
Erasmus MC



Viroscience lab

WHERE SKILLS MEET TO STUDY & PROTECT

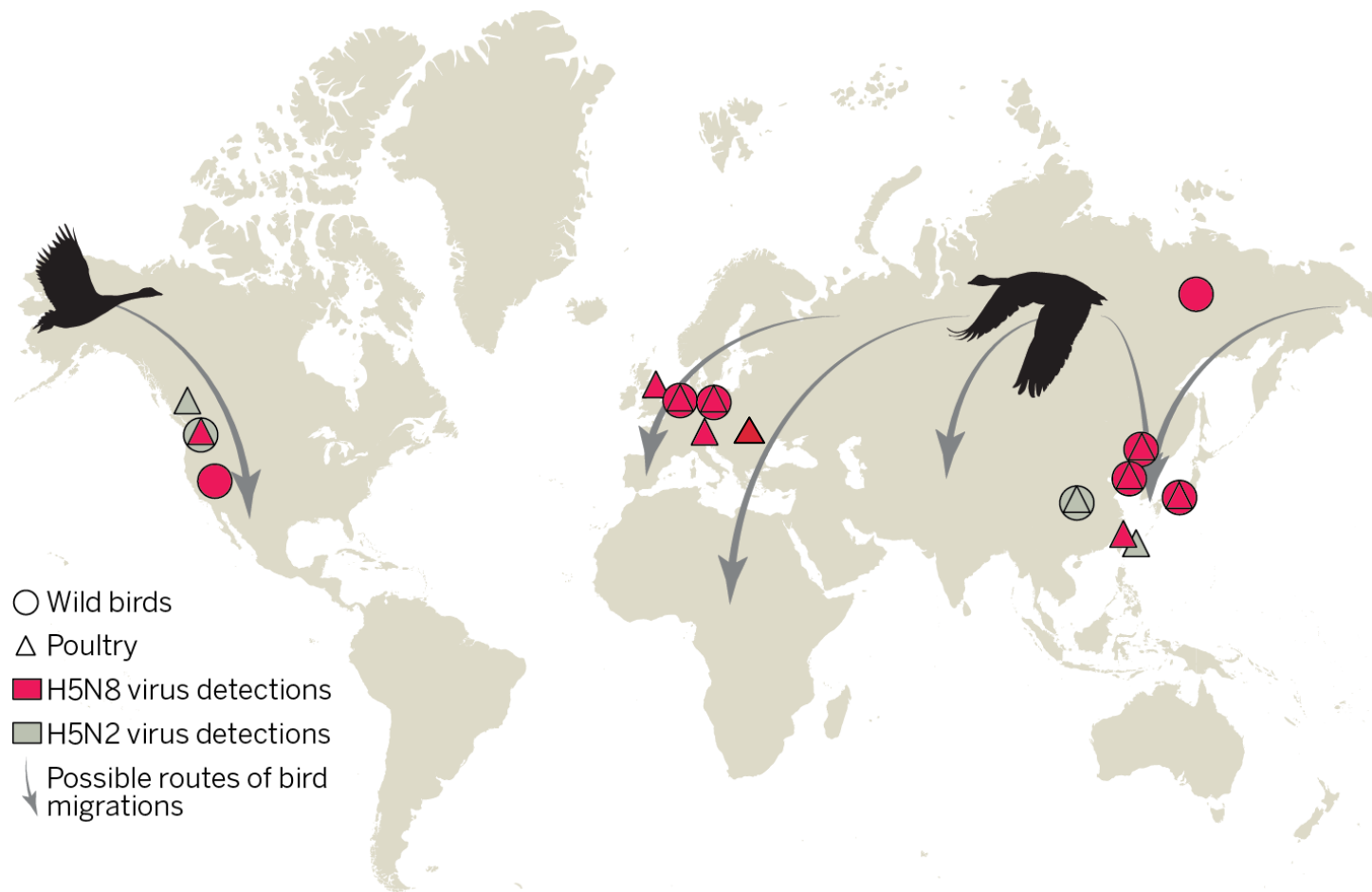


Spread of HPAI H5N8 to Europe:
