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The surveillance programme for avian influenza (AI) in wild birds in Norway 2021

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Content

Summary

Highly pathogenic avian influenza (HPAI) virus was detected in samples from 40 out of 1091 wild birds examined in the surveillance programme for avian influenza in Norway in 2021. Active surveillance detected 48 cases of influenza A virus infection, of which two cases were HPAI of the subtype A(H5N1). Passive surveillance detected 50 cases of influenza A virus infection, of which 38 were verified as HPAI H5 subtype. Thirty-six of the HPAI detections from the passive surveillance were of the subtype A(H5N8) and two were A(H5N1).

Introduction

The Norwegian Food Safety Authority is responsible for the surveillance programme of avian influenza (AI) in wild birds. The programme is based on virological investigations of samples from live or hunted birds (active surveillance) and dead or moribund birds (passive surveillance). Active surveillance of avian influenza in wild birds has been running from 2005 to 2007, from 2009 to 2010, and from 2016 onwards. The Norwegian Veterinary Institute is responsible for planning, laboratory investigations and reporting components of the programme.

Avian influenza viruses (AIVs) are highly contagious and can evolve rapidly by mutations and reassortment of the genetic material between different AIVs. Wild waterfowl species, such as ducks, geese, swans, waders and gulls, are natural reservoir hosts for low pathogenic avian influenza (LPAI) viruses. These birds do not usually develop clinical disease when infected with LPAI viruses, but shed large amounts of virus in their faeces (1).

Most LPAI viruses cause only mild disease in poultry. LPAI strains can potentially mutate into highly pathogenic avian influenza (HPAI) viruses when introduced into poultry populations. HPAI is a serious, highly contagious disease in poultry and other bird species. All HPAI epidemics recorded so far have been of the hemagglutinin subtypes H5 or H7. Wild migratory birds play a major role in the global spread of HPAI viruses (2, 3). In 2020, HPAI was detected for the first time in Norway in wild and captive birds (4).

Aims

The aim of the national surveillance programme is to monitor the prevalence of avian influenza viruses (AIVs) in wild birds, emphasising H5 and H7 subtype viruses.
Data from the surveillance programme are used in risk assessments that can be used by the Norwegian Food Safety Authority to timely implement appropriate measures in order to prevent incursions of AIVs in poultry establishments.

Materials and methods

Sampling

Cloacal and tracheal/oropharyngeal swabs from live, hunted, moribund or dead wild birds were screened for influenza A viral RNA using polymerase chain reaction (PCR). For active surveillance, sampling equipment was sent to designated ornithologists and hunters. The recruitment of samplers was based on their geographical location and estimated access to hunted or live birds within the order *Anseriformes* or the family *Laridae*. Geographical regions were mainly targeted for active surveillance by a risk-based approach considering the relative density of poultry farms in a given area and their overlap with the flyways and rest areas of many species of waterfowl (5, 6). In 2021, sampling of wild birds in the Norwegian archipelago Svalbard was also included in the active surveillance programme. Passive surveillance was conducted by collection of swabs from dead or moribund wild birds in the entire country. Inspectors from the Norwegian Food Safety Authority was responsible for the passive surveillance sampling. The wild bird species sampled were generally in accordance with, but not limited to, the EFSA list of target wild bird species for passive surveillance activities (7).

Staff involved in sampling activities received written instructions on sampling procedure and were requested to fill in registration forms for individual cases. Swabs were placed in transport medium immediately after sampling and shipped directly to the Norwegian Veterinary Institute. Upon arrival, samples were registered and processed immediately or stored for a few days at 4°C until testing.

Analyses

Samples were screened for AIVs using real-time reverse transcriptase polymerase chain reaction (rRT-PCR). The screening rRT-PCR used was an influenza A virus matrix gene method recommended by the European Union Reference Laboratory (EURL) for Avian Influenza (8). The matrix gene rRT-PCR can detect all subtypes of influenza type A viruses, however, the method does not distinguish the specific hemagglutinin (HA) or neuraminidase (NA) subtype in influenza-positive samples. Therefore, the samples found positive in the initial matrix rRT-PCR were further analysed using H5- and H7-specific PCRs (8). If samples were H5- or H7-positive, the HA cleavage site was sequenced in order to determine pathogenicity and confirm HPAI or LPAI virus infection. Additional neuraminidase (NA) N1 and N8 subtyping rRT-PCR was performed on positive samples by methods recommended by EURL (9).

