtype in Asia, Africa and Europe in both poultry and wild birds. The previous Task Force statement from January 2022 reported on high wild bird mortality and trans-Atlantic spread to north-eastern America at the end of 2021[8]. Following this introduction[9], throughout 2022 HPAI spread extensively in North America and then into Central America from October[10]. Later that year South America was also affected in what remains an on-going dynamic situation with expected further spread[10]. Re-assortment of genetic material with local low pathogenic viruses has occurred[2] and is likely to continue.

This epizootic caused by viruses of the original 'poultry virus' (goose/Guangdong/96) lineage, dominated by the H5N1 2.3.4.4b clade[1], can be considered relatively stable[2] and particularly 'fit' in wild birds. It is seemingly well adapted for some species (as indicated from field observations and experimental work[11]), enhancing probability of maintenance of infection and transmission. Despite circulation of virus in wild birds, the species most capable of asymptomatic carriage and/or spread of disease remain poorly understood and the role of the infected environment in spread of infection is also likely important[12].

Typical spread within poultry settings associated with production, trade and marketing systems remains highly important and has created steady range expansion of HPAI H5[13]. However, introduction from wild birds is now a significant part of the epidemiology of the disease especially where poultry biosecurity is poor. In many areas, viruses have been maintained in poultry populations, whether commercial or back-yard, with the potential for spillover and spillback linked to wild bird and domestic poultry movements[2].

This dynamic situation represents a One Health problem with significant costs to wildlife health and biodiversity conservation as well as livelihoods (including of those dependent on wildlife for subsistence), economies, livestock health, and a risk to humans due to zoonotic potential, thus demanding a One Health approach[14,15].

1.1 Why is this situation unprecedented?

From the wild bird perspective, the nature of the unprecedented outbreaks are notable for:

1. **The settings and seasons for outbreaks:** The nature of the epizootic is particularly notable for the shift in seasonality of wild bird involvement, changes in epicentre of outbreaks and the changes in settings in which outbreaks have occurred. In addition to aggregations of wintering waterbirds being the typical focus of outbreaks, the virus has been increasingly maintained throughout northern summers since 2020. The virus has also spilled over and in some cases spread into relatively new avian hosts in novel settings, namely, seabirds in their breeding colonies[16]. The nature of this 'fitter', better-adapted virus coupled with the density and gregarious behavioural nature of susceptible individuals in these situations has resulted in extremely high mortality seen in multiple locations particularly in the seabird breeding colonies of North-west Europe and beyond.

2. **The number and types of affected species:** No doubt as both a consequence of the nature of the virus and the now extensive geographical spread because of rapid spread in both old and new taxa[13], the range of species of bird affected is extremely wide. Deaths and/or detections have been confirmed in well over 400 bird species in, at least, wildfowl, herons, rails, grebes, cranes, gulls, terns, waders, cormorants, gannets, auks, penguins, pelicans, flamingos, raptors including vultures (and condors), owls, corvids, psittacines and some passerines[2,17]. The species affected have shifted over time and many questions remain around species susceptibility

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1 https://www.woah.org/en/disease/avian-influenza/#ui-id-2
2 https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential/en
3 https://www.efsa.europa.eu/en/topics/topic/avian-influenza
4 EFSA *et al.* (2023). https://www.ecdc.europa.eu/en/publications-data/avian-influenza-overview-december-2022-march-2023
5 EFSA *et al.* (2022). https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2022.7597
6 https://www.offlu.org/index.php/offlu-vcm-summary-reports/
7 WOAH World Assembly (2023a). https://www.woah.org/app/uploads/2023/05/a-90sg-8.pdf
8 CMS/FAO (2022). https://www.cms.int/sites/default/files/uploads/avian_influenza_0.pdf
9 Caliendo *et al.* (2022a). https://www.nature.com/articles/s41598-022-13447-z
10 https://www.paho.org/en/documents/epidemiological-update-outbreaks-avian-influenza-caused-influenza-ah5n1-region-americas
11 James *et al.* (2023). https://doi.org/10.1099/jgv.0.001852
12 Bregnballe *et al.* (2023). https://www.waddensea-worldheritage.org/resources/management-guidelines-mitigation-and-data-collection-strategies-avian-influenza-bird
13 Hill *et al.* (2022). https://doi.org/10.1371/journal.ppat.1010062
14 Adlhoch and Baldinelli (2023). https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2023.28.19.2300227
15 WOAH World Assembly (2023b). https://www.woah.org/app/uploads/2023/05/mastercopy-ahf-report-v-2-1.pdf
16 Boulinier (2023). https://doi.org/10.1016/j.tree.2023.02.002
17 https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential/bird-species-affected-by-h5nx-hpai/en

3. **The scale of the mortality:** In multiple outbreaks the scale of mortality has been extremely high often involving deaths of 100s, 1,000s or 10,000s of individuals with significant proportions of birds present being killed. As examples, the 2022 outbreak in the world's largest Dalmatian Pelican *Pelecanus crispus* breeding site, at Prespa Lake in Greece, killed around 60% of the colony[18] (some 1,800 birds dying), and in total 40% of the birds of South-east Europe died representing approximately 10% of the global breeding population[19]. Scotland, which holds the majority of the global population of breeding Northern Gannets *Morus bassanus*, suffered high losses at most of the key breeding colonies[20]. As a minimum, over 11,000 birds were killed[21].

   In general and important to note, numbers of wild birds detections of virus formally reported represents only a sub-set of numbers of birds found dead, which represents a sub-set of numbers actually killed by HPAI. In most wild settings it is very difficult to accurately assess levels of mortality but for species in, for example, marine settings 'found dead' birds likely represent the 'tip of the iceberg'[21].

4. **The geographical spread:** There has now been extensive and near global spread of HPAI virus detection including from wild birds in East and South Asia, West and Southern Africa, Europe, Iceland, Greenland[22], North America, Central and South America with further spread expected there[10]. At time of writing Australia[23] and the rest of Oceania and Antarctica do not yet seem to be affected based on surveillance findings. The establishment of the virus in species such as gulls has contributed to rapid range expansion of infection in episodic dispersal via different pathways[13].

   Figures 1 and 2 provide maps of distribution of reported avian influenza virus detections over the recent previous wave - October 2021 to September 2022, and the current wave - October 2022 to June 2023.

5. **Conservation implications:** The extent and scale of outbreaks is having significant conservation consequences for multiple species. Globally threatened species which have been affected include a number of crane species e.g. Hooded Cranes *Grus monacha*, White-naped Cranes *Grus vipio* and Red-crowned Crane *Grus japonensis*[24], and California

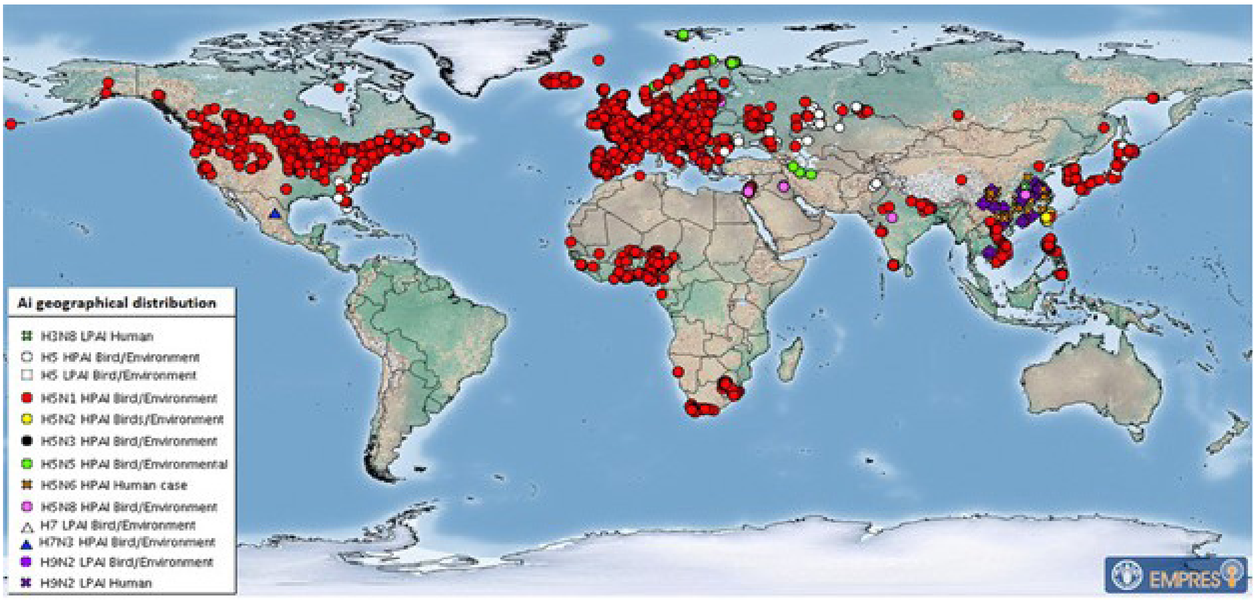

Figure 1. Global distribution of H5N1 HPAI virus and other AIVs observed in the period 1 October 2021 to 30 September 2022 (i.e. previous wave)[2]. Note: Symbols may overlap for events in similar geographic locations.

