

Ducks and rice play key role in avian influenza outbreaks

New scientific findings published

Ducks, people and rice paddies – rather than chickens – are the major factors behind outbreaks of H5N1 highly pathogenic avian influenza in Thailand and Viet Nam, and are probably behind outbreak persistence in other countries of the region such as Cambodia and Lao PDR.

In "Mapping H5N1 highly pathogenic avian influenza risk in Southeast Asia: ducks, rice and people", just published in the latest issue (26 March 2008) of the Proceedings of the National Academy of Sciences of the United States (PNAS)*, a group of experts from FAO and associated research centres looked at the series of waves of H5N1 highly pathogenic avian influenza (HPAI) in Thailand and Viet Nam between early 2004 and late 2005.



A girl leaves after feeding her family's ducks on a field of Gia Trieu village, Viet Nam (FAO/AFP Photo/Hoang Dinh Nam)

Initiated and coordinated by FAO senior veterinary officer Jan Slingenbergh, the researchers applied a modelling technique to establish how different factors contributed to spread of the virus, including the numbers of duck, geese and chicken, human population size, rice cultivation and local geography. The numbers of ducks and people, and the extent of rice cultivation emerged as the most significant factors, even though the two countries had fought outbreaks in two different ways. *cont'd on Page 2*



Understanding avian influenza

FAO will shortly release a major new and wide-ranging overview of avian influenza in an attempt to throw much-needed light on the disease and the viruses that cause it, explain what is known and what is still not known about it, and take a critical look at some of the major issues involved, including the pros and cons of different approaches to disease control. The work – *Understanding avian influenza – a review of the emergence, spread, control, prevention and effects of Asian-lineage H5N1 highly pathogenic viruses* – has been written for FAO by Les Sims and Clare Narrod. It will be released on FAO's avian influenza website (www.fao.org/avianflu) in three instalments. The first instalment of this MUST READ work will be accessible online from 4 April.

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The paper notes that there is a strong link between duck grazing patterns and rice cropping intensity. Ducks feed mainly on leftover rice grains in harvested paddy fields, so free-ranging ducks in both countries are moved to many different sites in line with rice harvest patterns.

In Thailand, for example, the proportion of young ducks in flocks was found to peak in September-October; these rapidly growing young ducks can therefore benefit from the peak of the rice harvest in November-December. Meat ducks are slaughtered around the Chinese New Year, a time when the volume of sales-related duck movement rises considerably.



A flock of geese near Beijing. This farm produces 10,000 geese a month for the Beijing market. China (FAO/F. Bottis)

These peaks in congregation of ducks indicate periods in which there is an increase in the chances for virus release and exposure, and rice paddies can easily become a temporary habitat for wild bird species.

Defining this pattern was made possible through the use of satellite mapping of rice paddy agriculture over time, cropping intensity and duck grazing locations. The intersections among these, together with the chronology of disease outbreaks, helped the scientists pinpoint critical situations in time when HPAI risk was greatest.

According to Slingenbergh, "we now know much better where and when to expect H5N1 flare-ups, and this helps to target control and prevention. In addition, with virus persistence becoming increasingly confined to areas with intensive rice-duck agriculture in eastern and southeastern Asia, evolution of the H5N1 virus may become easier to predict."

FAO estimates that approximately 90 percent of the world's 1.044 billion domestic ducks are in Asia. China and Viet Nam account for the bulk of this – 775 million or 75 percent. Thailand has about 11 million ducks.

In Thailand during 2005, long-distance duck travelling greatly diminished because farmers and traders had to provide a health certificate for the animals. The local movements of ducks decreased when the government started to support in-door keeping of ducks, offering feed subsidies and construction of enclosures. Together, these measures stopped the H5N1 transmission cycle and since late 2005 Thailand has suffered only sporadic outbreaks.

Viet Nam started nationwide vaccination of all poultry at the end of 2005, including the Mekong delta which is home to 50 million ducks. This large-scale vaccination was repeated in 2006/07. Initially, human infections disappeared and levels of disease in poultry fell noticeably. Only gradually did H5N1 viruses reappear, mostly in unvaccinated ducks and particularly in the Mekong delta.

Now, says Slingenbergh, interventions based on knowledge of hotspots and local rice-duck calendars are called for, in order to target disease control and replace indiscriminate mass vaccination.

* Go to <http://www.pnas.org/papbyrecent.shtml> to read the PNAS article.

Reassortant H5N1 virus spreading in Nigerian poultry

Genetic characterization of a selection of influenza virus (H5N1) samples circulating in eight Nigerian states over a 39-day period in early 2007 indicates that a new reassortant strain is present in seven of these states. The finding comes from a new study reported in the latest issue of *Emerging Infectious Diseases* (April 2008) under the title 'Reassortant Avian Influenza Virus (H5N1) in Poultry, Nigeria, 2007'. FAO's Animal Health Service supported sequence analysis of strains and facilitated sample submission, and the study was made possible through the framework of FAO's Technical Cooperation Projects. The work was also funded and supported by the European Union. The authors say their findings indicate that the viruses circulating in 2007 in Nigeria differ from the original sublineage prototypes introduced during 2006; the emergence of at least two reassortant viruses in Nigeria shows that co-infection with viruses of different sublineages has occurred. This, they continue, is most likely a result of poor biosecurity measures implemented by the poultry industry, particularly the live-bird market system, which is known to facilitate mingling of infected birds.