Results and discussion

In total, samples from 1091 wild birds were analysed for the presence of influenza A virus (Table 1). Results showed that samples from 98 (9.0%) birds were positive for influenza A virus. No samples were H7-positive and samples from 66 birds (6.0%) were H5-positive. Testing revealed highly pathogenic avian influenza (HPAI) virus in samples from 40 (3.7%) wild birds in 2021.

Active surveillance in 2021 detected 48 influenza A virus positive cases from a total of 700 wild birds sampled (6.9%, Table 1). Two of the cases were HPAI-positive, both belonging to the subtype A(H5N1).

Passive surveillance in 2021 detected 50 cases of influenza A virus infection from a total of 391 wild birds (12.8%). Among these, HPAI viruses was found in 38 cases.

Thirty-six of the HPAI detections from dead or moribund wild birds in 2021 were of the subtype A(H5N8) and two were A(H5N1). NA subtyping was not successful in two of the samples due to low viral load. In Norway as well as the rest of Europe subtype H5N8 dominated in the 2020-2021 season while the H5N1 subtype appeared in the autumn of 2021. The number of wild birds sampled from each county or territory are shown in Figure 1.

***Table 1**: Number of wild birds sampled in the surveillance programme for avian influenza in Norway in 2021.*

	2021	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Active surveillance													
HPAI H5N1	2											2	
H5N1	12											12	
H5Nx	3										2	1	
Other influenza A*	31			1							8	20	2
Influenza A negative	652			26	95	42	1		110	160	119	84	15
Total	**700**			**27**	**95**	**42**	**1**		**110**	**160**	**129**	**119**	**17**
Passive surveillance													
HPAI H5N1	2											1	1
HPAI H5N8	36	7	4	11	4		6	4					
H5N8	9	1	3	1	3			1					
H5Nx	2			2									
Other influenza A*	1											1	
Influenza A negative	341	53	79	49	52	19	10	10	13		9	24	23
Total	**391**	61	86	63	59	19	16	15	13		9	26	24
Active and passive surveillance													
Total	**1091**	61	86	90	154	61	17	15	123	160	138	145	41