Role of wild birds in epidemiology

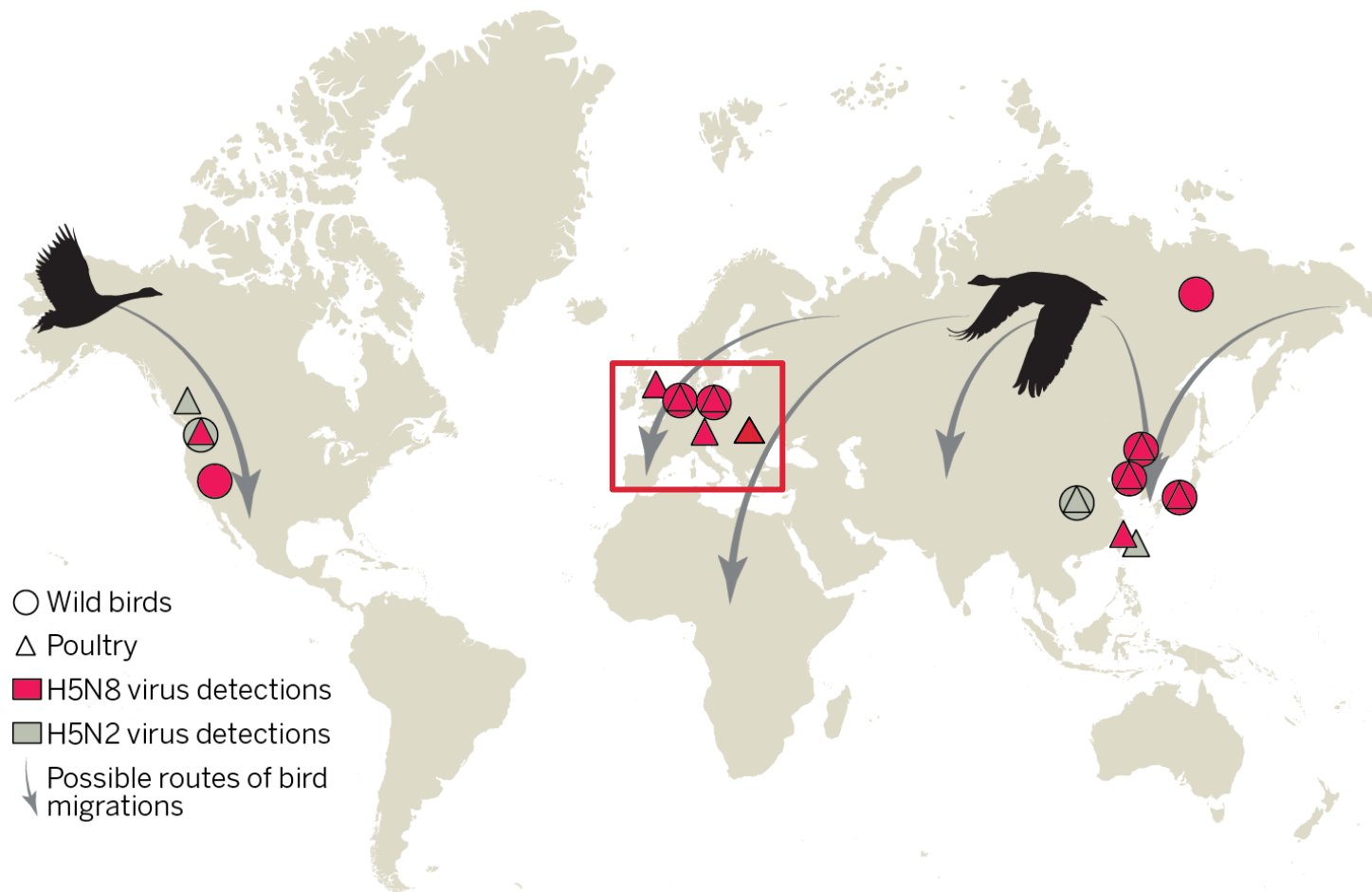


Josanne Verhagen, Henk van der Jeugd,
Bart Nolet, Roy Slaterus, Thijs Kuiken, Ron Fouchier