See <http://www.cdc.gov/eid/content/14/4/637.htm> for the full article.

MOST RECENT HPAI OUTBREAKS 2006-08

Note: This list has been compiled on the basis of information up to 16 March 2008.

2008

March	Bangladesh, China, Egypt, China (Hong Kong SAR) , India, Indonesia, Lao PDR, Pakistan, Turkey, Viet Nam
February	Myanmar, Ukraine, United Kingdom,
January	China, Israel, Saudi Arabia, Thailand

2007

December	Benin, Germany, Iran, Poland, Russian Federation
November	Romania
October	Afghanistan, Nigeria
August	France
July	Czech Republic, Togo
June	Ghana, Malaysia
April	Cambodia, Kuwait
March	Korea (Republic of)
January	Hungary, Japan

2006

November	Côte d'Ivoire
August	Sudan
July	Spain
June	Mongolia , Niger
May	Burkina Faso, Denmark
April	Djibouti, Sweden [H5], West Bank & Gaza Strip
March	Albania, Austria, Azerbaijan [H5], Cameroon, Croatia , Greece , Jordan, Kazakhstan, Serbia, Slovenia , Switzerland [H5]
February	Bosnia-Herzegovina , Bulgaria , Georgia , Iraq [H5], Italy , Slovakia

Green: wild birds only

Sources: World Organisation for Animal Health (OIE), European Commission (EC), FAO and national governments

I. WORLDWIDE SITUATION

One hundred and thirteen outbreaks/cases of HPAI (H5N1) were reported worldwide in February 2008 in eleven countries (Bangladesh, China, Egypt, India, Indonesia, Lao PDR, Pakistan, Turkey, Ukraine, United Kingdom and Viet Nam). This compares to 292 outbreaks reported in February 2006 and 138 in February 2007. The geographical location of outbreaks in poultry and cases in wild birds is shown in Figure 1.

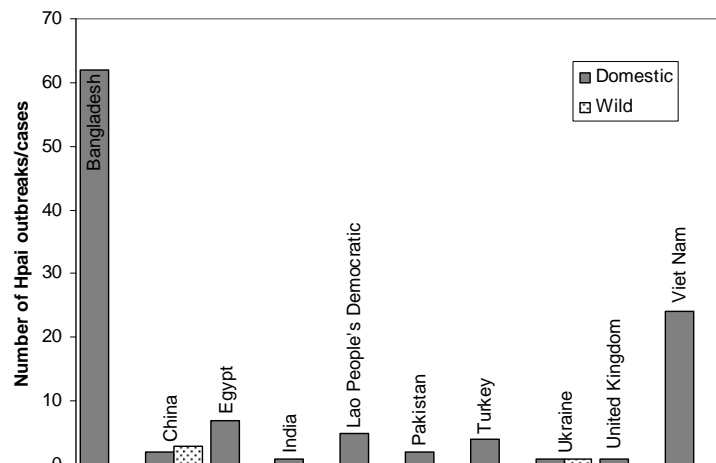


Chart 1 HPAI (H5N1) outbreaks confirmed during February 2008 (excluding Indonesia's PDS data) (Source: FAO EMPRES-i)