The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries. Dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

18 https://wahis.woah.org/#/in-event/4165/dashboard
19 Alexandrou *et al.* (2022). https://doi.org/10.1017/S0030605322001041
20 Lane *et al.* (2023). https://doi.org/10.1101/2023.05.01.538918
21 NatureScot (2023a). https://www.nature.scot/doc/naturescot-scientific-advisory-committee-sub-group-avian-influenza-report-h5n1-outbreak-wild-birds
22 Wenger (2023). https://polarjournal.ch/en/2023/01/25/for-the-first-time-avian-flu-virus-officially-confirmed-in-greenland/
23 Wille and Klaassen (2023). https://doi.org/10.1111/irv.13118
24 EAAFP (2022a). https://www.eaaflyway.net/updates-hpai-eaaf/

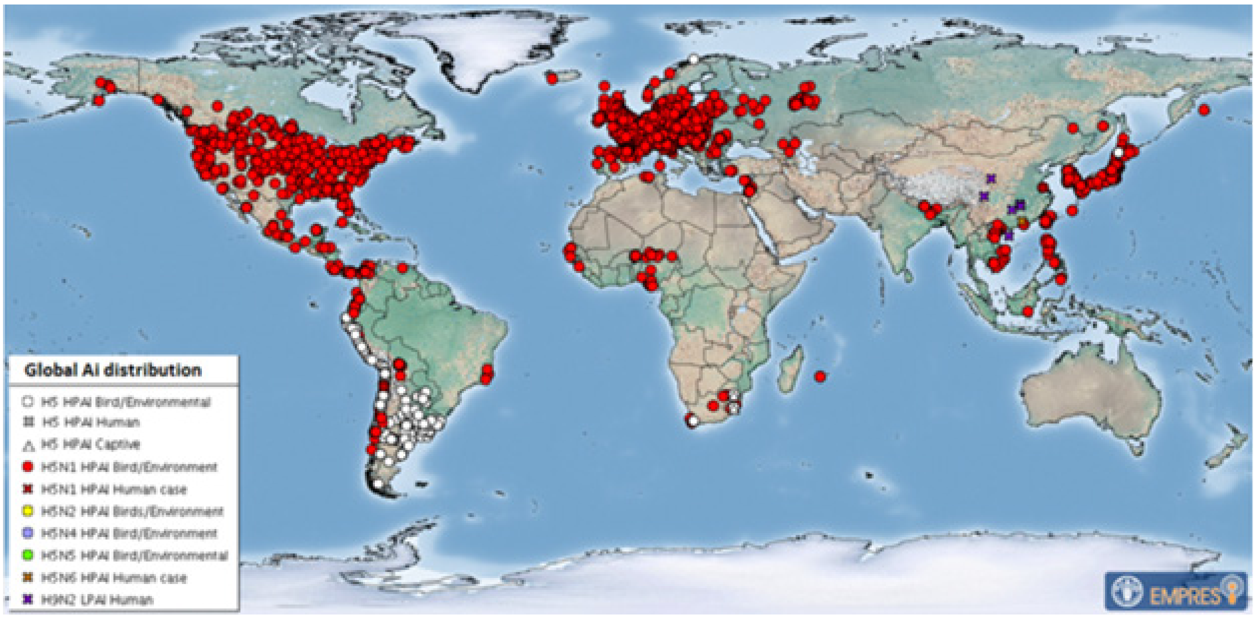

Figure 2. Global distribution of H5N1 HPAI virus and other AIVs observed in the period 1 October 2022 to 22nd June 2023 (i.e. current wave) – note further spread in Central and South America[2].

Note: Symbols may overlap for events in similar geographic locations.

Condors *Gymnogyps californianus*[25,26]. Of particular concern is the impact of the disease on those seabird populations heavily affected (see Section 1.2). Seabirds are often long-lived species whose life histories depend on high annual survival. The large-scale loss of breeding adults has the potential for significant impacts at a population level[16,20,21].

The conservation implications of the epizootic have renewed attention at multiple scales for action from national governments and their agencies and prompted international calls for mitigation of risks to wild birds and to minimise conservation impacts. Preparedness for responding to HPAI and monitoring of populations from hereon is essential to try to reduce impacts and to understand long-term implications for population sizes and ecosystem services. See Section 2 on Guidance below.

Moreover, there are calls for further action to address existing threats to wild populations to improve their resilience to outbreaks and their impacts through reducing other population pressures. This is of particular importance for groups such as seabirds already under threat due to the consequences of climate change and reduced food availability[27].

6. **Involvement of wild and farmed mammals:** Detections of numerous mammalian infections with H5N1 HPAI virus have been made in association with poultry and wild bird outbreaks[1,28]. Affected species include mainly predatory and scavenging species in terrestrial, wetland and marine environments with exposure likely through consumption of dead and infected wild birds. Species include foxes, seals and sea-lions, dolphins, bears, felids, opossums, coatis and mustelids including wild otters and farmed American Mink *Neovison vison*[1,29,30,31]. Mammal-to-mammal transmission is assumed to have occurred in the farmed mink[30] and cannot be ruled out in the high mortality seen in outbreaks in South American Sea Lions *Otaria flavescens* in Chile and Peru[32].

7. **Risk to human health:** Since the current resurgence

25 Wetzel (2023). https://www.newscientist.com/article/2371018-bird-flu-has-killed-20-critically-endangered-california-condors/
26 UNMC (2023). https://www.unmc.edu/healthsecurity/transmission/2023/04/11/at-least-3-california-condors-die-from-bird-flu-in-arizona/
27 AEWA (2022). https://www.unep-aewa.org/sites/default/files/document/aewa_mop7_6_seabirds_en.pdf
28 Offlu (2023). https://www.offlu.org/wp-content/uploads/2023/03/OFFLU-call-AI-mammals-Mar2023.pdf
29 USDA (2023). https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-mammals
30 Aguero *et al.* (2023). https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2023.28.3.2300001
31 https://wahis.woah.org/#/in-review/5046
32 Gamarra-Toledo *et al.* (2023). https://www.biorxiv.org/content/10.1101/2023.02.08.527769v2.full.pdf

Figure 3. Before and after HPAI. A comparison of drone footage from 2020 and 2022 of the world's largest Northern Gannet breeding colony in Scotland, UK. In 2022, mass mortality of adults and young transformed the typically packed breeding sites. Image credit (from top to bottom): ©Darwin 200 in partnership with the Scottish Seabird Centre; ©Scottish Seabird Centre in partnership with The University of Edinburgh

of H5N1 HPAI, there has been a relatively small number of human H5N1 detections globally with 11 cases (not deaths) at time of writing reported since 2011 from China, Cambodia, Vietnam, India, UK, Spain, USA, Ecuador and Chile[4,33,34]. These cases (which include ~1 annual death in recent years) have been associated with close and/or repeated contact with infected domestic birds or heavily contaminated poultry environments[35]. Zoonotic risk from this virus is still considered low[4,36]. However, the ability of the virus to infect a variety of mammal species and detection, for example, in the farmed mink setting, where there is high potential for mammal-to-mammal transmission, has created public health concern[30,36].

1.2 Regional perspectives

A regional perspective is provided within this section recognising that there are significant gaps in surveillance efforts worldwide hence wild bird cases are likely to be under-reported particularly so in some regions.

Europe

The past two years have represented the largest HPAI epizootic so far observed in Europe in terms of poultry and wild bird outbreaks[4,37] with numerous cases in wild mammals likely exposed via predation and scavenging on wild birds[1].

The first example of unusual timing, location and wild bird species affected, was during the summer of 2021, beginning in July, when a number of Great Skuas *Catharacta skua* were reported with H5N1 HPAI in the far northern Scottish Islands[9,38]. Consequent population decline of this species has been recorded[39]. As reported in the 2022 Task Force statement[8], summer mortality

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33 Schnirring (2023). https://www.cidrap.umn.edu/avian-influenza-bird-flu/more-latin-american-nations-report-h5n1-avian-flu-wild-birds#:~:text=Argentina%2C%20Bolivia%2C%20Guatemala%2C%20and,mammals%2C%20in%20multiple%20world%20regions.
34 WHO (2023). https://www.who.int/publications/m/item/cumulative-number-of-confirmed-human-cases-for-avian-influenza-a(h5n1)-reported-to-who-2003-2023-24-april-2023
35 https://www.woah.org/en/disease/avian-influenza/
36 EFSA (2023). https://www.efsa.europa.eu/en/news/efsa-ecdc-eurl-ongoing-avian-influenza-outbreaks-birds-low-risk-public
37 WOAH (2022). https://rr-europe.woah.org/wp-content/uploads/2022/09/analysis-of-the-animal-health-situation-in-members-in-the-region.pdf
38 Banyard *et al.* (2022). https://doi.org/10.3390/v14020212
39 Pearce-Higgins *et al.* (2023). https://www.bto.org/sites/default/files/publications/rr752_pearce-higgins_et_al_2023_hpai_workshop_final_web.pdf

was followed during the 2021/22 winter by significant mortality of Svalbard-breeding Barnacle Geese *Branta leucopsis* on their wintering grounds in the UK. A third of that population is now thought to have died in that outbreak with counts from the breeding grounds in 2022[21] confirming this estimate.

The summer of 2022 was then typified by mass mortality events in multiple seabird breeding colonies across North-west Europe. Examples include the aforementioned mass mortality at Northern Gannet breeding colonies in the UK and Ireland[40] with the disease possibly increasing movements of infected birds between key sites[21,41]. Significant losses of terns including Common *Sterna hirundo*, Arctic *S. paradisaea*, Roseate *S. dougallii* and Sandwich Terns *Thalasseus sandvicensis*, were most notable in the North Sea and Wadden Sea regions[12, 42,43,44]. As an example of impact of this mortality, it is suggested that only half of the expected number of Common Terns returned to a German site for the 2023 breeding season.

In recent months high mortality of gull species in particular Black-headed Gulls *Chroicocephalus ridibundus* has been reported in a number of European countries[2,4] along with smaller numbers of deaths of other species[2, e.g. 45] including Common Guillemots *Uria aalge*. Outbreaks involving hundreds of gulls (Laridae) have been reported by Russia since May 2023 .