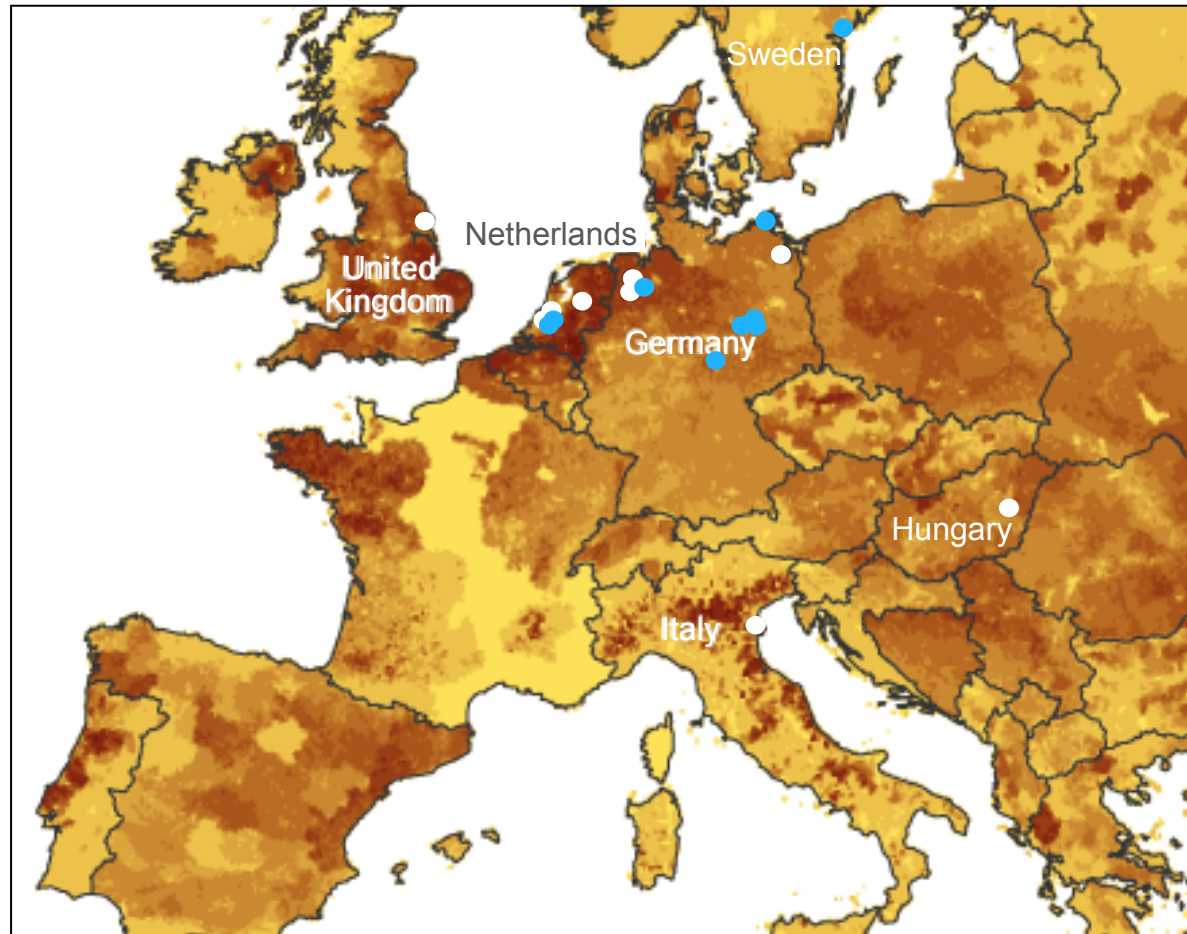
HPAI H5N8 global emergence



HPAI H5N8 global emergence



HPAI H5N8 clade 2.3.4.4 in Europe
4 November 2014 – 13 April 2015

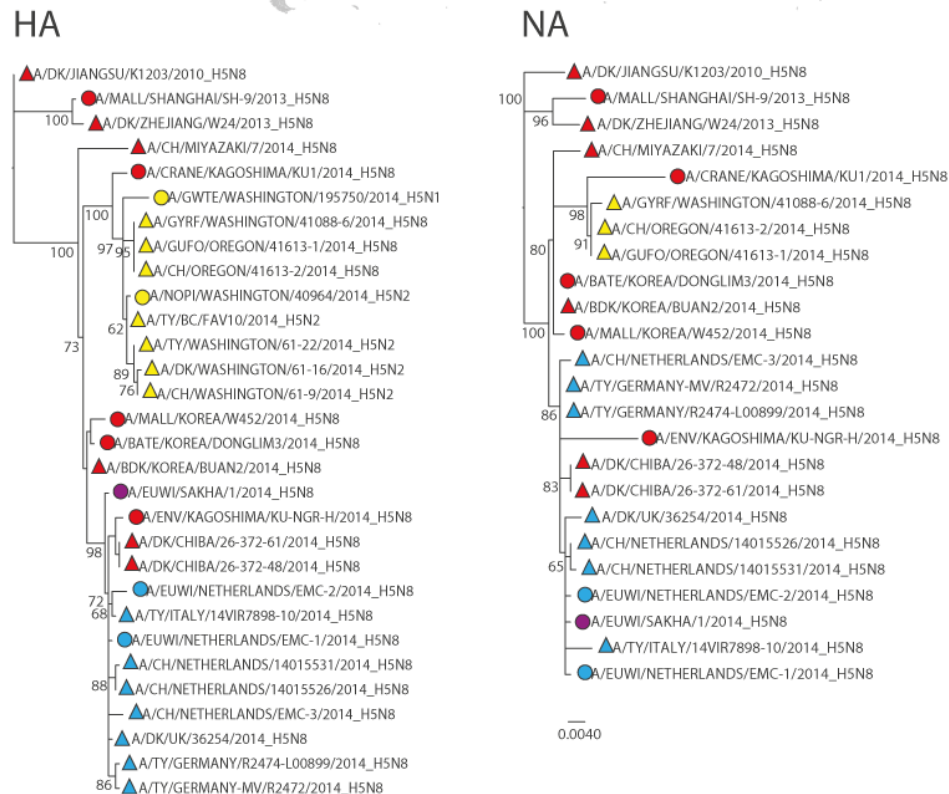
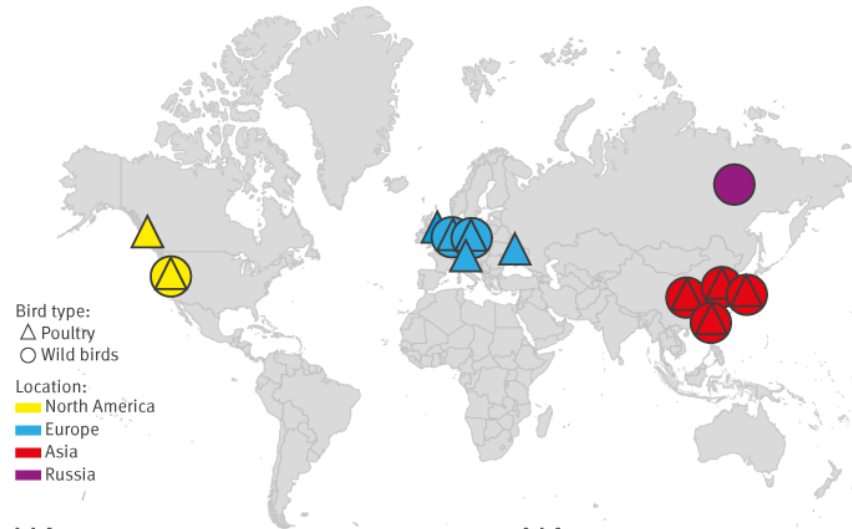