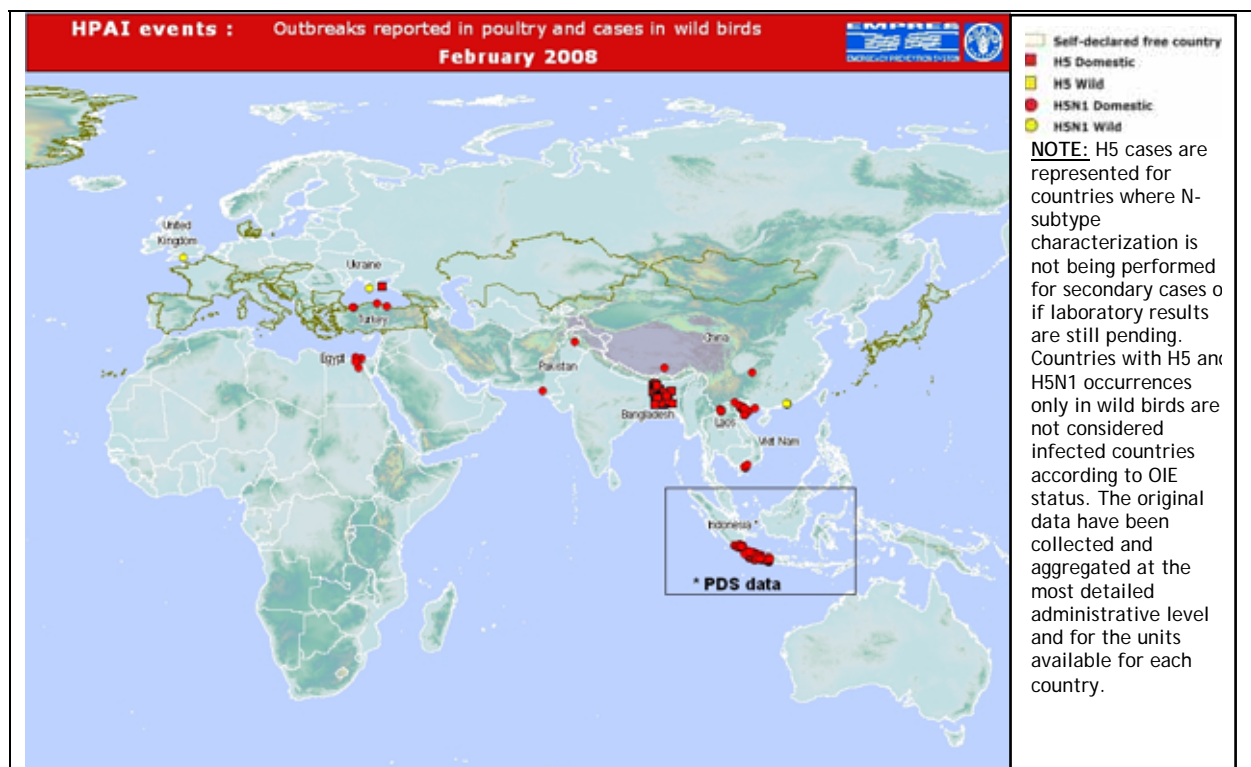


Figure 1 HPAI (H5N1) outbreaks in poultry and cases of H5N1 infection in wild birds reported in February 2008 (Source: FAO EMPRES-i)

The evolution of the number of reported cases over the last six months by continent and by species group (wild or domestic) is represented in Charts 2 and 3, respectively.

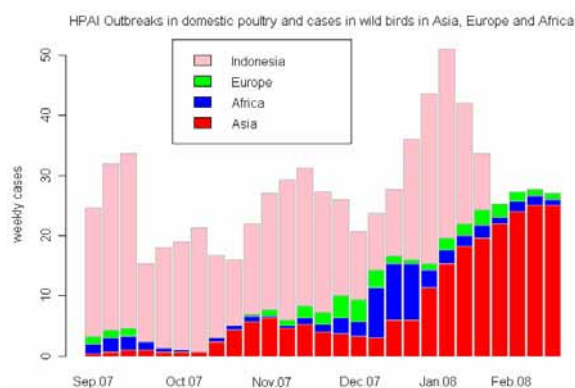


Chart 2 HPAI (H5N1) outbreaks in poultry and cases of H5N1 infection in wild birds per continent reported between September 2007 and February 2008 (Source: FAO EMPRES-i)

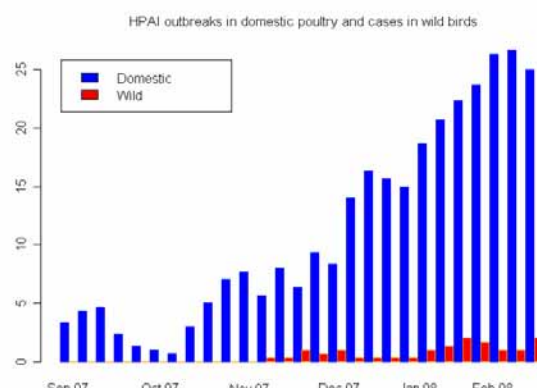


Chart 3 Number of HPAI (H5N1) outbreaks of HPAI in poultry and cases of H5N1 infection in wild birds reported between September 2007 and February 2008 (excluding Indonesia's PDS data) (Source: FAO EMPRES-i)

II. SITUATION BY CONTINENT/REGION

AFRICA

In Africa, **Egypt** reported seven outbreaks in the Nile Delta region during February 2008, a much lower number compared with the two previous months, which recorded over 50 poultry outbreaks/month (Chart 4). Both backyard/rooftop and commercial poultry systems were affected. Two of the poultry outbreaks were detected while investigating H5N1-infection cases in humans. In total, three confirmed human cases were reported to WHO during February 2008.

Nigeria has not recorded any HPAI outbreak since October 2007. The results of an FAO surveillance project funded by the European Commission became available recently. Out of 4,064 tracheal swabs, 3,913 cloacal swabs and 3,166 serum samples collected in all 35 states of Nigeria between October 2006 and December 2007, none was positive.

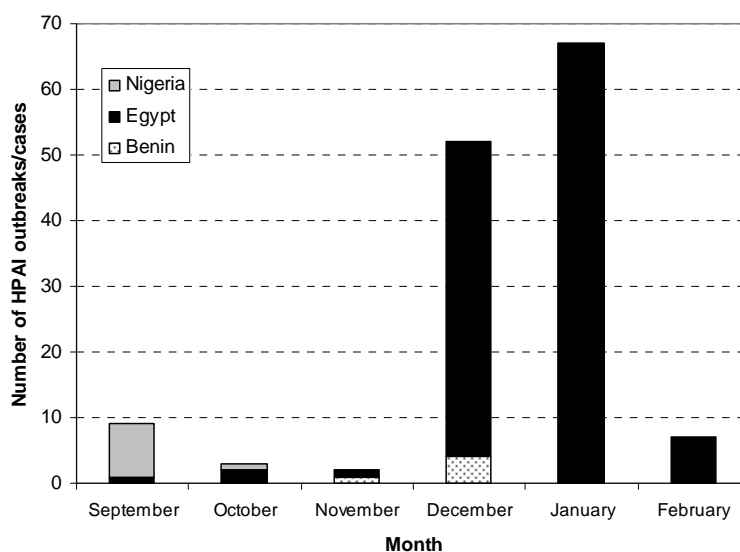


Chart 4 Number of outbreaks/cases of HPAI (H5N1) confirmed between September 2007 and February 2008 in Africa (Source: FAO EMPRES-i)