Middle East

Since the mass mortality event of Common Cranes *Grus grus* and other waterbirds in Israel during the 2021/22 norther winter, reported in the 2022 Task Force statement[8], there have been comparably few reported detections of HPAI H5N1 in both waterbirds and raptors in the Middle East region[2].

Africa

As seen from Figures 1 and 2, the current epizootic represents reports from mainly western and southern Africa[47].

Western Africa

Extensive mortality of Great White Pelicans *Pelecanus onocrotalus* in Senegal at the Djoudj National Bird Sanctuary, a UNESCO and Ramsar site, in early 2022[8, 48,49] has been followed by large-scale mortality of wild waterbirds in the first half of 2023 in other parts of West Africa. At time of writing the species most affected are Royal Terns *Thalasseus maximus*, many hundreds of which have been reported dead on the coast of Gambia, Senegal and Guinea Bissau (and likely Guinea[50]) along with large numbers of Caspian terns *Hydroprogne caspia* and other species[51,52,53,54].

Southern Africa

Since 2021 southern Africa (specifically Namibia and South Africa) has reported extensive mortality due to HPAI of African Penguins *Spheniscus demersus*[55] and Cape Cormorants *Phalacrocorax capensis*. The scale of the mortality of the latter has been particularly high with >20,000 birds reported dead[56,57]. Phylogenetic studies of the virus affecting the cormorants in Namibia in late 2021/early 2022 indicated the 2.3.4.4b clade which had been previously detected in the aforementioned countries[58] and Botswana and Lesotho[59].

Other detections have involved both long-distance migrants as well as resident birds, including amongst others, Common Terns, Sandwich Terns, Swift Terns *Thalasseus bergii*, Cape Gannets *Morus capensis*, Arctic Jaegers *Stercorarius parasiticus*, pelicans, gulls, other

40 Paradell *et al.* (2023). https://doi.org/10.1098/rsbl.2023.0090
41 Jeglinski *et al.* (2023). https://www.authorea.com/users/607294/articles/636040-hpaiv-outbreak-triggers-long-distance-movements-in-breeding-northern-gannets-implications-for-disease-spread?commit=554c9f0238d40f35cddaddcf16dce1ed97f98543&s=03
42 Rijks *et al.* (2022). https://doi.org/10.3201/eid2812.221292
43 Pohlmann *et al.* (2023). https://doi.org/10.1099/jgv.0.001834
44 El-Hacen (2022). https://www.waddensea-worldheritage.org/sites/default/files/2022_Avian%20influenza%20workshop.pdf
45 https://wahis.woah.org/#/in-review/4075
46 https://wahis.woah.org/#/in-review/5055
47 WOAH (2023). https://rr-africa.woah.org/wp-content/uploads/2022/12/eng-analysis-of-animal-health-situation-1.pdf
48 https://wahis.woah.org/#/in-event/3534/dashboard
49 https://wahis.woah.org/#/in-event/4308/dashboard
50 https://wahis.woah.org/#/in-review/5048
51 https://wahis.woah.org/#/in-review/5008
52 https://wahis.woah.org/#/in-review/4967
53 https://wahis.woah.org/#/in-review/4964
54 https://www.birdlife.org/news/2023/05/24/response-to-the-outbreak-of-avian-flu-in-senegal-gambia-and-guinea-bissau/
55 https://wahis.woah.org/#/in-event/2803/dashboard
56 https://wahis.woah.org/#/in-event/3733/dashboard
57 https://wahis.woah.org/#/in-event/4260/dashboard
58 Peyrot *et al.* (2022). https://pubmed.ncbi.nlm.nih.gov/36268570/
59 Molini *et al.* (2023). https://doi.org/10.1080/22221751.2023.2167610

Figure 4. Previously rarely affected species that are not in typical contact with poultry, such as terns, have died in high numbers at breeding sites and throughout migratory flyways across the world. Image credit: ©Ibrahim Alfarwi/ RSPB

species of cormorant and raptors including Secretarybird *Sagittarius serpentarius* and Barn Owl *Tyto alba*[60].

South, East and South-east Asia

H5Nx HPAI viruses have continued to circulate in South, East and South-east Asia with the majority of wild bird detections being reported from Japan, Republic of Korea and People's Republic of China[61]. Cases have included Black-faced Spoonbill *Platalea minor* and the aforementioned threatened crane species e.g. over 1,200 Hooded Cranes[62] and dozens of White-naped Cranes[24]. In the summer of 2022, People's Republic of China reported H5N1 HPAI in wild birds in the Qinghai region[63,64] where the original large scale die-off of wild birds occurred in 2005[65].

Cognisant of the seabird mortality in Europe, although no large scale mortality events have been confirmed as HPAI outbreaks there is local concern about tern mortality and unexpected population decline for some species[66].

The deaths of some 300 or so Demoiselle Cranes *Anthropoides virgo* in India in 2021 were reported in the previous Task Force statement[8].

North America

The threat to wild birds was recognised after introduction of virus to north-eastern North America at the end of 2021[9,67]. The virus then spread westwards, including some re-assortment with North American wild bird AI viruses[68], and affected multiple species in multiple states[69] (see Figures 1 and 2)[70].

60 https://wahis.woah.org/#/in-review/3733?fromPage=event-dashboard-url
61 EAAFP (2023b). https://www.eaaflyway.net/avianinfluenza_2023asia/
62 https://www.env.go.jp/nature/dobutsu/bird_flu/
63 https://wahis.woah.org/#/in-event/4553/dashboard
64 EAAFP (2022b). https://www.eaaflyway.net/ai-updates-eaaf-jun-sept-2022/
65 Wang *et al.* (2008). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2885753/
66 EAAFP (2022c). https://www.eaaflyway.net/alert-ai-in-seabirds/
67 Ramey *et al.* (2022). https://wildlife.onlinelibrary.wiley.com/doi/full/10.1002/jwmg.22171
68 Youk *et al.* (2023). https://dx.doi.org/10.2139/ssrn.4477349
69 https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-wild-birds
70 WOAH (2022). https://rr-americas.woah.org/wp-content/uploads/2022/10/eng_americas_regional_conference_ahsr-final.pdf

Some hundreds of Bald Eagle *Haliaeetus leucocephalus* mortalities have been reported across numerous locations[71] and the disease is being associated with significant reductions in breeding success related to reduced adult survival and nest failure[72].

Other outbreaks include:

a. possibly 5-15% of the nesting population of Common Eider Ducks *Somateria mollissima* dying on the St. Lawrence waterway[73],

b. a 58% decline in the breeding population of Northern Gannets at Rocher aux Oiseaux in Canada[74],

c. over 1,000 dead Caspian Terns on Lake Michigan[75],

d. several involving Snow Geese *Anser caerulescens* e.g. ~1,000 dead birds on waterways in Colorado[76],

e. deaths of at least 20 critically endangered California Condors which represents 7% of the global population[25,77]. Vaccination of the extant wild population is now planned[78].

Mammals cases include sporadic scavenging and predatory species and numerous cases in Harbour *Phoca vitulina* and Gray Seals *Halichoerus grypus* associated with wild bird HPAI deaths[79,80].

Central and South America

The current circulating virus was first detected in wild birds and poultry in Central America from October onwards of 2022 and in South America later the same year[10,81], presumably associated with the southwards migration of wild birds.

Since late 2022 and in particular the beginning of 2023 there has been fairly rapid spread of virus with detections in wild birds, and often poultry, in (at time of writing) Argentina[82], Bolivia[83], Brazil[84], Chile[85], Colombia, Costa Rica, Cuba, Ecuador[86], Guatemala[33], Honduras, Mexico, Panama, Peru[87], Uruguay[88,89] and Venezuela[10]. The range of species affected is wide with wild bird deaths recorded in species such as psittacines (macaws, parrots and parakeets), Black-necked Swans *Cygnus melancoryphus*, Andean Geese *Chloephaga melanoptera* and other waterbirds such as Royal Terns[90].

A mass mortality event of 1,000s of mainly Peruvian Pelicans *Pelecanus thagus* but also Brown Pelicans *Pelecanus occidentalis* began on the Peruvian coast and off-shore islands in November 2022[33]. Other species involved include deaths of 1,000s of Peruvian Boobies *Sula variegata* and 100s of Blue-footed Boobies *Sula nebouxii*. By the beginning of 2023, the outbreak had spread to marine mammals including the threatened Marine Otter *Lontra felina*[1], cetacea[91], and South American Sea Lions, which also experienced a mass die-off of many 1,000s of animals[32,92,93].

The epizootic situation in South America can be considered highly dynamic with further spread expected. In response, under the WOAH FAO Global Framework for the Progressive Control of Transboundary Animal Disease, a Standing Group of Experts on Avian Influenza for the Americas has been established[94].