*Other influenza A: H5/H7-negative

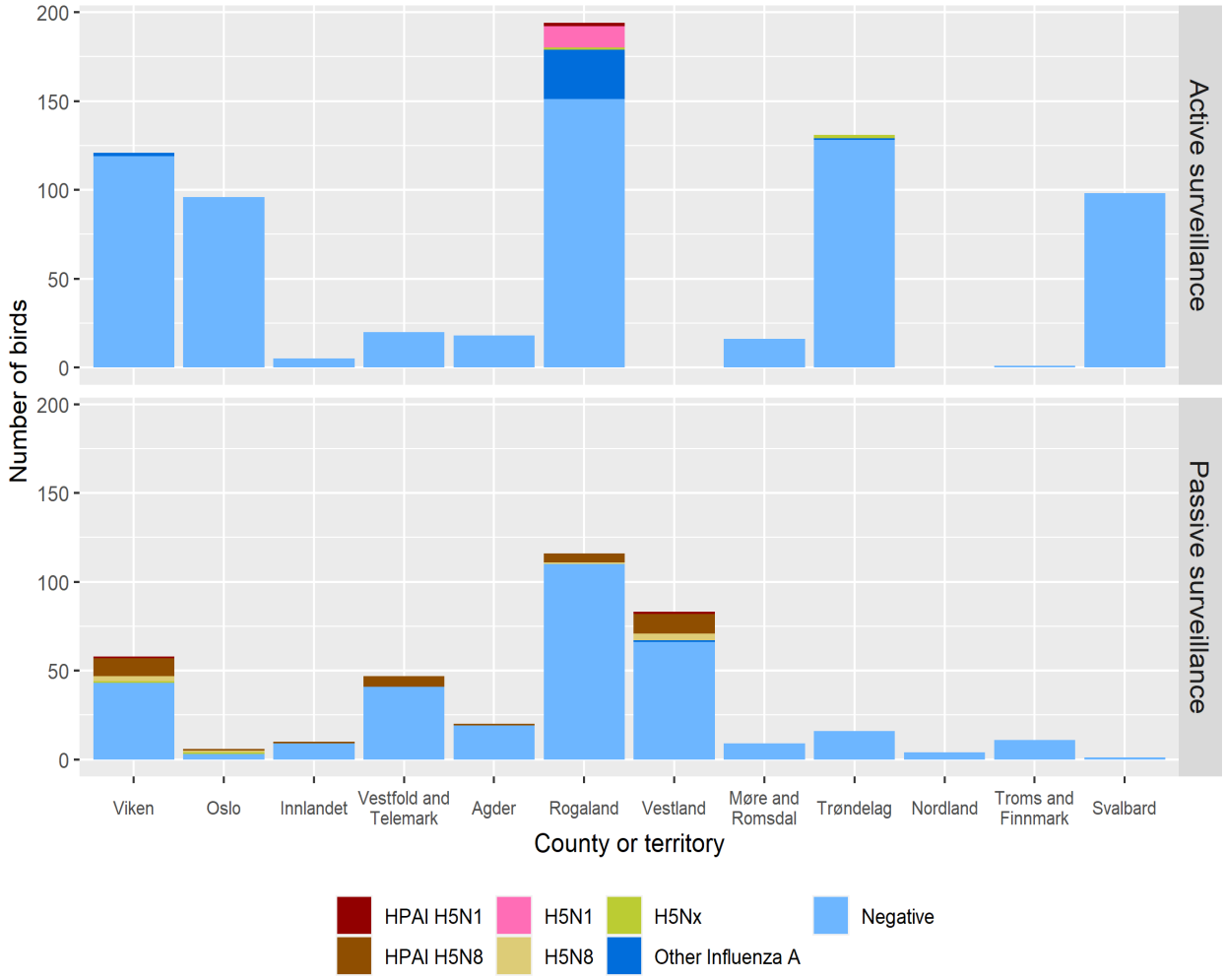

***Figure 1**: The number of wild birds from counties and territories included in the active and passive surveillance programme for avian influenza in Norway in 2021.*

Among all wild birds sampled in accordance with active or passive surveillance, HPAI H5 subtype virus was detected in samples from 40 birds. The majority of HPAI-positive birds (38/40) were detected by passive surveillance, and most of these birds were found dead. HPAI cases in 2021 were reported most frequently in mute swans (*Cygnos olor*) (Table 2). The geographical distribution of HPAI-detections are shown in Figure 2.

The first HPAI outbreak in commercial poultry in Norway appeared in Rogaland county in November 2021.

***Table 2**: Species distribution of HPAI-positive wild birds in Norway in 2021.*

Species (Eng.)	Species (Nor.)	Species (Lat.)	HPAI H5N1	HPAI H5N8
Black-headed Gull	Hettemåke	*Chroicocephalus ridibundus*		1
Canada Goose	Kanadagås	*Branta canadensis*		4
Common Eider	Ærfugl	*Somateria mollissima*		4
Common Gull	Fiskemåke	*Larus canus*		1
Duck (species unknown)	And, art ukjent	*Anatidae*		1
Eurasian Wigeon	Brunnakke	*Mareca penelope*	1	
Greylag Goose	Grågås	*Anser anser*		4
Mallard	Stokkand	*Anas platyrhynchos*	1	
Mute Swan	Knoppsvane	*Cygnus olor*	1	13
Swan (species unknown)	Svane, art ukjent	*Anatidae*		5
White-tailed Eagle	Havørn	*Haliaeetus albicilla*	1	
Whooper Swan	Sangsvane	*Cygnus cygnus*		3
Total			**4**	**36**