ASIA

Indonesia is still experiencing the highest number of cases of HPAI type H5N1 in poultry worldwide. The situation remains critical despite major efforts to control HPAI, which has become deeply entrenched (31 out of 33 Indonesian provinces are infected). The virus is endemic in Java, Sumatra, Bali and southern Sulawesi with sporadic outbreaks reported from other areas. The high figure of reported cases for Indonesia in 2007-08 is largely due to the ongoing 'participatory disease surveillance' (PDS) programme that uses participatory techniques combined with an influenza type A rapid test to identify cases of HPAI in backyard village-type poultry production environments (Figure 1 and Chart 2). The programme is supported by FAO with donor support (e.g. United States, Australia and the Netherlands) and is operating in 157 districts in Java, Sumatra and Bali. In addition, two human cases were reported in February 2008, both of them with fatal consequences.

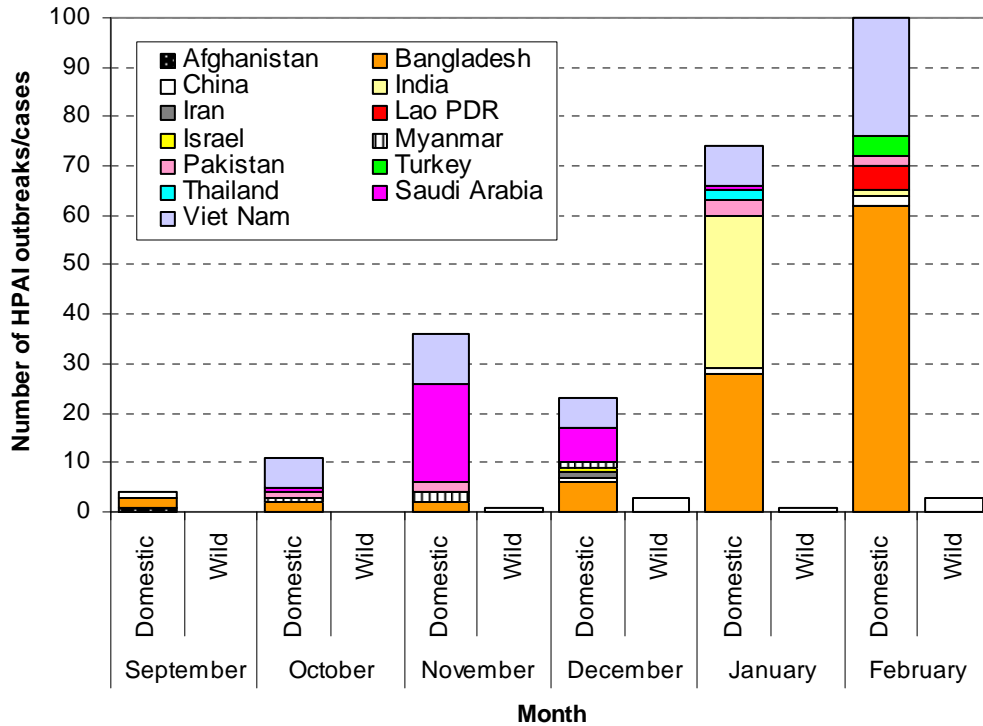


Chart 5 Number of outbreaks/cases of HPAI (H5N1) confirmed between September 2007 and February 2008 in Asia (excluding Indonesia's PDS data)
(Source: FAO EMPRES-i)

Outbreaks in poultry have been reported regularly by **Viet Nam** (24 outbreaks in February), mainly in non-vaccinated duck production systems, compared with two cases in February 2007. In addition, there were three fatal human cases reported to WHO during February.

The endemic situation of HPAI in **Bangladesh** is of great concern, with H5N1 virus spreading to 16 additional districts during February 2008, (46 out of 64 districts are infected). During February alone, H5 was confirmed on 101 farms, representing 50 percent of the outbreaks since the start of the epidemic in February 2007 (n=198). Surveillance and control campaigns have so far not succeeded in interrupting virus transmission between districts.

In **China**, HPAI outbreaks were reported in Guizhou Sheng province and Xizang Zizhiqu province (Tibet), affecting domestic poultry. Three wild birds were reported in Hong Kong SAR. Two human cases were reported to WHO during February.

After experiencing its worst-ever HPAI epidemic in January, **India** apparently managed to control the situation in West Bengal through an aggressive depopulation campaign, and only one outbreak was reported in early February.

In **Lao PDR**, after one year without HPAI, five new outbreaks were reported in backyard poultry, clustered in the north of the country, close to the borders with China and Myanmar.

In **Pakistan**, two commercial broiler farms were affected by H5N1 HPAI in North West Frontier province and in Karachi, on the Southern coast. (H7 and H9 subtypes are also known to be circulating widely in poultry).