- Wild birds
- Poultry holding

Genetic analyses of HPAI H5N8 viruses from Europe

Simultaneous detection of

- Genetically very close IAV, with same gene constellation
- Large geographical distance
- HPAI H5N8 in wild birds

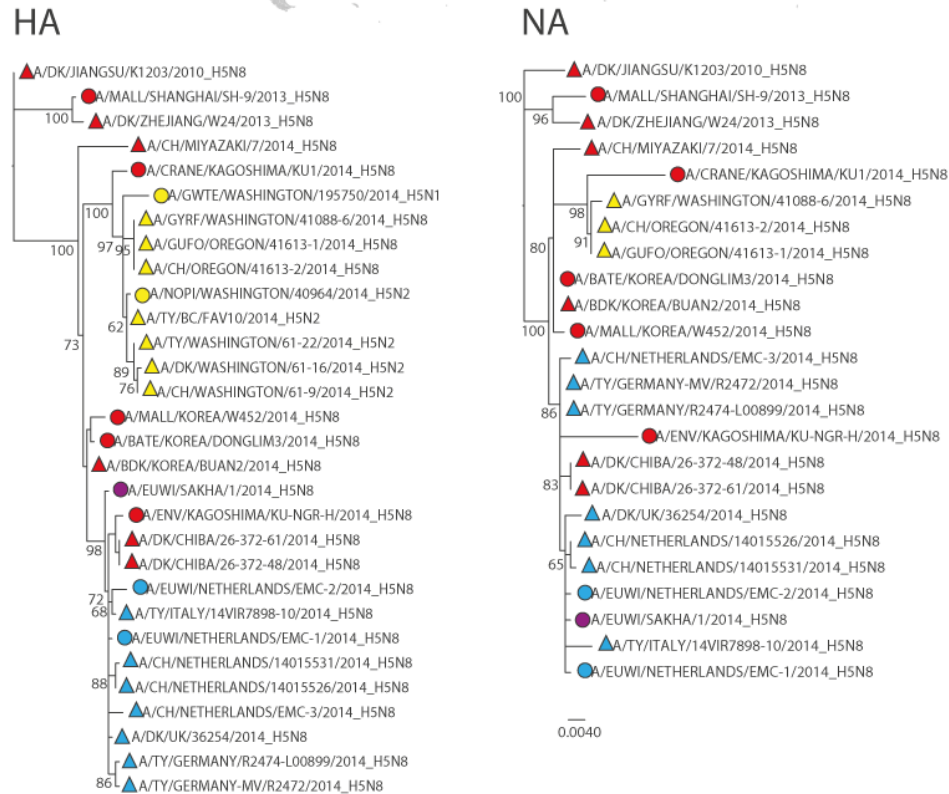
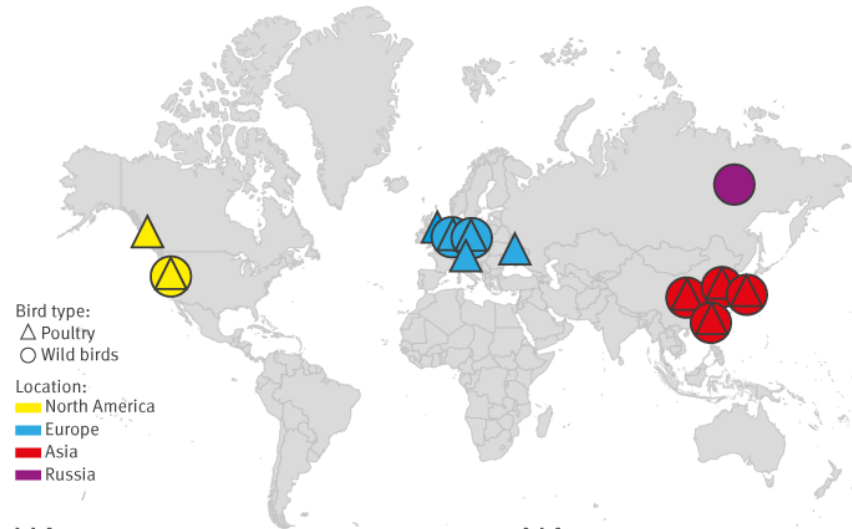