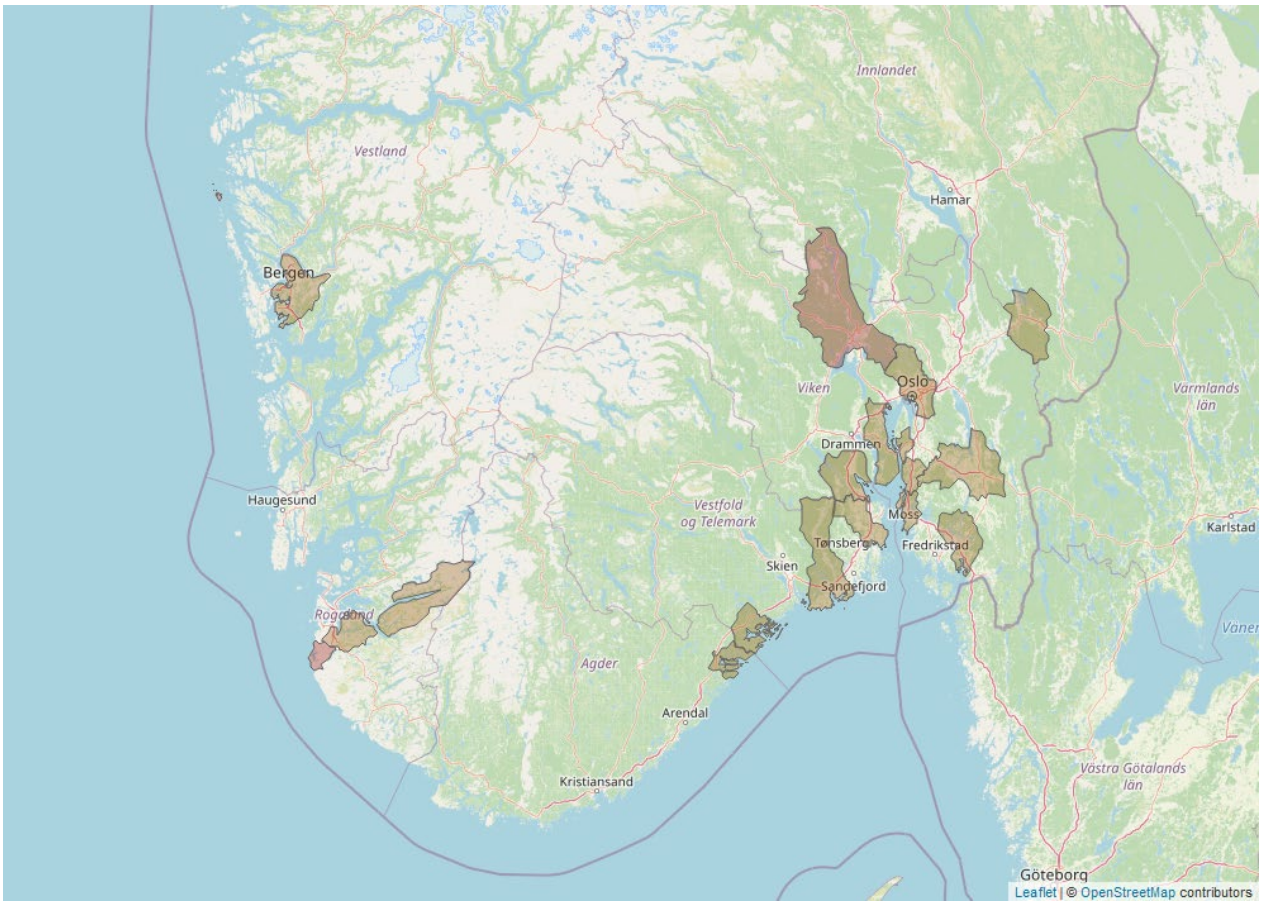

***Figure 2**: Geographical distribution of HPAI virus detections in wild birds in Norway in 2021. Colour marks municipalities with one or more detections of HPAI-positive wild birds: HPAI H5N8 (yellow) and HPAI H5N1 (red). If more than one HPAI subtype was detected in a municipality in 2021, the colour representing the most recent detected subtype at the end of the year is shown.*

Among wild birds sampled by active surveillance, influenza A virus was detected in samples from 27.9% (19/68) of Eurasian wigeons (*Mareca penelope*), 24.4% (11/45) of Eurasian teals (*Anas crecca)* and 13.7% (14/102) of mallards (*Anas platyrhynchos*) (Table 3). All influenza A-positive samples were further analysed for the presence of subtype H5 or, if negative, for H7. Seventeen out of the 48 influenza A-positive samples were H5 positive, while none were H7 positive. Samples from two birds were characterized as HPAI virus positive based on sequencing of the HA gene. Twelve samples were H5N1-positive based on PCR results, but these samples were not suitable for pathotyping by sequencing due to low viral load.