Some Asian countries such as **Cambodia** and **Iraq** did not experience outbreaks of HPAI in January 2008, but they report regularly about the negative results obtained from all samples submitted from suspect cases. **Cambodia** is using an animal health hotline activity to receive reports from the field on suspicious outbreaks or cases of HPAI. **Iraq** also reported the laboratory results of surveillance activities for the month of February. These data refer to all governorates except Kurdistan Province, in the north of the country. All samples from poultry farms (567), backyard poultry (1,828), game & wild birds (792), and markets and slaughter houses (2,479) proved negative.

EUROPE

In Europe, **Turkey** experienced four outbreaks in backyard chickens at different locations along the Black Sea coast. Most outbreaks are believed to have been from contact with infected wild birds, mainly through hunting and subsequent exposure of backyard poultry to wild bird leftovers. An FAO mission to the country has confirmed the strong hypothesis that wild birds play a role, and additional analytical results are expected.

Ukraine reported an outbreak in backyard chickens and eight H5N1 positive wild birds in Crimea.

The **United Kingdom** found an additional H5N1-positive wild bird (a Canada goose) at a location very close to the previously affected swannery in Dorset.

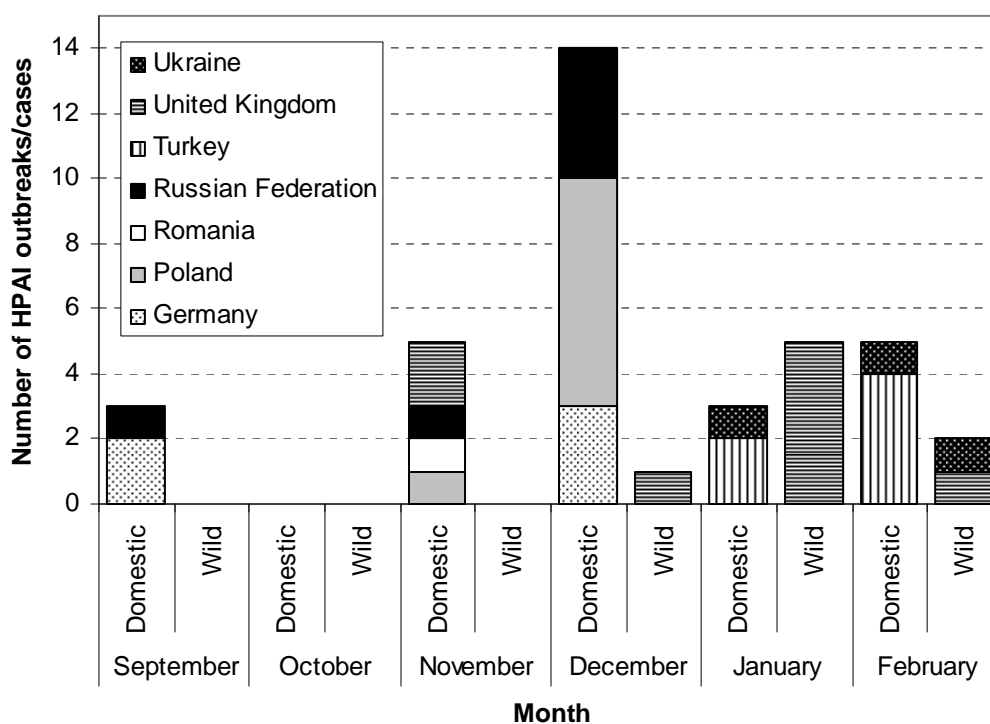


Chart 6 Number of outbreaks/wild bird cases of HPAI (H5N1) confirmed between September 2007 and February 2008 in Europe (Source: FAO EMPRES-i)

III. CONCLUSIONS

An increase in the number of HPAI outbreaks in backyard poultry linked to hunted birds being brought home and cleaned, and poultry being exposed to infectious material (viscera and feathers) appears to have been the causes of recent cases in Turkey. The reported cases in wild birds in the Crimean peninsula in Ukraine suggest H5N1 presence in the wild bird population in the Black Sea basin. Following a specific FAO multidisciplinary mission to Turkey, the outbreaks reported in February have been associated with hunting of wild birds and subsequent feeding of the entrails/leftovers to backyard poultry. Further investigation is needed on the role of the different migratory species that arrive in the Black Sea area, as well as the role that resident species may play as potential reservoirs of HPAI virus or as bridge species.

To assess the real situation of HPAI worldwide and its evolution, it is important to understand and evaluate the surveillance systems implemented by different countries. In endemic settings, HPAI virus is likely to be circulating in all production systems (commercial, semi-commercial and backyard). A better global understanding of poultry production systems, poultry chains and the related risks could help to improve the sensitivity of surveillance systems and disease control methods. For instance, the PDS programme in Indonesia is very efficient for detection of HPAI outbreaks in backyard poultry systems at village level. However, it is biased because it focuses on just one production system. The inclusion of the commercial sector, live bird markets and poultry collection points in a comprehensive and holistic national surveillance strategy could help improve HPAI control.

Eighty-two percent of HPAI outbreaks (without considering Indonesia) continue to be reported in domestic poultry from heavily infected/endemic countries (Indonesia, Bangladesh, Viet Nam and Egypt) with sporadic outbreaks in both domestic poultry and wild birds from other countries.