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71 Sidik (2023). https://www.audubon.org/magazine/spring-2023/the-bird-flu-blazes-amping-concerns-wildlife-and
72 Nemeth *et al.* (2023). https://doi.org/10.1038/s41598-023-27446-1
73 https://montreal.ctvnews.ca/more-than-1-000-seabird-carcasses-found-on-shores-of-st-lawrence-river-1.5928308
74 https://www.journaldequebec.com/2023/02/18/iles-de-la-madeleine-la-grippe-aviaire-a-decime-la-moitie-des-fous-de-bassan
75 https://www.michiganradio.org/environment-climate-change/2022-06-29/bird-flu-has-killed-nearly-1-500-threatened-caspian-terns-on-lake-michigan-islands
76 https://edition.cnn.com/2023/01/17/us/hpai-colorado-wild-bird-mortality/index.html
77 https://www.unmc.edu/healthsecurity/transmission/2023/04/11/at-least-3-california-condors-die-from-bird-flu-in-arizona/
78 Kozlov (2023). https://www.nature.com/articles/d41586-023-01760-0
79 Puryear *et al.* (2023). https://wwwnc.cdc.gov/eid/article/29/4/22-1538_article
80 NOAA (2022). https://www.fisheries.noaa.gov/feature-story/recent-increase-seal-deaths-maine-linked-avian-flu
81 WOAH (2023a). https://www.woah.org/en/controlling-the-surge-of-avian-influenza-cases-in-central-and-south-america/
82 https://wahis.woah.org/#/in-review/4908
83 https://wahis.woah.org/#/in-review/4901
84 https://wahis.woah.org/#/in-review/5057
85 Azat *et al.* (202X preprint). https://www.biorxiv.org/content/10.1101/2023.04.24.538139v1
86 https://wahis.woah.org/#/in-review/4869?reportId=159784&fromPage=event-dashboard-url
87 https://wahis.woah.org/#/in-review/4732?reportId=158014&fromPage=event-dashboard-url
88 https://wahis.woah.org/#/in-review/4900?reportId=159331&fromPage=event-dashboard-url
89 https://www.gub.uy/ministerio-ambiente/comunicacion/noticias/comunicado-presencia-gripe-aviar-animales
90 https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential/bird-species-affected-by-h5nx-hpai/en
91 Sernapesca (2023). http://www.sernapesca.cl/noticias/sernapesca-informa-que-dos-delfines-chilenos-dieron-positivo-gripe-aviar
92 Leguia *et al.* (2023). https://doi.org/10.1101/2023.03.03.531008
93 Sernanp (2023). https://www.gob.pe/institucion/sernanp/noticias/719899-sernanp-reporta-lobos-marinos-afectados-por-gripe-aviar-y-continua-con-plan-de-vigilancia-y-monitoreo-en-areas-naturales-protegidas
94 WOAH (2022b). https://rr-americas.woah.org/wp-content/uploads/2022/12/esp-eng-recommend-1-sge-ai-gf-tads-13-dec-2022.pdf

Figure 5. H5N1 is capable of infecting a wide range of scavenging and predatory mammals, including this South American Sea Lion, a victim of a large outbreak affecting the Peruvian and Chilean coast. As the disease spreads in South America, the range of species affected is increasing. Image credits: ©Carla Salazar, EPIFAVET, Universidad de Chile.

Oceania and Antarctica

At time of writing, H5N1 HPAI in wild birds has not been reported in these regions.

1.3 Future prospects

This 'fitter', better adapted and relatively stable virus can be expected to continue to both circulate and spread further in wild birds. As migratory birds return to breeding sites, it is likely that re-infections will occur in addition to spread into currently unaffected areas of conservation importance. Oceanic islands which are globally important for breeding seabirds, including albatrosses and petrels, can be considered to be at risk of introduction of HPAI viruses most likely from infected wild birds[16,95].

The extent to which surviving exposure to HPAIVs will confer immunity from future infection is not clear although some species-dependent immunity would be expected[20,96]. The role of exposure to both low pathogenic and less virulent high pathogenicity viruses may be advantageous too in terms of increasing likelihood of survival[96,97]. However, re-assortment and genetic drift of the current virus may well in effect break through any current immunity. Moreover, the range of species and situations involved in this current epizootic and the recent relationship between hosts and this 'fitter' virus suggest that a range of responses and outcomes is likely.

It is difficult to predict the longer-term ecological impacts of HPAI in wild birds and other wildlife. Some species, by nature of their life histories, are better adapted to respond to mass mortality in stochastic events. Where there are density dependent effects on breeding grounds, one might predict good breeding seasons following large-scale losses of adults[21] in the absence of other perturbing events. For other species dependent on high adult survival and with low productivity, and those many species additionally under pressures from a range of other anthropogenic threats, this disease represents a significant risk to population status.

Poultry production has changed significantly in recent

95 Uhart *et al.* (2022). https://www.acap.aq/resources/acap-conservation-guidelines/4084-guidelines-for-working-with-albatrosses-and-petrels-during-h5n1-avian-influenza-outbreak/file
96 Caliendo *et al.* (2022b). https://journals.asm.org/doi/10.1128/jvi.01233-22
97 Latorre-Margalef *et al.* (2017). https://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1006419

Figure 6. With H5N1 HPAI now capable of spreading in wild seabirds, remote oceanic islands, such as where these Laysan Albatross *Phoebastria immutabilis* breed, can no longer be considered safe from this virus which originated in poultry. There is growing concern about the possible impact of a highly pathogenic virus on such vulnerable populations as they are both already under significant pressures and rely on high annual adult survival. Image credit: ©Canva.com

decades along with increases in high-risk practices such as grazing of domestic ducks in natural wetlands. Further evolution and spread of avian influenza viruses can be expected in these situations (see Section 2.3.1.13).

Prior to 2003 when the original goose/Guangdong/96 virus (a 'poultry virus') spread to wild birds, outbreaks of HPAI in wild birds were highly unusual. Following that, and the significant spillover event at Lake Qinghai in China in 2005, wild birds have died sporadically or in significant numbers with frequent spillback to poultry. Considering the evolution of this virus over the last 20 years, with its re-assortment and genetic drift, until recently, viral persistence and maintenance in wild birds has been faltering. This has now changed.

The current epizootic suggests that a new phase has been entered. What is clear is that HPAI in wild birds must now be seen as not just a threat to poultry production, livelihoods and economies but also as a significant threat to wildlife. The international community, governments and their agencies as well as the NGO sector must now tackle it as such recognising the resourcing that this entails.

As pressures on biodiversity mount, and noting calls for reassessment of the poultry sector[98] (see Section 2.3.1.13 on Reforms to poultry production systems) this One Health issue requires both commitments to addressing broader drivers of population declines as well as cross-sectoral working and responses to ensure conservation obligations are met and health of people, livestock and wildlife is protected.

98 Kuiken and Cromie (2022). https://www.science.org/doi/10.1126/science.adf0956

2. Guidance on responses and further information

2.1 Overarching recommendations for countries affected and/or at risk

There is no benefit to be gained in attempting to control HPAI through culling wild birds or habitat destruction. Spraying of birds or the environment with disinfectant is considered potentially counter-productive, harmful to the environment and not effective from a disease control perspective[99].

Effective prevention and management of HPAI outbreaks requires a One Health approach to ensure appropriate cross-sectoral attention to human, animal and environmental health and coordination among agencies. Maintaining intensified surveillance and biosecurity measures, along with awareness raising by local authorities, is of utmost importance in high-risk areas and at times of high risk[15].

Poultry: Responses to HPAI in poultry must follow WOAH international standards, guidelines and recommendations on notifications, surveillance, diagnosis, trade and control measures[100] and official national regulations. Biosecurity should include significant efforts to prevent spread of infection from infected poultry holdings to wild birds. As a minimum, improved standards of hygiene and a reduction of the density of commercial poultry farms is recommended. This is primarily important in densely populated poultry areas and areas close to wetlands and other ecosystems with abundant wildlife. Long term, a reorganisation of poultry production systems susceptible to avian influenza exposure will minimise the risk of virus introduction and further spread. See Section 2.3.1.13.

Wild birds and other animals: All those with responsibilities for animal health are reminded of advice of FAO and WOAH, and international obligations under CMS, the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) and the Ramsar Convention on Wetlands (see Section 2.2), to ensure that there is no consideration of killing of wild birds, spraying toxic products or negatively affecting wetlands and other habitats as disease control measures. For poultry disease control, focussing attention on wild birds, to the exclusion of other potential routes of transmission, can misdirect critical resources away from effective disease control and result in continued spread among poultry populations and economic losses to farmers and national income. Importantly it can also result in negative conservation outcomes and loss of biodiversity with resultant negative impacts on human and domestic animal health.

High levels of protection of wetland habitats has been found to provide lower HPAI risk which is most likely related to separation of poultry operations from within wild areas and 'attracting' wild birds from human-dominated landscapes to more natural habitats[101].

Captive wild birds: There is no justification for any pre-emptive culling of zoological collections. In addition to strict biosecurity (ramped up at times of higher risk), control measures for captive wild birds should consider vaccination where appropriate[102,103]. In places where virus is detected, control should be based on strict movement control, isolation and, only when necessary, limited culling of affected birds.

2.2 Key government obligations and recommendations in response to the current crisis

In addition to the above existing overarching obligations and recommendations, the current wild bird HPAI crisis has highlighted the importance of the following key recommendations for governments and their agencies[104]:

1. **HPAI responsibilities of governmental environment ministries:** The importance of HPAI in terms of threats to biodiversity means that environment ministries, and associated government agencies, must take responsibility and be fully engaged in planning and responding to the disease with the goal of minimising risks and losses to wildlife. Mechanisms for effective cross-governmental department working will bring advantages for all sectors affected by HPAI.

2. **Prioritising development of integrated wild bird HPAI mitigation plans:** One of the main lessons learned from dealing with outbreaks in wild birds has been the complexities in government inter-departmental and cross-sectoral working, involving many stakeholder groups, which had to

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99 https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential/recommendations/en
100 https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=chapitre_avian_influenza_viruses.htm
101 Wu *et al.* (2020). https://link.springer.com/article/10.1007/s13280-019-01238-2
102 Vergara-Alert *et al.* (2011). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3122527/
103 Lecu *et al.* (2009). https://pubmed.ncbi.nlm.nih.gov/20063820/
104 These issues were developed within an HPAI side event at AEWA 8th Meeting of the Parties in September 2022.

be developed within the emergency situation. If lacking, governments should prioritise development of integrated multi-agency wild bird AI mitigation strategies and contingency plans. As One Health approaches, these should be undertaken in collaboration with conservation and animal and human health sectors (and potentially others e.g. disaster management, communication and information management), with clear guidelines for those managing wildlife settings. Regular review (especially where gaps have been identified during emergency responses) and testing of plans is encouraged.