Genetic analyses of HPAI H5N8 viruses from Europe

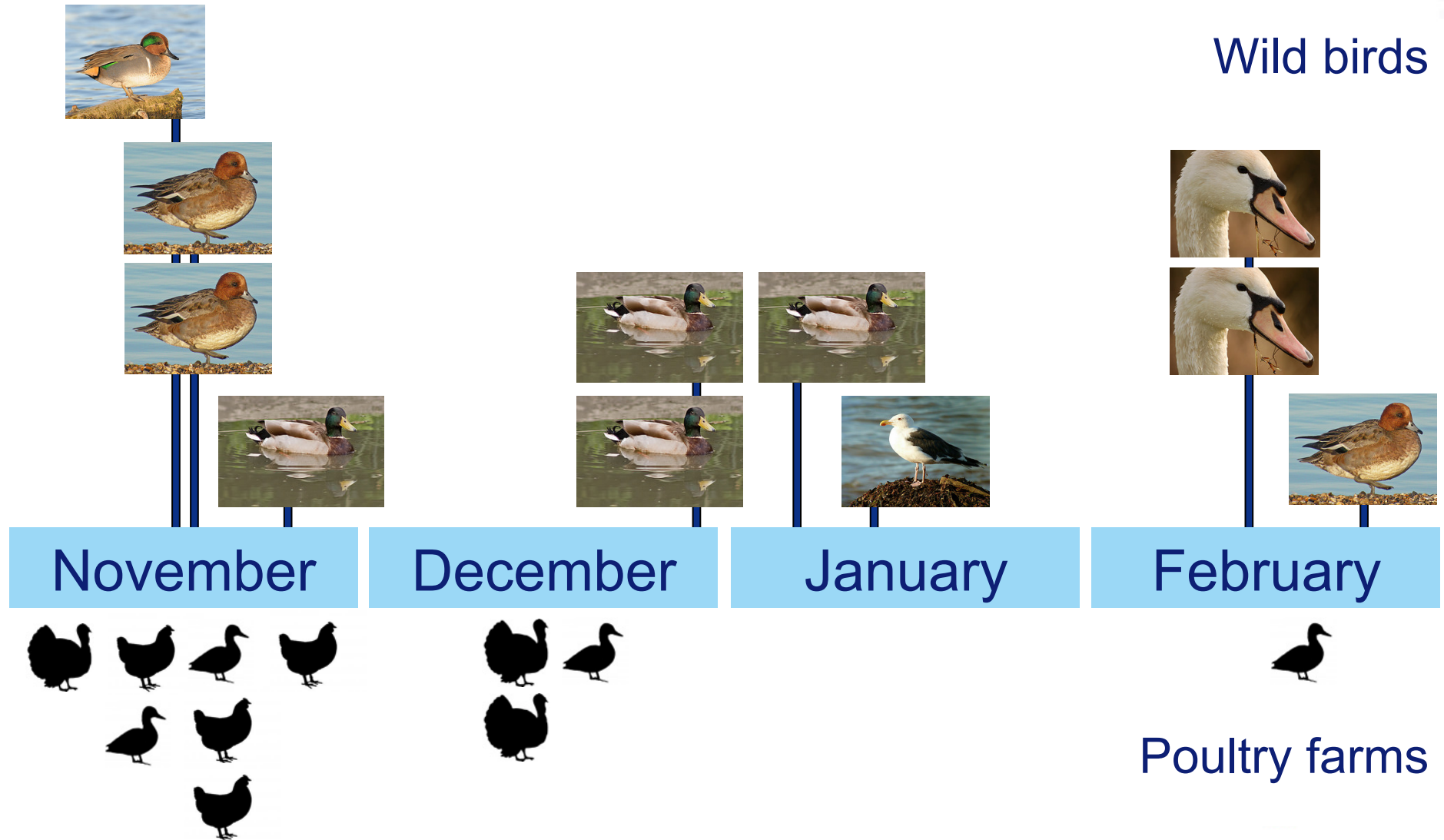
Simultaneous detection of

- Genetically very close IAV, with same gene constellation
- Large geographical distance
- HPAI H5N8 in wild birds

Role of wild birds in long-distance movement of HPAI H5N8?