Overall, in February 2008, fewer outbreaks were officially reported compared with February 2006 and February 2007 (Chart 8). Although there is a progress in disease awareness, outbreaks/cases of HPAI are still likely to be underestimated and underreported in most affected countries because of the lack of systematic and effective disease surveillance systems.

Regionally, disease distribution during February 2008 has changed dramatically compared with previous years, with most outbreaks occurring in Asia, and very sporadic incidence in Europe and Africa (Egypt). On the other hand, in 2006, more than half of the HPAI outbreaks and cases were reported in Europe, mainly because of the high number of cases in wild birds. In 2007, Africa had the highest concentration of HPAI outbreaks and the total number of outbreaks/cases halved. It is important to bear in mind that underreporting from some countries may affect considerably the shape of the distribution of outbreaks by region (Chart 7). It is also important to note that outbreaks reported from Indonesia are not considered in Chart 7.

An animated map showing the evolution of outbreaks over the last six months, including January 2008, is available at: www.fao.org/ag/againfo/programmes/en/empres/maps.html.

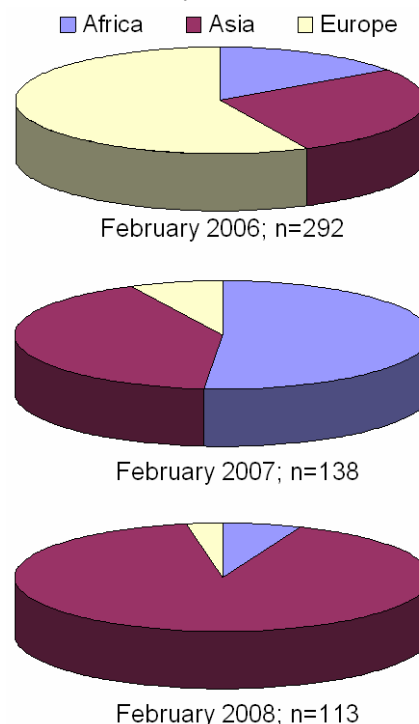


Chart 7 Number and distribution of outbreaks and cases in wild birds of HPAI (H5N1) confirmed in February 2006, 2007 and 2008 (excluding Indonesia's PDS data) (Source: FAO EMPRES-i)

AT A GLANCE

The latest HPAI outbreaks for the period 12 February – 16 March 2008

Note

AIDEnews publishes reports of **confirmed HPAI cases** using the following sources: OIE, European Commission, FAO and national governments.

AFRICA

Egypt

FAO reported 6 March 2008 that an outbreak of HPAI occurred in Al Giza on 28 February among commercial farm chickens which had been vaccinated on 23 January. It also reported that surveillance introduced following confirmed human HPAI cases had revealed outbreaks in backyard poultry (chickens, ducks and geese) in Al Fayoum (3 March) and Al Menia (27 December 2007).

On 27 February 2008, FAO reported two HPAI outbreaks: the first (19 February) affected 175-day-old chickens in two poultry houses on a commercial farm in Menia Al Kamh/Al Tellen, Al Sharkia governorate; the second (21 February) backyard poultry in Al Mahala Alkobra/Saft Torab, Al Gharbia governorate. Birds in both outbreaks had been vaccinated.

A week earlier, on 19 February, FAO said 67 outbreaks had been reported in both backyard and commercial poultry during the month of January. In addition, targeted surveillance in response to suspected human cases had revealed outbreaks among poultry in Gharbia and Kafr el Sheik (both on 13 February) and in Al Menofia province (9 February).

ASIA

Bangladesh

Between 13 February and 14 March 2008, outbreaks of HPAI had led to the culling of tens of thousands of chickens, ducks and pigeons on affected farms (and some unaffected farms in close range of those affected) and in hundreds of households in the districts of Bagerhat, Bagura, Barisal, Chandpur, Chittagong, Comilla, Dhaka, Dinajpur, Feni, Gazipur, Jamalpur, Jhinaidah, Kishoregonj, Khulna, Manikganj, Meherpur, Munshigonj, Mymensingh, Narsingdhi, Narayanganj, Natore, Niphamari, Nobabgonj, Pabna, Patuakhali, Rajbari, Rajshahi, Satkhira, Shariatpur, Tangail and Thakurgaon.

As of 13 March, 229 farms in 47 districts had confirmed infection with H5.

China

The Chinese National Avian Influenza Reference Laboratory informed the Ministry of Agriculture on 16 March 2008 confirming cases of H5N1 avian influenza in the Jinhuaixin market of Guangzhou City in Guangdong Province. As a result, the ministry together with the provincial government implemented a series of control measures, including identification of epidemic spots and affected areas, movement control combined with the culling and disinfection, and vaccination of all susceptible domestic poultry within a 5-km radius.

The Chinese Ministry of Agriculture reported 26 February 2008 that a suspected HPAI outbreak on 17 February among chickens in the Beiyuan Community of the town of Fengyi, Zheng'an County, Guizhou province had been confirmed as H5N1 by the National Avian Influenza Reference Laboratory at the Harbin Veterinary Research Institute.

Six days earlier, on 18 February, the ministry reported that an HPAI outbreak on 6 February in the village of Sema, Duilong Deqing County, Xizang Autonomous Region, had been confirmed as H5N1 by the same laboratory on 17 February.

