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The surveillance programme for avian influenza (AI) in Norwegian wildlife 2023

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Content

Summary

Highly pathogenic avian influenza (HPAI) virus was detected in 164 of 926 wild birds examined in the surveillance programme for avian influenza in Norway in 2023. Active surveillance detected influenza A virus in 52 birds, of which one was characterised as HPAI H5Nx. Passive surveillance detected influenza A virus in 112 birds, of which 102 were identified as HPAI H5. Eighty-four of the HPAI detections in wild birds in 2023 were H5N1, eight were H5N5, and ten were H5Nx. Of sixteen wild mammals tested as part of passive surveillance, one red fox (*Vulpes vulpes*) tested positive for HPAI H5N1.

Introduction

The Norwegian Food Safety Authority (NFSA) is responsible for the surveillance programme of avian influenza (AI) in wildlife, in accordance with Commission Delegated Regulation (EU) 2020/689 (1). The programme is based on virological investigations of samples from live or hunted wild birds of target species (active surveillance) and dead or moribund wild birds and mammals (passive surveillance). Active surveillance of avian influenza in wild birds has been running in the years 2005-2007, 2009-2010, and from 2016 and onwards. The Norwegian Veterinary Institute is responsible for planning, laboratory investigations and reporting components of the programmes. For the first time, results of avian influenza testing in wild mammals are also presented in this report.

Avian influenza viruses (AIVs) are highly contagious and evolve rapidly by genetic drift and reassortment. Wild waterfowls, such as ducks, geese, swans, waders and gulls, are natural reservoir hosts for low pathogenic avian influenza (LPAI) viruses. These birds rarely develop clinical disease when infected with LPAI viruses, but shed large amounts of virus in their faeces (2). Some LPAI viruses can infect poultry, but normally cause only mild disease. However, LPAI viruses of the H5 and H7 subtypes sometimes mutate into highly pathogenic avian influenza (HPAI) viruses when introduced into poultry flocks (3). HPAI is a severe and highly contagious disease causing high mortality in poultry. Wild migratory birds play a major role in the global spread of HPAI viruses (4, 5). Since 2021-2022, H5Nx belonging to the H5 clade 2.3.4.4.b have established in wild birds, and this has also led to increased detections in wild mammals (6). Since 2021, H5N1 has been the predominating virus circulating, causing severe illness and high mortality in several species of birds and mammals.

HPAI was confirmed for the first time in Norway in 2020, when HPAI H5N8 was detected in wild and captive birds (7). In 2022, HPAI H5N1 was diagnosed in three red foxes (*Vulpes vulpes*) (8), marking the first detection of this disease in mammals in Norway.

Aims

The aim of the national surveillance programme is to monitor the prevalence of AIVs in wildlife, emphasising H5 and H7 subtype viruses. The surveillance is conducted in accordance with Commission Delegated Regulation (EU) 2020/689 (1).

Materials and methods

Sampling

Cloacal and tracheal/oropharyngeal swabs for virological testing were collected from live or hunted wild birds (active surveillance), and moribund or dead wild birds and mammals (passive surveillance). 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 *Anseriformes* and *Laridae*, respectively. 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 (9, 10). Active surveillance was ongoing year-round, but with a focus primarily in the autumn during hunting season.

Passive surveillance was conducted by collecting swabs from dead or moribund wild birds and mammals across the entire country. Inspectors from the NFSA were 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 (11). Samples, mainly swabs, were taken from wild mammals in cases where HPAI was suspected based on clinical signs or when found dead in affected areas. Passive surveillance continued throughout the year.

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 tested for AIVs using a real-time reverse transcriptase polymerase chain reaction (rRT-PCR). The rRT-PCR used was an influenza A virus matrix (M) gene method recommended by the European Union Reference Laboratory (EURL) for Avian Influenza (12). The M gene rRT-PCR can detect all influenza A viruses, but cannot be used to determine the hemagglutinin (HA) or neuraminidase (NA) subtypes. Therefore, the influenza A virus positive samples were further analysed using H5- and H7-specific PCRs (12). 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. From June 2022, pathotyping by sequencing was replaced by a more rapid HPAI H5-detection rRT-PCR assay for 2.3.4.4b viruses recommended by the EURL

(13). Additional NA subtyping rRT-PCR was performed on positive samples by methods recommended by EURL (14). Representative AIV-positive samples from the surveillance programme are further characterized by genome sequencing.