Two types of plan are required:

a. A proactive broader **risk mitigation plan** which aims primarily to reduce risks to wild birds but also those to poultry and people, plus surveillance and monitoring the impact of HPAI. This plan should be implemented immediately given the near global occurrence of disease in wildlife.

b. A reactive **emergency response** plan for dealing with outbreaks when they occur which aims to minimise losses to wild birds and other animals, reduce public health risks and gather important data to aid epidemiological understanding.

Further details on planning are provided in Section 2.3.1 but overall, both types of plan should contain clear details of roles and responsibility, and communication structures which should help overcome delays and unnecessary losses of birds. Recognising that those working with wildlife and the public may be exposed to HPAI viruses in outbreak situations, human health guidance should be included in the plans.

Establishment of a multidisciplinary advisory panel of experts, including those with ornithological and other wildlife experience, is valuable and can assist in this planning and other aspects of disease response (see Section 3.1.2 of the Ramsar Wetland Disease Manual[105]).

3. **Other conservation measures:** Recognising the impacts that HPAI is likely to be having on wild bird populations in addition to existing pressures, additional focus is required on wider conservation actions for those species affected by HPAI. This might entail ramping up existing or implementing new conservation activities or specifically undertaking conservation activities to reduce HPAI risks e.g. creation or protection of new breeding sites as an HPAI mitigation measure. Reducing pressures on wild birds will improve their resilience to disease and other stochastic events.

4. **Government resourcing:** Government involvement is required both in creating and facilitating the work of the aforementioned planning, but also in the resourcing of the responses, surveillance and research, much of which is currently being borne by non-governmental sectors or is lacking altogether.

5. **Obligations under Multilateral Environmental Agreements:** Parties to CMS, AEWA, the Ramsar Convention on Wetlands and the Convention on Biological Diversity (CBD) are reminded of their obligations from previous Resolutions (see end of this section).

Parties to AEWA are reminded here of recent timely commitments made at the 8th Meeting of the Parties in September 2022 (operative paragraphs in italics):

Resolution 8.2: Adoption of Amendments to the AEWA Annexes[106]

"Noting with concern significant recent mortality from highly pathogenic avian influenza (HPAI) H5N1 of several AEWA-listed migratory waterbirds including cranes, skuas, geese, terns and other seabirds, which may have population-level impacts…"

> *"Urges Parties and stakeholders to enhance monitoring and assessment of those species affected by recent HPAI H5N1 outbreaks and to report these data to allow population assessments for MOP 9 to be made on the basis of most recent information on status."*

Resolution 8.7: Improving the Base of Knowledge for Effective Waterbird Conservation and Management[107]

"Aware of the crucial importance of contemporary information on the sizes and trends of waterbird and coastal seabird populations at site, national and flyway scales, to inform risk assessments and response strategies for highly pathogenic avian influenza and other emerging waterbird and coastal seabird diseases,"

> *"Urges Parties and stakeholders to increase the intensity of population monitoring generally, and especially for species being impacted by highly*

105 Cromie *et al.* (2012). https://www.wwt.org.uk/uploads/documents/Ramsar_Wetland_Disease_Manual.pdf
106 AEWA (2022a). https://www.unep-aewa.org/en/document/adoption-amendments-aewa-annexes-6
107 AEWA (2022b). https://www.unep-aewa.org/en/document/improving-base-knowledge-effective-waterbird-conservation-and-management-0

pathogenic avian influenza and other diseases, as the basis for potentially implementing emergency measures envisaged by paragraph 2.3 of the Action Plan which requires that "Parties shall … develop and implement emergency measures for populations listed in Table 1, when exceptionally unfavourable or endangering conditions occur anywhere in the Agreement Area."

Resolution 8.15: Addressing causes of waterbird mortality[108]

"Encourages Parties to co-ordinate across government and work with stakeholders to establish HPAI contingency plans nationally and at sites of significant importance to waterbirds, and to implement these as appropriate, especially giving priority to surveillance and rapid testing for HPAI of dead birds so as to inform site-related management and biosecurity measures as needed;"

Other CMS, Ramsar Convention on Wetlands, AEWA and CBD Resolutions with their obligations are provided here:

- Ramsar Resolution X.21: Guidance on responding to the continued spread of highly pathogenic avian influenza
- Ramsar Resolution IX.23: Highly pathogenic avian influenza and its consequences for wetland and waterbird conservation and wise use
- CMS Resolution 12.06 Wildlife disease and migratory species
- AEWA Resolution 4.15 Responding to the spread of highly pathogenic avian influenza H5N1
- Ramsar Resolution XI.12: Wetlands and health: taking an ecosystem approach
- Convention on Biological Diversity Kunming-Montreal Global Biodiversity Framework – Target 11 which elaborates ecosystem approaches for health and disease risk reduction.

2.3 Guidance in relation to minimising risks to wild birds

Substantial guidance, both written prior to the current epizootic and in response to it, exists (see Sections 2.4.2 and 2.4.3) and should be applied. This statement synthesises advice from a range of sources in addition to the main intergovernmental health and conservation bodies to specifically help those involved in conservation and management of wildlife, in marine and terrestrial environments, in both natural and agricultural settings used by birds.

2.3.1 Contingency planning

In addition to government responsibilities set out in Section 2.1 and 2.2, those with responsibilities for wildlife whether governmental or otherwise, including site managers or other relevant stakeholders[e.g.109], should develop and test their two types of plan - risk mitigation plan (proactive) and emergency response plan (reactive) (see Section 2.2 for aims).

All contingency and response planning, should be undertaken in 'peacetime'[105,110] and should include activities and actions to be taken or suspended according to different levels of risk (See Fig. 3.7 p69 of Cromie *et al.* (2012)[105] as an example).

Mitigation measures, which can be flexible, should include for example, changes in management[111], zoning of land uses to minimise contact with domestic animals and/or people, and suspension of sources of potential disturbance such as human recreational activities (e.g. access to trail footpaths, sailing and hunting).

For effective and timely responses, the plans require and/or can benefit from pre-determined processes and structures to allow efficient cross-sectoral working and communication with relevant stakeholders. The plan should clarify the roles and responsibilities of relevant stakeholders, and how that is coordinated, and stakeholders should be familiar with the plan to allow rapid response. Contact details of the relevant stakeholders and the areas of their responsibilities should be included within plans. 'Action cards' which are a prescriptive set of actions for a particular stakeholder to undertake in an emergency situation are a useful and practical means to reduce delays and confusion, can also be included. Plans can also be practised under simulation exercises to test practical application and strengthen readiness.
As mentioned above, those managing important natural areas are in key positions to both help reduce impacts of HPAI and improve our collective understanding of the epidemiology of the disease in wild birds, and are encouraged to gather good data to help support that goal – as described later in this guidance (see Section 2.3.1.6).

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108 AEWA (2022c).https://www.unep-aewa.org/en/document/addressing-causes-waterbird-mortality-0
109 IAATO (2002). https://iaato.org/wp-content/uploads/2022/11/IAATO-2022-23-Biosecurity-Protocols-Regarding-Avian-Influenza-NOV162022.pdf
110 FAO (2021). https://www.fao.org/3/cb3833en/cb3833en.pdf
111 This may include changes where species, such as geese, are under active management.

Figure 7. The increase in the practice of grazing domestic ducks in natural wetlands has created interfaces where virus exchange and re-assortment can occur easily. This creates risks to poultry and people as well as wildlife and from a health perspective is advised against. Image credit: ©Rob McInnes

Plans should, as a minimum, contain the following principles and practices set out below in Sections 2.3.1.1 – 2.3.1.13.

See Section 2.4.2 for examples of contingency plans and recommendations produced by a range of organisations and bodies.

See Section Section 3.1.4 p67-71 of the Ramsar Wetland Disease Manual[105] for information on contingency planning.

Chapter 2 of the Ramsar Handbook No. 4[112] (English, French and Spanish) provides guidelines for reducing avian influenza risks at Ramsar sites and other wetlands of importance for waterbirds including zoning of activities.

FAO Manual No. 25[110] (available in multiple languages) provides the principles for contingency plans which can be adapted to suit natural settings.

2.3.1.1 Integration of disease planning into site management plans

Risks can be substantially reduced through site and land planning that integrates a One Health perspective, considering and minimising disease risk by avoiding the types of conditions that facilitate risk in and around wetlands and other areas with high wild bird presence or ensuring adequate biosecurity.

See Ramsar Wetland Disease Manual[105] Section 3.1.3 p63-66 plus Section 3.1.4 p67-71 on Contingency Planning which explain the value of integrating disease management into site management plans to reduce risks in the long term.