Hong Kong SAR

On 14 March 2008, the Hong Kong Agriculture, Fisheries & Conservation Department (AFCD) reported that a peregrine falcon found in Ma Wan had been confirmed as H5N1 positive after a series of laboratory tests. Peregrine falcons are winter visitors to Hong Kong. Although here are no chicken farms within a 3-km radius, AFCD was contacting poultry farmers, pet bird shop owners, and licensed holders of pet poultry and racing pigeons to remind them to strengthen precautionary and biosecurity measures against avian influenza. It also said it would be conducting frequent inspections of poultry farms and the wholesale market.

Earlier, on 7 March, AFCD confirmed that an oriental magpie robin found in Tai Po was H5N1 positive after a series of laboratory tests.

India

The Department of Animal Husbandry, Dairying and Fisheries confirmed 9 March 2008 that poultry in two villages in Murshidabad district had tested positive for the H5 strain of avian influenza in rapid tests conducted at the High Security Animal Disease Laboratory (HSADL).

Indonesia

FAO's weekly report (15 March 2008) of its participatory disease surveillance (PDS) activities showed that 201 positive cases of HPAI had been detected in Bali (1), Java (150), Kalimantan (0), Sulawesi (0) and Sumatra (51). Since the beginning of 2006, FAO's PDS teams have undertaken over 142,650 interviews, with 3.4 percent of these leading to detection of positive HPAI cases.

Lao PDR

FAO reported 11 March 2008 that two HPAI outbreaks had been reported in Luang Namtha district affecting chickens and ducks. These followed earlier outbreaks in the same province: one on 17 February in the village of Thongmai was confirmed on 18 February; another, also on 17 February, occurred in the village of Pong and was confirmed on 22 February.

Myanmar

On 14 February 2008, FAO reported from the field that 156 serum samples from ducks in four different locations (Bago, Sagaing, East Shan and South Shan) had resulted HPAI positive. The agency said that the presence of so many seropositive ducks, particularly in the states of East and South Shan, had led to the imposition of strict surveillance on farms with seropositive ducks and an enforced ban on poultry movement.

Pakistan

On 10 March 2008, the Government reported to OIE an HPAI outbreak among broiler chickens on a commercial farm in Abbottabad, North West Frontier province. The outbreak started on 3 March and contact with wild species was thought to be the cause.

The Government reported to OIE on 26 February that an HPAI outbreak had been confirmed in Malir, Dumlootee (Gadap town), Karachi, Sindh province, among broilers in a commercial flock. The outbreak had started on 21 February.

Viet Nam

As of 14 March 2008, the Department of National Health (DAH) had reported HPAI outbreaks in poultry in 11 provinces – Ha Noi, Ha Nam, Lao Cai, Ninh Binh, Phu Tho, Quang Binh, Quang Nam, Quang Tri, Tuyen Quang, Ninh, Soc Trang and Vinh Long – in the previous 21 days.

On 12 March, the DAH reported to OIE H5N1 in six Owston's palm civets in Cuc Phuong National Park. Civets in the park had tested positive for H5N1 by Ho Chi Minh City Tropical Hospital and the National Veterinary Diagnosis Centre. The reports followed the deaths of the six civets, and of two other civets, five red-whiskered bulbuls, two langurs and one loris.

NEAR EAST

Iraq

Between 29 February and 3 March 2008, FAO reported that media reports about two HPAI outbreaks in backyard chickens in Basra governorate had been confirmed. The first on 18 February concerned chickens in a house in the region of Al Fadaghia, Al Faw district in Basra governorate. The second, on 29 February, took place among backyard poultry 500 metres from the site of the first outbreak.

Saudi Arabia

The OIE said 18 February 2008 that the country had reported 29 HPAI outbreaks between November 2007 and January 2008, with the outbreaks affecting layer and broiler chickens, ducks, turkeys and pigeons.

EUROPE

Turkey

Turkey officially reported 26 February 2008 to the OIE that an HPAI outbreak had occurred on 11 February among backyard poultry in the village of Tasmanli village, Merkez district, Sinop province, in the Black Sea Region. Samples sent to the Pendik (Istanbul) Veterinary Control and Research Institute for confirmation tested positive for H5N1 on 25 February. The source of the outbreak was declared to be contact between backyard poultry and wild waterfowl.

Ukraine

In a report on 25 February 2008, the Ukraine informed the OIE that the phylogenetic sequence of the isolate found in the country conformed to the sequence of avian influenza viruses obtained in 2007 in the Czech Republic, Romania, United Kingdom and Poland. The report said that the virus isolate nucleonic sequence conformed to that derived in the Czech Republic (A\mute\swan\Czech Republic\10732\07) with a confidence level of 99.5 percent. Monitoring and laboratory testing had been conducted on all species of birds throughout the country; from the beginning of 2008, 18,551 examinations had been carried out: wild birds (837), synantropic birds (879), backyard flocks (8,525) and production establishments (8,310).