Detections of HPAI H5N8 in wild birds in Europe, fall/winter 2014-2015



Wild birds

November

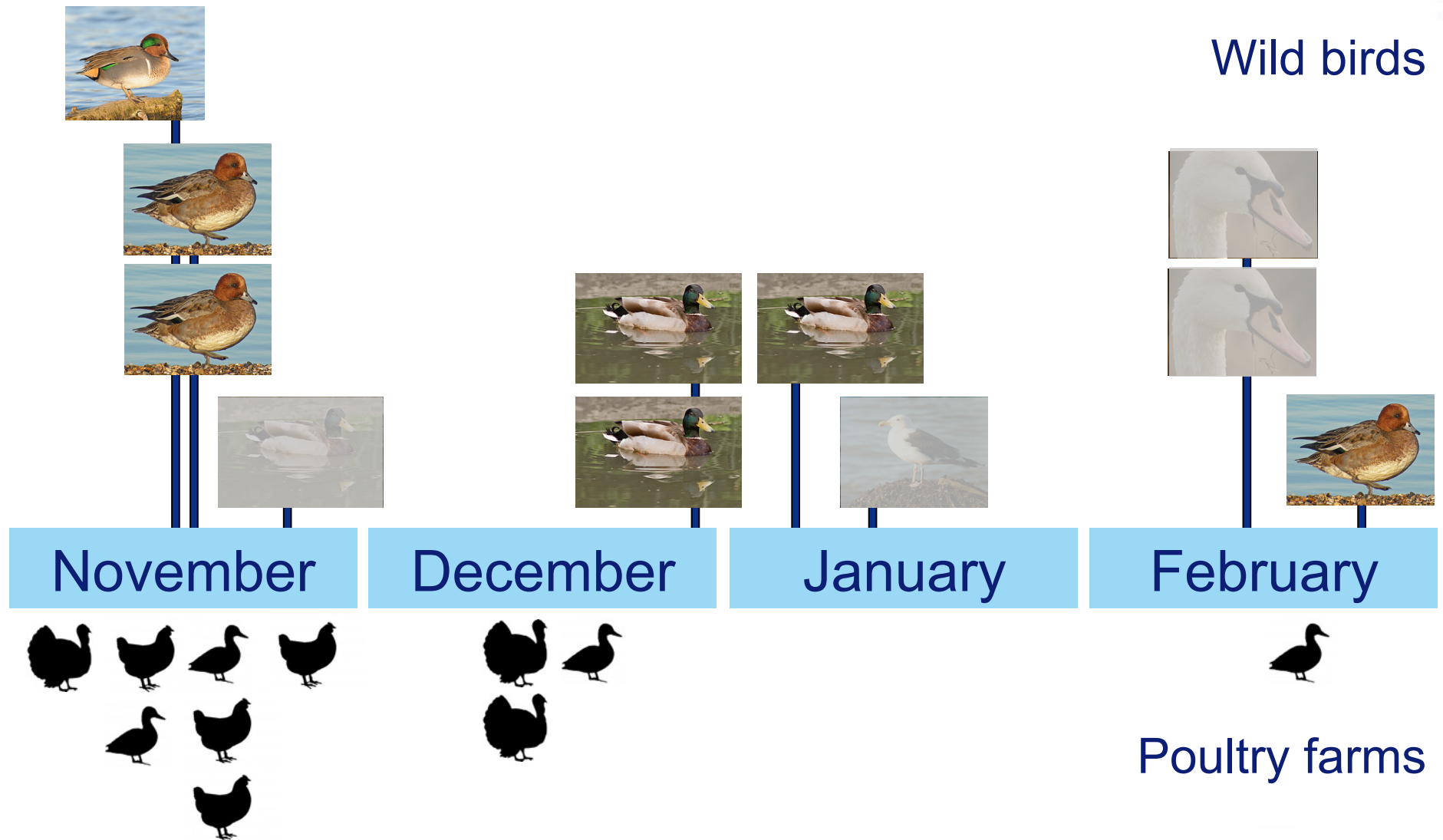
December

January

February

Poultry farms

Detections of HPAI H5N8 in live wild birds in Europe, fall/winter 2014-2015



Role for ducks of *Anas* spp.

- Worldwide HPAI H5 clade 2.3.4.4 detected in live birds in 8 of at least 27 free-living bird species: limited to ducks -

Accipitriformes

Eagles and hawks



Charadriiformes

Gulls



Falconiformes

Falcons



Gruiformes

Cranes and coots



Passeriformes

Bulbuls

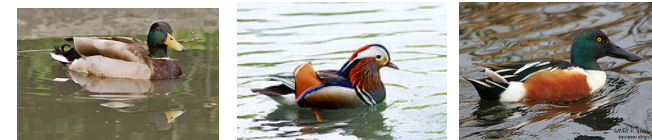
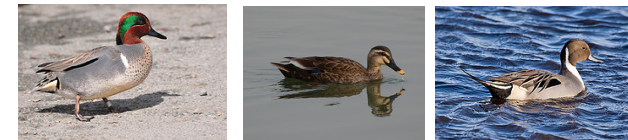
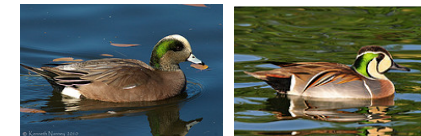


Pelecaniformes

Hérons

Anseriformes

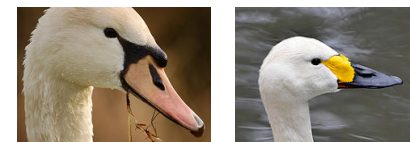
Ducks



Geese



Swans



Role for ducks of *Anas* spp.
 - HPAI H5N8-specific antibody detection in ducks -