***Table 3**: Number of birds sampled in the active surveillance programme for avian influenza in Norway in 2021.*

Species (Eng.)	Species (Nor.)	Species (Lat.)	No. sampled	Inf. A positive	H5 positive	H7 positive	H5N1 positive	HPAI H5N1
Barnacle Goose	Hvitkinngås	*Branta leucopsis*	116					
Bird (species unknown)	Fugl, art ukjent	*Aves*	3					
Black-headed Gull	Hettemåke	*Chroicocephalus ridibundus*	40					
Canada Goose	Kanadagås	*Branta canadensis*	6	1				
Common Eider	Ærfugl	*Somateria mollissima*	3					
Common Goldeneye	Kvinand	*Bucephala clangula*	5					
Common Gull	Fiskemåke	*Larus canus*	47					
Common Murre	Lomvi	*Uria aalge*	1					
Common Scoter	Svartand	*Melanitta nigra*	3					
Common Teal	Krikkand	*Anas crecca*	45	11	1			
Ducks, geese, swans	Andefamilien	*Anatidae*	2					
Eurasian Wigeon	Brunnakke	*Mareca penelope*	71	19	10		9	1
European Herring Gull	Gråmåke	*Larus argentatus*	24	1				
Greylag Goose	Grågås	*Anser anser*	151					
Great Black-backed Gull	Svartbak	*Larus marinus*	2					
Lesser Black-backed Gull	Sildemåke	*Larus fuscus*	13					
Mallard	Stokkand	*Anas platyrhynchos*	104	14	4		3	1
Mandarin Duck	Mandarinand	*Aix galericulata*	1					
Mute Swan	Knoppsvane	*Cygnus olor*	12					
Northern Goshawk	Hønsehauk	*Accipiter gentilis*	1					
Osprey	Fiskeørn	*Pandion haliaetus*	1					
Pink-footed Goose	Kortnebbgås	*Anser brachyrhynchus*	47	2	2			
Tufted Duck	Toppand	*Aythya fuligula*	1					
Western capercaillie	Storfugl	*Tetrao urogallus*	1					
Total			**700**	**48**	**17**		**12**	**2**

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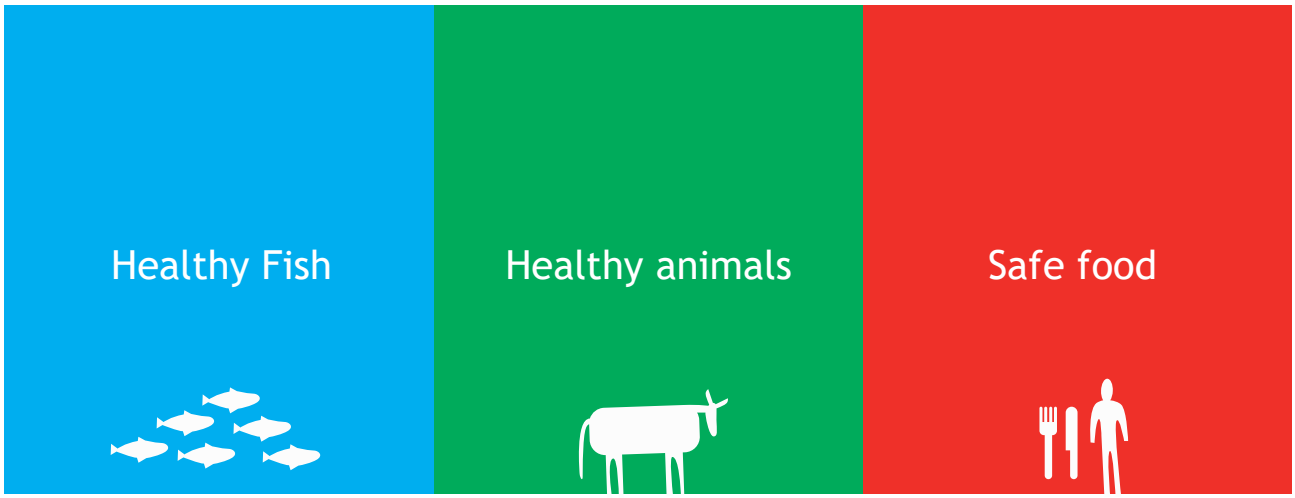

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