Results and discussion

In total, samples from 926 wild birds were analysed for the presence of influenza A virus (Table 1). The majority of samples were collected during late summer-early autumn. Results showed that 164 (17.7%) wild birds were positive for influenza A virus. Of these, no birds were H7-positive and 114 were H5-positive (12.3%). Testing revealed highly pathogenic avian influenza (HPAI) virus in 103 (11.1%) wild birds in 2023.

Active surveillance in 2023 detected Influenza A virus in 52 out of 525 birds sampled (9.9%, Table 1). One of these birds, a European Herring Gull sampled in Oslo by an ornithologist, tested positive for HPAI H5Nx. NA subtyping was not successful due to low viral load in the sample. The ringed gull was observed alive six months after the positive test, implying that it survived the infection.

Passive surveillance in 2023 detected influenza A virus in 112 of 401 wild birds (27.9%). Among these, HPAI viruses was identified in 102 birds. Eighty-four of the HPAI detections from dead or moribund wild birds in 2023 were H5N1, eight were H5N5 and ten were H5Nx, i.e. NA subtyping was not successful due to low viral load. 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 2023.*

	Total 2023	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Active surveillance													
HPAI H5Nx	1											1	
H5Nx	6									5		1	
Other influenza A*	45									8	30	6	1
Influenza A negative	473	2		6	18	25	24	16	29	155	123	48	27
Total	**525**	**2**		**6**	**18**	**25**	**24**	**16**	**29**	**168**	**153**	**56**	**28**
Passive surveillance													
HPAI H5N1	84	11	10	1	2	4	12	18	21	5			
HPAI H5N5	8			1			1			2	3	1	
HPAI H5Nx	10						1	4	3			2	
H5N1	1							1					
H5Nx	4							2	2				
Other influenza A*	5				2			2	1				
Influenza A negative	289	34	17	28	10	11	49	22	57	14	22	19	6
Total	**401**	**45**	**27**	**30**	**14**	**15**	**63**	**49**	**84**	**21**	**25**	**22**	**6**
Active and passive surveillance													
Total	**926**	47	27	36	32	40	87	65	113	189	178	78	34