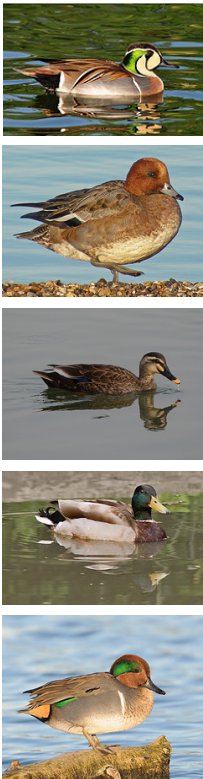


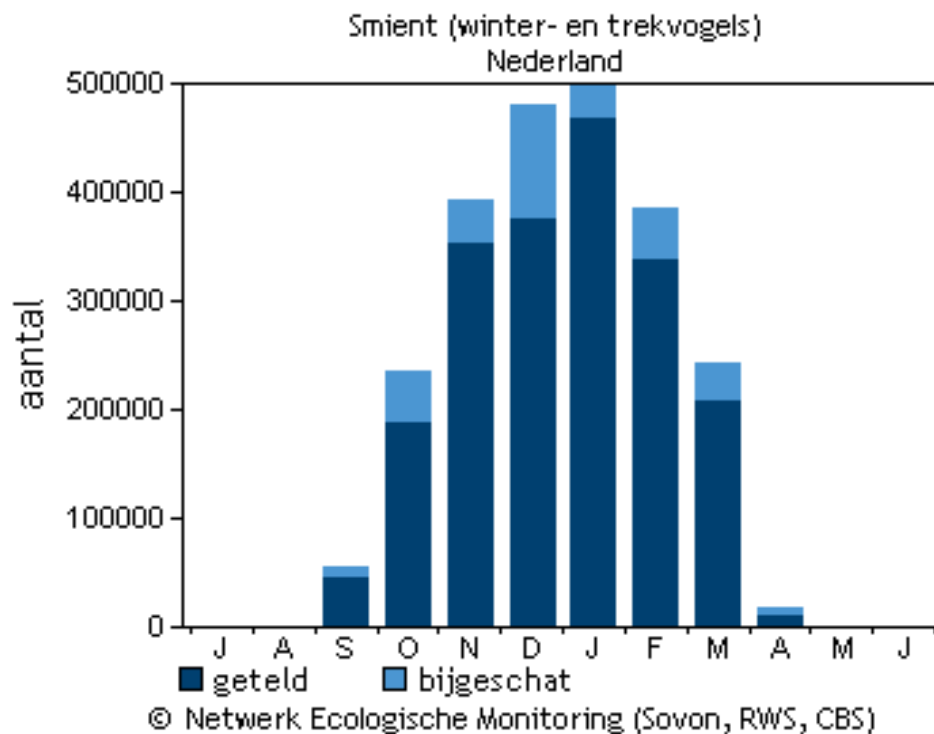
Table 3
 H5N8 HPAIV isolates and H5 antibodies (Ab) detected in captured wild birds from Korea up to May during 2014.

Species	No. of samples	H5Ab	Ab positive rate (%)	H5N8 HPAIVs
Baikal teal	30	16	53	0
Eurasian wigeon	12	6	50	0
Spot-billed duck	146	26	18	2
Mallard	379	54	14	3
Common teal	50	5	10	4
Pintail	16	0	0	0
Mandarin duck	8	0	0	0
Red-crested pochard	1	0	0	0
Gadwall	1	0	0	0
Total	643	107	16.6	9

Role for ducks of *Anas* spp.

- Timing H5N8 detection: high numbers of overwintering ducks -

- E.g. eurasian wigeon (*Anas penelope*) in the Netherlands



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Sovon, the Netherlands

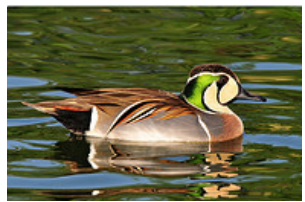
Indirect migratory connection between SE Asia and Europe HPAI H5N8-positive bird species