2.3.1.2 Assessing risks of introduction of infection

As part of assessing risks, transmission routes between wild birds and wild bird sites should be considered.
Virus can be transmitted:

- Directly between wild birds in close proximity, where the role of dead or sick birds is likely to be important in terms of infectivity,
- Via the environment in both substrate and water bodies,
- Over distances via wild bird movements (including between breeding colonies as colonial nesting seabirds may travel between sites)[16],
- Via poultry (or other bird species) and their carcasses, excretions or secretions being introduced to natural sites e.g. due to poultry holdings sited in natural

112 Ramsar (2010). https://www.ramsar.org/sites/default/files/documents/pdf/lib/hbk4-04.pdf

areas, run-off from poultry holdings, use of poultry manure as fertiliser or fish food, use of poultry cuts or viscera used as fishing bait, use of live decoy birds to attract wild birds, or grazing of domestic ducks in wetlands, and
- Via human activities bringing infection into a site from either infected poultry sites/domestic settings or from other infected wild areas via fomites such as footwear, vehicles and equipment[12].

Many questions remain on the relative importance of these different pathways which will differ between settings. A local assessment by a group of experts including those familiar with the site is advised.

2.3.1.3 Assessing risks to populations and their vulnerability to negative impacts

Analysis can be made of the vulnerability of populations to HPAI and its impacts[16,39], in terms of:

- Species - accepting there are many knowledge gaps on species susceptibility. Re-assortment and genetic drift of the virus over time means that this can change,
- Immunological status of the population - although there are significant knowledge gaps it is likely that infected and recovered individuals will contribute to some resistance within the population,
- Likelihood of exposure - as a product of proximity and connectivity with sources of infection,
- Frequency of exposure - for example as a product of contact networks such as within a breeding colony versus remote nesters,
- Likelihood of negative impacts from a population perspective based on their species and life history characteristics such as breeding strategy. Those typically long lived birds with delayed sexual maturity, low reproductive rate and dependence on high adult annual survival (as found in many species of seabirds) would be expected to have slower recover rates following an outbreak,
- Other population vulnerabilities.

This analysis can help inform and guide contingency and emergency response planning. Mitigation measures for vulnerable populations may include actions such as closing/reducing access to sites, reduction of disturbance, provision of additional protected areas, or even consideration of vaccination for key localised populations where this is practically and financially feasible.

2.3.1.4 Biosecurity in natural settings

Being aware of the routes by which virus can enter a wild bird site (see Section 2.3.1.2), biosecurity protocols should be created as part of both broader risk mitigation plans and site-specific emergency response plans. These protocols can be adapted to different levels of biosecurity depending on the level of risk to the site (e.g. proximity or connectivity to other outbreaks), type and frequency of activity being undertaken, proximity to birds and vulnerability of the populations at risk (See Section 2.3.1.3).

At times of higher risk, i.e. prior to, or following, an outbreak of HPAI at a site, biosecurity should be increased to reduce risk of spread into, or out of, a site. This should involve deployment of the emergency response plan and can involve the following:

1. Reducing non-essential human activity in, into and out of a site (including consideration of suspension of visitors to wildlife sites),
2. Disinfection of footwear or tyres etc. of those entering and exiting the site,
3. Keeping access restricted to specific controlled routes with appropriate cleansing and disinfection points,
4. Reducing other forms of disturbance that may encourage wild birds to fly to other areas (see ‘emergency response plan’ above),
5. Considering suspension of hunting in sensitive areas to reduce disturbance. This can reduce possibilities of spreading infection between natural areas and into the domestic setting by moving infected hunted birds. This additionally reduces risks to health of both humans and hunting dogs (recognising zoonotic potential and canid susceptibility to infection). Live decoy birds should not be used at times of higher risk and at any other times must always be kept in biosecure environments away from poultry.
6. Increased biosecurity at local poultry holdings – importantly excluding/minimising contact with wild birds including ‘bridge species’ which risk spread to and from the poultry, and ensuring appropriate poultry carcass management to prevent scavengers and carnivores carrying infection to wild areas
7. Preventing the use of poultry faeces or other untreated poultry products as fish feed or fishing bait in open aquaculture or other settings,
8. Preventing domestic duck grazing in natural wetlands

Also see NatureScot guidelines and ACAP guidelines[113] for HPAI in seabird breeding colonies[95], the principles of which are relevant to other situations of high bird density.

See FAO Manual No. 165 (Section 1 in English, French and Arabic) and the WOAH Terrestrial Code chapter

113 NatureScot (2023b). https://www.nature.scot/doc/highly-pathogenic-avian-influenza-bird-flu-guidance-site-managers

6.5[115] for the principles of biosecurity in the poultry context and the Ramsar Wetland Disease Manual[105] for this in the context of wetlands (Section 3.2.4 p83-86).

2.3.1.5 Early detection of infection

Vigilance and close monitoring of sites is required to identify a problem at the earliest opportunity to allow implementation of emergency response plans. Action should be taken (such as training) to raise awareness of site managers, site users, site monitors (such as as those involved in the International Waterbird Census) and local inhabitants of increases in level of risk as well as importance of vigilance, biosecurity and the reporting mechanisms for sick or dead birds..

Citizen scientists and NGO networks can play a crucial role in early warning data gathering and collation. Provision of a means of reporting of sick or dead birds should be introduced and maintained, e.g. telephone hotlines, phone apps or other means by which to share photographs and information such as citizen science platforms. Collaborative responses between these stakeholders and land management, conservation and health bodies are to be encouraged and should be built into emergency response plans.

See Section 2.3.2.12 and Ramsar Wetland Disease Manual[105] Communication and Public Awareness Section 3.5.1 p150-156 and FAO Manual No. 25[110] on emergency management practices (available in multiple languages).

2.3.1.6 Surveillance and data gathering in the face of an outbreak

Both targeted (active) and scanning (passive) surveillance is encouraged (see Section 2.3.1.9). Sick or dead birds should be reported to local authorities (veterinary services, public health officials, community leaders, etc.). See Section 2.3.1.5 for the value of public and NGO reporting networks. If hunting is being undertaken at the site, collaboration with local hunters for testing of their birds can provide useful samples for surveillance.

Samples or whole carcasses should be tested for avian influenza viruses and information, including on viral genomics, should be shared in a timely manner recognising that implementing response plans relies on quick turnaround of results. Great efforts should be made to quantify and contextualise mortality to help improve understanding of the epidemiology of the disease and impacts[116].

In the face of an outbreak, as well as testing of sick or dead birds and recording any rings or other tags, additional data such as the checklist suggested by the Ramsar Wetland Disease Manual[105] Section 3.3.5 p 106-110, or Annex 1 of FAO Manual No. 4[117] (available in multiple languages) should be gathered to assist in understanding of the epidemiology of the disease in wild birds.

Recording systems which gather epidemiological information including with GPS coordinates are available and improving (capitalising on existing apps used for reporting of bird records) although there is as yet no single formal reporting system. Moreover, rapid information about estimates of dead birds are more often to be found in popular articles or social media rather than formal reporting systems. Further developments in the reporting of wildlife surveillance are therefore required as a matter of urgency.

When officially reporting wild bird cases, countries are encouraged to submit full epidemiological data wherever possible to the WOAH WAHIS system[118].

For guidance see Article 10.4.29 of the WOAH Terrestrial Code chapter on surveillance of wild bird populations[119], FAO Manuals No. 4. Wild Bird Highly Pathogenic Avian Influenza Surveillance[117] (available in multiple languages) and No. 5. On Wild Birds and Avian Influenza research and sampling techniques[120] (available in multiple languages), and Ramsar Wetland Disease Manual[105] Surveillance and Monitoring Section 3.3.1 p89-96.

2.3.1.7 Disinfection and sanitation

Disinfectants should not be introduced to wetland sites or other sensitive areas. Disinfectants may be used at key localised access points for personnel and possible fomites, such as footwear, tyres, and equipment as long as chemicals do not enter watercourses. Surfaces should be cleaned with soap/detergent and water to remove dirt, and then sprayed with or soaked in disinfectant (e.g. Safe4, 1% Virkon, 10% bleach, 60-90% ethanol, 60-90% isopropyl alcohol[121]).

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114 FAO (2008). https://www.fao.org/3/i0359e/i0359e.pdf
115 https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=chapitre_biosecu_poul_production.htm
116 Kleyheeg *et al.* (2017) DOI: 10.3201/eid2312.171086
117 FAO (2006). https://www.fao.org/documents/card/en/c/de4959ee-b8c2-58c7-b180-907d9d87761d/
118 https://wahis.woah.org/#/home
119 https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=chapitre_avian_influenza_viruses.htm
120 FAO (2007). https://www.fao.org/documents/card/en/c/151ffd39-d538-544a-a4f2-1c1d9754bcf4
121 WOAH and IUCN (2022). https://www.woah.org/app/uploads/2022/08/avian-influenza-and-wildlife-risk-management-for-people-working-with-wild-birds.pdf

Spraying of birds or the environment with disinfectant, such as sodium hypochlorite or bleach, is considered counter-productive, harmful to the environment and not effective from a disease control perspective. It is possible that there may be some exceptions for localised areas where birds congregate but evidence is currently lacking. The potential environmental degradation consequences reinforces the need for ongoing involvement of environment authorities to assess scientific evidence and weigh up possible trade-offs.

See Ramsar Wetland Disease Manual[105] *Disinfection and Sanitation Section 3.4.1 p114-116.*

2.3.1.8 Carcasses of wild birds: decisions on removal and practicalities

Carcasses provide a source of infection with high viral load for birds in close proximity as well as for scavenging birds and mammals as well as people. The evidence on the benefits of removing carcasses from outbreaks is still limited[122] but benefits have been reported in some settings[12] and is therefore to be encouraged considering the following:

Attempting to remove carcasses for disposal has the potential for creating problems caused by:

1. Disturbance and displacement of birds, including problems in breeding colonies of scaring parents from nests and allowing predation of chicks. In settings where birds are more habituated to human presence and activities, removing carcasses may not cause too much additional disturbance,
2. Potential for spread of infection by the displaced birds, those personnel and vehicles involved in disease control measures, and the carcasses if they are not properly disposed of,
3. Human health risks associated with carcass handling and the requirement for appropriate personal protective equipment (PPE) and training which need to be factored in to any decision making and risks mitigated as necessary,
4. Resourcing - although carcass removal may bring benefits from a disease control perspective it has the potential to divert limited resources from other priority actions.