*Other influenza A: H5/H7-negative

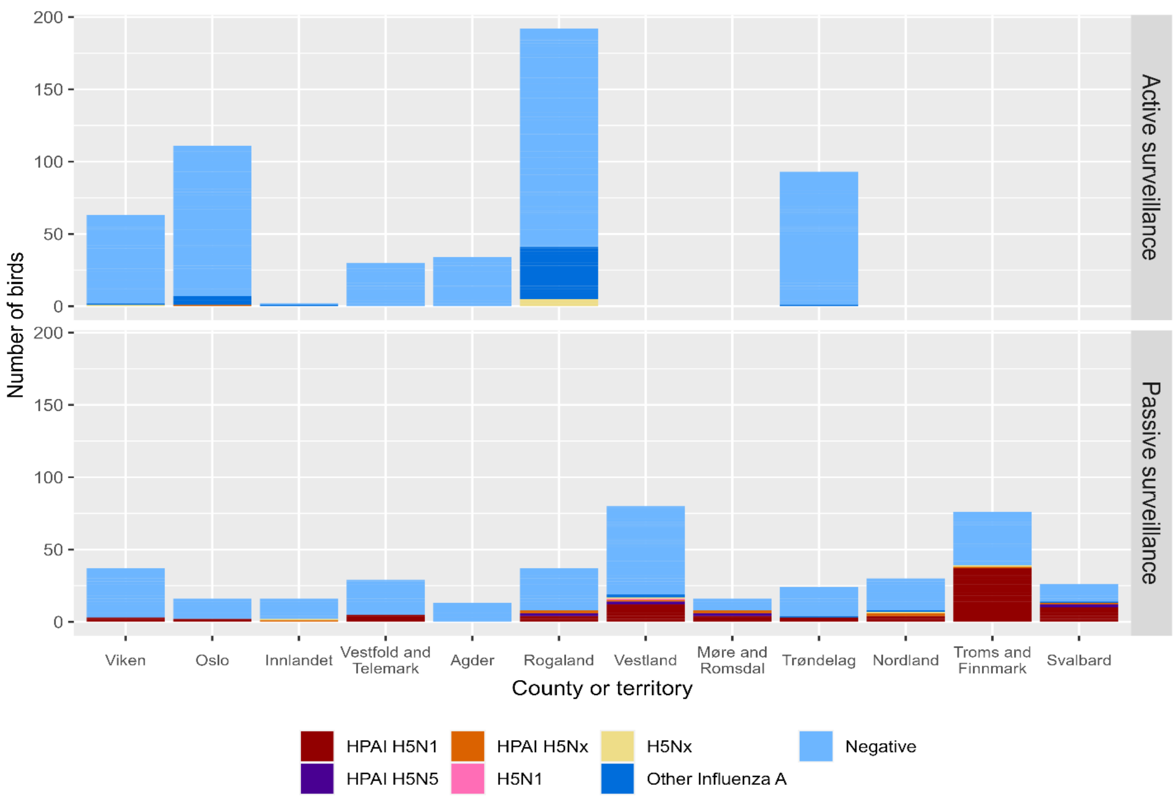

Figure 1: *The number of wild birds from counties and territories included in the active and passive surveillance programmes for avian influenza in Norway in 2023.*

Among all wild birds sampled in accordance with active or passive surveillance, HPAI H5 subtype virus was detected in samples from 114 birds. All but one HPAI-positive bird were detected by passive surveillance, and most of these birds were found dead. HPAI cases in 2023 were reported most frequently in black-legged kittiwakes (*Rissa tridactyla*) (Table 2). HPAI H5N1 caused high mortality in this and other gull species during spring and summer 2023, in particular in seabird colonies in northern parts of Norway. The geographical distribution of HPAI-detections are shown in Figure 2.

In 2023, there were three outbreaks of HPAI among backyard poultry and captive birds in regions where wild birds had tested positive for HPAI. Birds in all three holdings exhibited clinical signs consistent with HPAI and were sampled due to suspicion. Surveillance of avian influenza in poultry is presented in a separate report (15).

Among wild birds sampled in active surveillance, influenza A virus was detected in 37.8% (28/74) of Eurasian teals (*Anas crecca*), 10.0% (10/100) Mallards (*Anas platyrhynchos*), 8.8% (3/34) European herring gulls (*Larus argentatus*), and 7.4% (2/27) Common gulls (*Larus canus*) (Table 3). All influenza A-positive samples were further analysed for the presence of subtype H5 or, if negative, for H7. Seven of the 52 influenza A-positive samples were H5 positive, while none was H7 positive. One of the H5 positive isolates was further confirmed as HPAI H5Nx, i.e. NA subtyping was not successful due to low viral load.

Sixteen wild mammals, both marine and terrestrial species, were sampled as part of passive surveillance for avian influenza. Influenza A virus was detected in one out of six tested red foxes (16.7%). The fox was found dead in the municipality of Tromsø, Troms and Finnmark county, and it was diagnosed with HPAI H5N1 (Table 4).