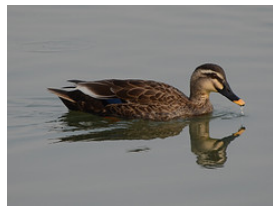
Northern pintail
Anas acuta



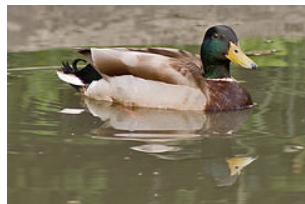
Eurasian wigeon
Anas penelope



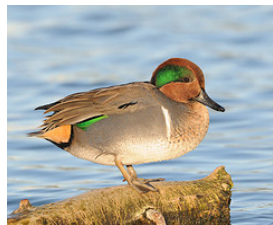
Baikal teal
Anas formosa



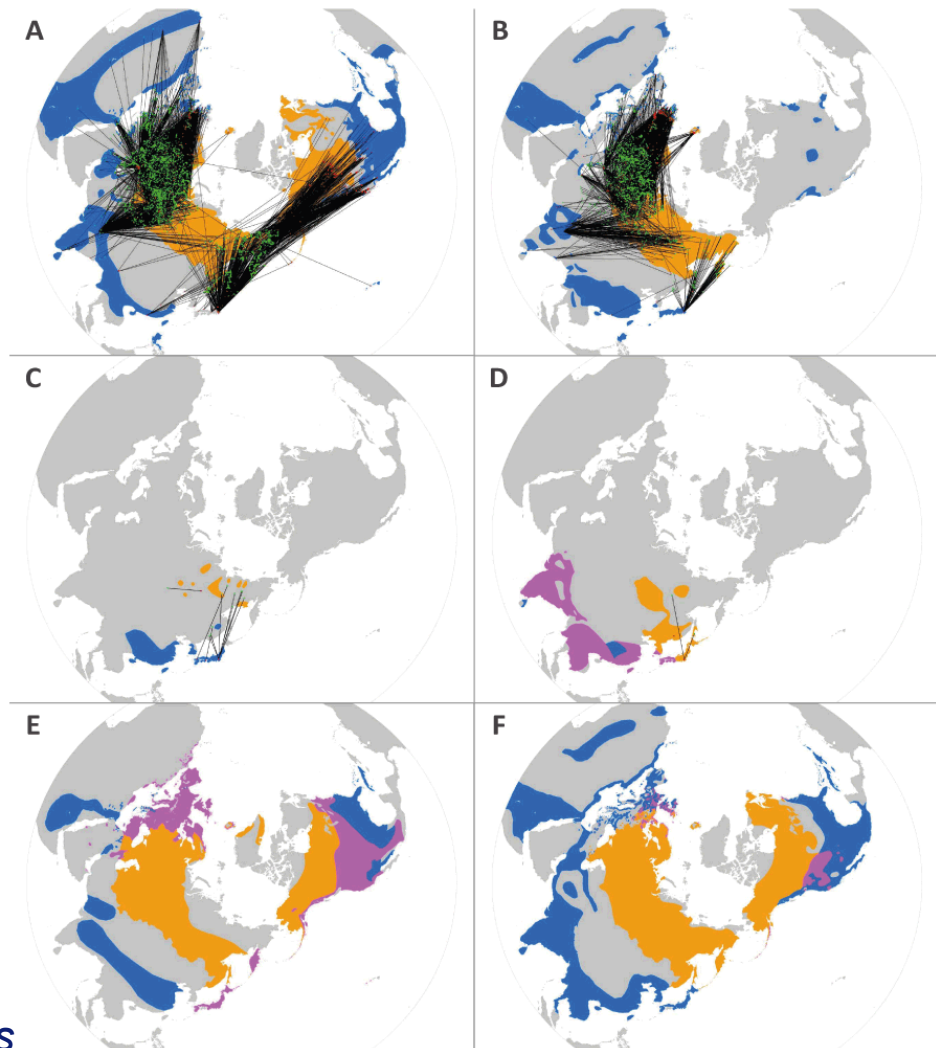
Spot-billed duck
Anas poecilorhyncha



Mallard
Anas platyrhynchos



Teal
Anas crecca/carolinensis



Wild bird surveillance activities around HPAI H5N8 outbreaks - the Netherlands, 14 November 2014 until 18 March 2015 -

Order	Family	Species	Birds sampled	AIV positive	H5 positive	Pathotype	
Anseriformes	Ducks	Common teal	106	19	1	LPAI	
		Egyptian goose	40	0	0		
		Eurasian wigeon	2123	39	3	HPAI	
		Gadwall	128	1	0		
		Mallard	1394	292	9	LPAI	
		Northern shoveler	4	2	0		
		Red-breasted merganser	1	1	0		
		Tufted duck	3	0	0		
		Geese	Barnacle goose	38	2	0	
			Brant goose	39	1	0	
Greylag goose	17		0	0			
Greater white-fronted goose	449		1	0			
Swans	Bewick's swan	72	4	0			
	Mute swab	109	18	0			
	Whooper swan	2	1	0			
Charadriiformes	Gulls	751	35	0			
Gruiformes	Coots	289	9	0			
	Rails	20	0	0			
Passeriformes	Crows	1	0	0			
Strigiformes	Owls	1	0	0			
Total			5587	425	13		

Use of HPAI H5N8-specific serology

H5 clade 2.3.4.4 antigenically different from other clades



- Table ferret antisera H5 clades

Virus	Ferret antisera raised against						
	LPAI	Clade 0	Clade 1	Clade 2.1	Clade 2.2	Clade 2.3	H5N8
A/Mallard/Netherlands/3/1999 (H5N2, LPAI) ^a	<u>160</u>	120	<10	<10	10	<10	<10
A/Hong Kong/156/1997 (H5N1, Clade 0)	160	<u>560</u>	120	40	320	80	80
A/Vietnam/1194/2004 (H5N1, Clade 1)	<10	<10	<u>80</u>	<10	<10	<10	<10
A/Indonesia/5/2005 (H5N1, Clade 2.1)	<10	<10	<10	<u>160</u>	<10	<10	<10
A/Turkey/Turkey/1/2005 (H5N1, Clade 2.2)	40	20	10	<10	<u>1280</u>	40	<10
A/Anhui/1/2005 (H5N1, Clade 2.3)	<10	<10	20	40	40	<u>160</u>	<10
A/Chicken/Netherlands/EMC-3/2014 (H5N8)	<10	20	<10	<10	<10	<10	<u>240</u>

- Wild bird sera along major migratory flyways

Conclusions



- Wild birds, most likely ducks of the *Anas* species, involved in epidemiology of HPAI H5N8:
 - i) virus detection in live birds; ii) H5N8-specific antibodies suggest survival infection; iii) fecal samples direct into environment; iv) timing of detections; v) locations of H5N8-positive farms
- Use of HPAI H5N8-specific serology wild birds global, along major migratory flyways, with emphasis on North-east Europe, Russia and north China (r.fouchier@erasmusmc.nl and dstall@uga.edu)

Acknowledgements



- **Labwork**

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- **Fieldwork**

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