With the above considerations in mind, a site-specific assessment of the benefits and dis-benefits of carcass removal, plus information on the practicalities, should be built into the emergency response plan so that actions can be taken with urgency.

The following should be taken into account when considering planning for carcass removal:

1. Setting: including aspects of the contact networks between birds e.g. there is a likely greater benefit of removal of carcasses from high density situations, yet the physical geography of the area may prove too complex to clear e.g. inaccessible cliffs and steep rocky shorelines,
2. Benefit versus the costs of disturbance and displacement of birds,
3. Scale of mortality,
4. Likelihood of high exposure of carcasses to other wild birds or mammals i.e. where there is a clear risk to scavengers and additional risk of scavengers spreading infection there is a likely greater benefit of removal of carcasses,
5. Easy access to carcasses with minimal disturbance,
6. Possibility of successful disposal,
7. Minimal risks to biosecurity during disposal operations,
8. Minimal risks to personnel during disposal operations,
9. Public health reasons i.e. likelihood of the public (and e.g. dogs and cats) encountering carcasses,
10. Adequate resources.

How to collect and dispose of wild bird carcasses

If decisions have been made to collect carcasses this should be done with the minimum number of people required and in a manner least likely to cause disturbance e.g. by clearing high tide carcasses at low water, recognising the sensitivity of the species present. Subdued colour of PPE coveralls can help to minimise disturbance.

Strict attention should be paid to PPE to reduce risks to those involved in the collection and disposal operations (see Section 2.3.1.11). Training of personnel will be needed. If collection involves water when wearing coveralls, a life jacket is recommended to avoid drowning risks associated with lower parts of coveralls remaining inflated in the water.

Cleansing and disinfection (C&D) of personnel and equipment is required so siting of key C&D points is required with appropriate equipment and disinfectant disposal capability[114,119].

Good data should be collected on species, numbers and ages of birds affected and reported appropriately (see Section 2.3.1.6).

For disposal of carcasses, primary consideration should be given to official means of disposal by local animal health authorities. Options include:

122 Furness *et al.* (2023). https://www.mdpi.com/2076-0817/12/4/584

1. Burying – recognising problems with suitable sites in wetland areas, and need for avoidance of affecting water courses, and need to ensure scavengers cannot unearth carcasses,
2. Incineration,
3. Specialist composting.

See Ramsar Wetland Disease Manual[105] Collection and Disposal of Carcasses Section 3.4.2 p117-120, or WOAH and IUCN recommendations[119] for working with wild birds or FAO guidance for carcass management guidelines[123] (available in multiple languages).

2.3.1.9 Monitoring and surveillance of wild birds and mammals

- **General approach**

Surveillance provides the foundations of epidemiological understanding and facilitates risk assessment[100,124].

It is recommended that national and regional approaches to AI surveillance should include wildlife health and biodiversity conservation, in addition to early warning for poultry and human health, in the goals and methods. This reflects a One Health approach and brings benefits to all sectors[125].

Given the connectivity between wild bird sites due to wild birds movements (local or migratory), flyway-based AI surveillance is recommended.

Current global reporting surveillance systems for wildlife are poor for provision of quality data on mortality and morbidity with contextual information. See Section 2.3.1.6 for further information on reporting system needs.

Full characterisation of viruses with ability to determine viral genomics has the potential to significantly improve our understanding of HPAI in wild populations[13,43,126,127] and is encouraged wherever possible[122,123,128].

- **Site-based surveillance for informing emergency response planning: aiming to minimise losses of wildlife and understand epidemiology of outbreaks**

See Section 2.3.1.6 on surveillance for early detection of infection and outbreak situations.

- **Surveillance for understanding risks to poultry and wild birds, epidemiology of disease in wild birds, and measuring impacts of HPAI**

The principles and practices in Section 2.3.1.6 also apply to proactive broader longer term surveillance. Traditionally surveillance for HPAI viruses in wild birds has been designed to inform risks to poultry. Given the impacts of HPAI on wildlife, surveillance should be designed to also inform risks to conservation and to measure impacts (as above).

Where national wildlife health surveillance networks are lacking, these should be established[129] and work best with close cooperation between the land managers, conservation and health sectors.

Surveillance can include the above site-based surveillance (Section 2.3.1.6), as well as targeted and scanning surveillance. Samples for surveillance may include carcasses or swabs from living birds, environmental samples and samples taken during hunting activities (heads of birds not usually of use to hunters may be valuable for brain sampling). Both virus detection and serological studies (to understand previous exposure and potential immunity) are encouraged.

Wherever possible full viral genomic characterisation should be undertaken as this allows far greater epidemiological understanding, mapping of hotspots and elucidation of spread[13].

As it stands, there are regulatory processes which inhibit easy international movement of wildlife samples for research and surveillance – there is clear need to alleviate this issue to maximise our understanding of HPAI epidemiology in wildlife.

For guidance see Article 10.4.29 of the WOAH Terrestrial Code chapter on surveillance of wild bird populations[119], FAO Manuals No. 4. Wild Bird Highly Pathogenic Avian Influenza Surveillance[117] (available in multiple languages) and No. 5. On Wild Birds and Avian Influenza research and sampling techniques[120] (available in multiple languages), and Ramsar Wetland Disease Manual[105] Surveillance and Monitoring Section 3.3.1 p89-96.

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123 FAO (2020). https://www.fao.org/documents/card/en?details=CB2464EN%2f
124 https://www.offlu.org/wp-content/uploads/2023/03/Avian-OFFLU-VCM-F23-OFFLU-final.pdf
125 WOAH General Assembly Resolution 28 (2023). https://www.woah.org/app/uploads/2023/06/a-resos-2023-all.pdf
126 Byrne *et al.* (2023). https://www.biorxiv.org/content/10.1101/2022.12.03.518823v1
127 Okuya *et al.* (2022). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9239871/
128 Machalaba *et al.* (2015). https://wwwnc.cdc.gov/eid/article/21/4/14-1415_article
129 Lawson *et al.* (2021). https://www.mdpi.com/2076-2615/11/9/2543

Figure 8. As this outbreak of HPAI in pelicans in Senegal shows, there are challenges in carcass removal but this can be undertaken safely if appropriate PPE is worn and carcasses are disposed of appropriately. Planning for such operations should be built into emergency response plans and developed in 'peacetime'. Image credits: FAO

2.3.1.10 Measuring impacts of HPAI in wildlife populations

Despite 20 years since HPAI originally spilled into wild birds, impacts on wild populations remain poorly understood due to poor quality of data surrounding outbreaks. Impacts of HPAI can only be determined by good quality data on mortality and morbidity gathered during and following outbreaks (see Section 2.3.1.6) integrated with good population monitoring data (based for example on programmes such as the International Waterbird Census).

Where surveillance and monitoring efforts are well co-ordinated and integrated it is possible to quantify mortality such as:

- the study undertaken in the Netherlands during the 2016/17 outbreak of H5N8 HPAI which suggested 25% of local Tufted Ducks *Aythya fuligula* died along with 11-39% of wintering Peregrine Falcons *Falco peregrinus*[116],
- long term monitoring data of some UK seabird breeding colonies allowed estimations of impacts e.g. decline in breeding success of Northern Gannets by ~66% compared to the long-term average and reduction in adult survival of 42% than the preceding 10-year average[20].

Despite good investigation of some of the recent outbreaks, such studies are unusual but they should become the norm (see Section 2.2 for AEWA Party obligations). Immediate and longer terms impacts should be estimated based on life history traits (see Section 2.3.1.3) and wider contexts of other anthropogenic threats.

Research is needed to understand impacts and address key epidemiological knowledge gaps such as species susceptibility, role of exposure to low and high pathogenicity viruses in immune response and survival, as well as efficacy of different management responses. Hotpot mapping and better understanding of interfaces between wildlife and poultry settings is also needed to understand risks and impacts.

Strong collaboration between ornithological/ecological sectors and health sectors is required to address research, surveillance and population monitoring requirements to measure impacts of disease[39,113,130].

130 Wells *et al.* (2022). http://www.marineornithology.org/PDF/51_1/51_1_11-22.pdf

2.3.1.11 Human health considerations

Risks to human health mean that contingency and emergency outbreak plans should contain information and contact details about health protection agencies so that advice and decisions on practicalities relating to human health can be made quickly. To reiterate, planning in peacetime is of great value.

Despite the relatively low zoonotic potential of the current circulating HPAI viruses discussed in this statement, strict health and safety measures should be employed for those handling infected birds, mammals and materials. This should include use of PPE, including face coverings, and personnel should familiarise themselves with protocols for putting on and removing PPE and cleansing and disinfecting in a safe manner (see Sections 2.3.1.7 and 2.3.1.8). Regular and proper washing of hands and clothing and footwear is indicated and this should always be done after handling birds or other animals.

There should also be good understanding of the need to monitor personal health and personnel should be familiar with symptoms of potential infection which may develop up to two weeks following exposure. Medical attention should be sought immediately if any symptoms of fever are noted after contact with wild birds or other animals. Personnel should consider receiving seasonal human flu vaccination, not as protection against avian influenza viruses, but to reduce chances of co-infection and subsequent re-assortment of circulating human infection and HPAI viruses.

Additionally, advice should be sought from health protection agencies in consideration of pre- or post-exposure antiviral prophylaxis.