***Table 2**: Species distribution of HPAIV-positive wild birds in Norway in 2023.*

Species (Eng.)	Species (Nor.)	Species (Lat.)	HPAI H5N1	HPAI H5N5	HPAI H5Nx
Arctic Tern	Rødnebbterne	*Sterna paradisaea*	1		
Black-headed Gull	Hettemåke	*Chroicocephalus ridibundus*	1		
Black-legged Kittiwake	Krykkje	*Rissa tridactyla*	41		1
Eurasian Eagle-Owl	Hubro	*Bubo bubo*		1	
Eurasian Magpie	Skjære	*Pica pica*			1
Eurasian Sparrowhawk	Spurvehauk	*Accipiter nisus*	1		
European Herring Gull	Gråmåke	*Larus argentatus*	12	2	5
Glaucous Gull	Polarmåke	*Larus hyperboreus*		1	
Great Black-backed Gull	Svartbak	*Larus marinus*	3		
Great Cormorant	Storskarv	*Phalacrocorax carbo*	1		
Great Skua	Storjo	*Stercorarius skua*			1
Lesser Black-backed Gull	Sildemåke	*Larus fuscus*			1
Mute Swan	Knoppsvane	*Cygnus olor*	14		
Northern Fulmar	Havhest	*Fulmarus glacialis*	1		
Northern Goshawk	Hønsehauk	*Accipiter gentilis*	2	1	
Purple Sandpiper	Fjæreplytt	*Calidris maritima*		1	
White-tailed Eagle	Havørn	*Haliaeetus albicilla*		2	1
Bird (species unknown)	Fugl, art ukjent	Aves	7		1
Total			**84**	**8**	**11**

***Figure 2**: Geographical distribution of HPAI virus detections in wild birds in Norway in 2023. Colour marks municipalities with one or more detections of HPAI-positive wild birds: HPAI H5N1 (red), HPAI H5N5 (purple) and HPAI H5Nx (yellow). If more than one HPAI subtype was detected in a municipality in 2023, the colour representing the most recent detected subtype at the end of the year is shown.*

Table 3: *Number of wild birds sampled in the active surveillance programme for avian influenza in Norway in 2023.*

Species (Eng.)	Species (Nor.)	Species (Lat.)	No. sampled	Positive		
				Inf. A	H5	H7
Barnacle Goose	Hvitkinngås	*Branta leucopsis*	9			
Black-headed Gull	Hettemåke	*Chroicocephalus ridibundus*	19			
Canada Goose	Kanadagås	*Branta canadensis*	33			
Common Eider	Ærfugl	*Somateria mollissima*	20			
Common Goldeneye	Kvinand	*Bucephala clangula*	2			
Common Gull	Fiskemåke	*Larus canus*	27	2		
Common Merganser	Laksand	*Mergus merganser*	1			
Common Scoter	Svartand	*Melanitta nigra*	2			
Eurasian Teal	Krikkand	*Anas crecca*	74	28	5	
Eurasian Wigeon	Brunnakke	*Mareca penelope*	65	6		
European Herring Gull	Gråmåke	*Larus argentatus*	34	3	1	
Great Black-backed Gull	Svartbak	*Larus marinus*	6	2		
Greylag Goose	Grågås	*Anser anser*	75			
Lesser Black-backed Gull	Sildemåke	*Larus fuscus*	17	1		
Mallard	Stokkand	*Anas platyrhynchos*	100	10	1	
Mute Swan	Knoppsvane	*Cygnus olor*	4			
Pink-footed Goose	Kortnebbgås	*Anser brachyrhynchus*	34			
Bird (species unknown)	Fugl, art ukjent	*Aves*	3			
Total			**525**	**52**	**7**	

Table 4: *Number of wild mammals sampled for surveillance of avian influenza in Norway in 2023.*

Species (Eng.)	Species (Nor.)	Species (Lat.)	No. sampled	Positive		
				Inf. A	H5	HPAI H5
Common minke whale	Vågehval	*Balaenoptera acutorostrata*	1			
Eurasian otter	Oter	*Lutra lutra*	1			
Harbor seal	Steinkobbe (fjordsel)	*Phoca vitulina*	3			
Pinnipeds (species unknown)	Seler (art ukjent)	*Pinnipedia* (clade)	3			
Polar bear	Isbjørn	*Ursus maritimus*	1			
Red fox	Rødrev	*Vulpes vulpes*	6	1	1	1
Sei whale	Seihval	*Balaenoptera borealis*	1			
Total			**16**	**1**	**1**	**1**

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