Where waterbird and terrestrial gamebird hunting is permitted, these measures are also relevant to hunters especially in or near regions of outbreaks.

See Chapter 12 of FAO Manual No. 4. Wild Bird Highly Pathogenic Avian Influenza Surveillance[117] (available in multiple languages).

2.3.1.12 Public communications and awareness

As seen from Sections 2.3.1.5, 2.3.1.6 and 2.3.1.8, the public can play a key role in both surveillance and possible spread of infection and may be both at risk and of value in outbreak situations.

Therefore establishing communication plans within the contingency plans to enable efficient and clear public communication is important and may involve multiple means depending on purpose. Examples of posters to use in the field to both warn the public about risks and utilise their eyes on the ground can be found here[131]. Note use of telephone helplines, official websites and QR codes to direct the public to further help and guidance. In other settings radio announcements or message alerts may be of value. Community animal health workers and other workforce at the subnational level may also be important conduits of information.

Where visitation to wildlife sites is a key part of activities, management of visitors will need to be built into contingency plans[113].

See Ramsar Wetland Disease Manual[105] Communication and Public Awareness Section 3.5.1 p150-156 which includes information on emergency communication and dealing with the media. Also see FAO Manual No. 25 Good Emergency Management Practice[110] (available in multiple languages).

2.3.1.13 Reform of poultry production systems

The spread of H5N1 HPAI from poultry settings into wild birds during the mid-2000s and the repeated spillover and spillback events which will have occurred since indicate the severity of the problem for biodiversity conservation, pandemic risk and wildlife becoming reservoirs for livestock disease. Poultry and their products remain a staple in terms of food security in low-income countries. However, the poultry sector has grown six-fold in recent decades[98]. Growth and intensification of the poultry sector has been associated with increase in HPAI pandemics[132] and there have been calls for reform of poultry production systems[133].

In high income settings, poultry and poultry products are often considered as relatively inexpensive protein sources when in effect full costs in terms of broader environmental pollution and disease risks are not being borne by the industry nor consumers. As a minimum, and placing calls for a shift in demand to one side[134], a reduction in density of production facilities is needed[133] along with factoring disease risk into land planning for poultry rearing activities which can help to anticipate and reduce the conditions that allow for the mixing of wild and domestic species. In all settings, moving poultry production from areas of high risks of wildlife contact (e.g. wetland areas) and into areas closer to consumption can bring additional

131 https://www.gov.uk/government/publications/avian-influenza-bird-flu-posters-for-land-managers
132 Dhingra *et al.* (2018). https://www.frontiersin.org/articles/10.3389/fvets.2018.00084/full
133 EFSA (2021). https://www.ecdc.europa.eu/sites/default/files/documents/AI-Report-XVIII_draft_published.pdf
134 Stel *et al.* (2022). https://link.springer.com/article/10.1007/s10393-022-01605-8

value chain benefits in terms of reduced transport costs for animals feeds and proximity to markets.

The increase in extremely high risk practices such as grazing of domestic ducks in wetlands[135] as well as wild bird farming needs addressing as they can maximum the potential for viral re-assortment and transfer between wild and domestic animals and onward transfer to other poultry sectors and humans.

There should be a clear recognition of the importance of the health of the wider environment and the interdependence of the health of all sectors within this context. Continued collaborative work of the Quadripartite partners (WHO, FAO, WOAH and UNEP) to this end is welcomed[125].

2.4 Resources

2.4.1 Key situation reports and overviews

1. Global avian influenza situation updates are provided regularly by FAO here with data on outbreaks provided by FAO EMPRES here.
2. The WOAH WAHIS interactive database of outbreaks can be found here, the WOAH WAHIS Portal is here and WOAH avian influenza situation reports are here.
3. The EFSA avian influenza overview December 2022-March 2023 can be found here and the June-September 2022 overview is here.
4. The EU Reference Laboratory Avian Flu Data Portal can be found here.
5. The WOAH/FAO Network of Expertise on Animal Influenza (OFFLU) avian influenza statement from March 2023 can be found here.
6. European Centre for Disease Prevention and Control periodic avian influenza updates are here.
7. WOAH information on the situation in Central and South America can be found here.
8. Pan American Health Organisation epidemiological update and guidance can be found here.
9. USDA avian influenza information is here with wild bird information here.
10. Canadian CFIA information can be found here.
11. OFFLU guide to FAO publications and guidance is here.
12. One Health High Level Expert Panel white paper on zoonotic spillover prevention is here.

2.4.2 Recent national or regional recommendations and guidance

1. WOAH, IUCN SSC and Wildlife Health Specialist Group AI and wildlife recommendations are here.
2. FAO overarching recommendations are here.
3. FAO WOAH GF-TADs Standing Group of Experts on Avian Influenza for the Americas Strategic Activities with recommendations is here.
4. WOAH World Assembly 2023 Resolution 28 on strategic challenges in the global control of HPAI is here and their Report of the Animal Health Forum on avian influenza, WOAH General Session May 2023 is here.
5. Common Wadden Sea Secretariat Management guidelines - Mitigation and data collection strategies for avian influenza in bird colonies in the Wadden Sea (Bregnballe *et al.* 2023) is here.
6. A UK government mitigation strategy for avian influenza in wild birds can be found here. The organisational and legal frameworks are national but the principles are relevant to all.
7. NatureScot Guidance for site managers is here.
8. Agreement on the Conservation of Albatrosses and Petrels (ACAP) Guidelines for working with albatrosses and petrels during the on-going high pathogenicity H5N1 avian influenza outbreak conservation guidelines are here.
9. The Risk of Avian Influenza in the Southern Ocean: A practical guide for operators interacting with wildlife (Dewar *et al.* 2022) is here.
10. International Association of Antarctica Tour Operators 2022-23 Biosecurity Protocols Regarding Avian Influenza is here.
11. Government of South Georgia & the South Sandwich Islands (2022) Biosecurity Handbook is here.
12. National Environmental Update for USAP Personnel in Response to the Highly Pathogenic Avian Influenza (HPAI H5N1) (which includes a video compilation of signs of HPAI in seabirds) is here.
13. Report on workshops on 'Highly pathogenic avian influenza in wild birds in the United Kingdom in 2022: impacts, planning for future outbreaks, and conservation and research priorities' is here.
14. Further information on surveillance from the USGS is here and the Implementation Plan for Avian Influenza Surveillance in Waterfowl in the United States is here.
15. USDA Guidance for zoos and captive wildlife facilities on protecting birds from highly pathogenic avian influenza is here.
16. OFFLU guide to FAO publications and guidance is here.

2.4.3 Other guidance

1. FAO Manual No. 25: Good Emergency Management Practice: The Essentials. A guide to preparing for animal health emergencies (2021). Available in multiple languages.

135 Cappelle *et al.* (2014). https://link.springer.com/article/10.1007/s10393-014-0914-2

2. FAO Manual No. 5. On Wild Birds and Avian Influenza. An introduction to applied field research and disease sampling techniques research and sampling techniques (2007). Available in multiple languages.
3. FAO Manual No. 4. Wild Bird Highly Pathogenic Avian Influenza Surveillance. Sample collection from healthy, sick and dead birds (2006). Available in multiple languages.
4. FAO Carcass management guidelines: Effective disposal of animal carcasses and contaminated materials on small to medium-sized farms (2020). Available in multiple languages. Succinct 'Focus On' version in English and French (2018).
5. FAO Manual No. 165: Biosecurity for Highly Pathogenic Avian Influenza (2008). Also available in French, Arabic.
6. FAO Manual No. 3: Preparing for Highly Pathogenic Avian Influenza (2009). Also available in French, Spanish, Arabic, Macedonian.
7. WOAH Terrestrial Code chapter on High Pathogenicity Avian influenza
8. WOAH Terrestrial Manual chapter on avian influenza
9. Ramsar Wetland Disease Manual Ramsar Technical Report No. 7 (2012).
10. Ramsar Handbook No. 4 on Avian Influenza and Wetlands (2010). Available in English, French and Spanish.
11. EFSA Avian influenza overview December 2022-March 2023.
12. IUCN/OIE Guidelines for Wildlife Disease Risk Analysis
13. IUCN/OIE Manual of Procedures for Wildlife Disease Risk Analysis.

2.5 Submission of further information

Submission of further guidance to the Task Force for practitioners, particularly in non-English languages, is encouraged (contact details below).

2.6 The Scientific Task Force on Avian Influenza and Wild Birds

The Convention on Migratory Species (CMS) and the Food and Agriculture Organization (FAO) co-convened the Scientific Task Force on Avian Influenza and Wild Birds in 2005. It works as a communication and coordination network and continues to review the role of wild birds in the epidemiology of AI and the impact of the disease on wild birds, promoting a balanced opinion based on currently available evidence. Task Force observers include the United Nations Environment Programme, World Health Organisation and World Organisation for Animal Health. Task Force members include FAO, CMS, and the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), BirdLife International, East Asian-Australasian Flyway Partnership (EAAFP), EcoHealth Alliance, International Council for Game and Wildlife Conservation (CIC), Ramsar Convention on Wetlands, Royal Veterinary College, Wetlands International, and Wildfowl & Wetlands Trust (WWT).

Contact: **cms.secretariat@cms.int**

Citation: CMS FAO Co-convened Scientific Task Force on Avian Influenza and Wild Birds (2023). Scientific Task Force on Avian Influenza and Wild Birds statement on H5N1 high pathogenicity avian influenza in wild birds - Unprecedented conservation impacts and urgent needs. Available at: https://www.cms.int/en/workinggroup/scientific-task-force-avian-influenza-and-wild-birds

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