United Kingdom

The UK Department for Environment, Food and Rural Affairs (Defra) confirmed on 29 February 2008 that a Canada goose discovered around 1 km from the Abbotsbury Swannery in Dorset, scene of previous cases among swans, had tested positive for H5N1, bringing to 11 the total number of wild birds confirmed with H5N1 in the area. Defra, which had earlier reported (on 18 February) the tenth case of HPAI in a mute swan from the same area, said evidence suggested that the level of infection in the mute swan population was low and that there remained no evidence of spread to other wild birds or domestic poultry.

SUMMARY OF CONFIRMED HPAI OUTBREAKS (as of 16 March 2008)

Sources: OIE, European Commission (EC), FAO and national governments – WHO for human cases/deaths

Note: Highlighted countries indicate those in which there has been only one officially confirmed outbreak or occurrence

AFRICA	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Benin	7 November 2007	15 December 2007	Domestic poultry	-
Burkina Faso	1 March 2006	20 May 2006	Domestic poultry - wild birds	-
Cameroon	21 February 2006	28 March 2006	Domestic poultry – wild birds	-
Côte d'Ivoire	31 March 2006	9 November 2006	Domestic poultry – wild birds	-
Djibouti	6 April 2006	6 April 2006	Domestic poultry	1 / 0
Egypt	17 February 2006	6 March 2008	Domestic poultry – wild birds	47 / 20
Ghana	14 April 2007	13 June 2007	Domestic poultry	-
Niger	6 February 2006	1 June 2006	Domestic poultry	-
Nigeria	16 January 2006	6 October 2007	Domestic poultry – wild birds	1 / 1
Sudan	25 March 2006	4 August 2006	Domestic poultry	-
Togo	6 June 2007	20 July 2007	Domestic poultry	-

ASIA	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Afghanistan	2 March 2006	2 October 2007	Domestic poultry – wild birds	-
Bangladesh	5 February 2007	16 March 2008	Domestic poultry	-
Cambodia	12 January 2004	6 April 2007	Domestic poultry – wild birds	7 / 7
China	20 January 2004	16 March 2008	Domestic poultry – wild birds	30 / 20
China (Hong Kong SAR)	19 January 2004	10 March 2008	Wild birds	-
India	27 January 2006	9 March 2008	Domestic poultry	-
Indonesia	2 February 2004	February/March 2008 (PDS data)	Domestic poultry – pigs (with no clinical signs)	129 / 105
Japan	28 December 2003	30 January 2007	Domestic poultry – wild birds	-
Kazakhstan	22 July 2005	10 March 2006	Domestic poultry – wild birds	-
Korea, Rep. of	10 December 2003	8 March 2007	Domestic poultry – wild birds	-
Lao, PDR	15 January 2004	2 March 2008	Domestic poultry	2 / 2
Malaysia	19 August 2004	2 June 2007	Domestic poultry – wild birds	-
Mongolia	10 August 2005	5 June 2006	Wild birds	-
Myanmar	8 March 2006	23 December 2007	Domestic poultry	1 / 0
Pakistan	23 February 2006	3 March 2008	Domestic poultry – wild birds	1 / 1
Thailand	23 January 2004	18 January 2008	Domestic poultry – wild birds – tiger	25 / 17
Viet Nam	9 January 2004	14 March 2008	Domestic poultry	105 / 51

NEAR EAST	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Iran	2 February 2006	10 December 2007	Domestic poultry - wild birds	-
Iraq (H5)	18 January 2006	1 February 2006	Domestic poultry – wild birds	3 / 2
Israel	16 March 2006	1 January 2008	Domestic poultry	-
Jordan	23 March 2006	23 March 2006	Domestic poultry	-
Kuwait	23 February 2007	20 April 2007	Domestic poultry – wild birds – zoo birds	-
Saudi Arabia	12 March 2007	29 January 2008	Domestic poultry	-
West Bank & Gaza Strip	21 March 2006	2 April 2006	Domestic poultry	-

EUROPE	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Albania	16 February 2006	9 March 2006	Domestic poultry	-
Austria	10 February 2006	22 March 2006	Wild birds – cats	-
Azerbaijan	2 February 2006	18 March 2006 (H5)	Wild birds – domestic poultry – dogs	8 / 5
Bosnia-Herzegovina	16 February 2006	16 February 2006	Wild birds	-
Bulgaria	31 January 2006	9 February 2006	Wild birds	-
Croatia	21 October 2005	24 March 2006	Wild birds	-
Czech Republic	27 March 2006	11 July 2007	Wild birds – domestic poultry	-
Denmark	12 March 2006	26 May 2006	Wild birds – domestic poultry	-
France	17 February 2006	14 August 2007	Wild birds – domestic poultry	-
Georgia	23 February 2006	23 February 2006	Wild birds	-
Germany	8 February 2006	25 December 2007	Wild birds – domestic poultry – cats – stone marten	-
Greece	30 January 2006	27 March 2006	Wild birds	-
Hungary	4 February 2006	23 January 2007	Wild birds – domestic poultry	-
Italy	1 February 2006	19 February 2006	Wild birds	-
Poland	2 March 2006	16 December 2007	Wild birds – domestic poultry	-
Romania	7 October 2005	6 December 2007 (cat)	Wild birds – domestic poultry – cat	-
Russian Federation	15 July 2005	19 December 2007	Domestic poultry – wild birds	-
Serbia	28 February 2006	16 March 2006	Wild birds – domestic poultry	-
Slovakia	17 February 2006	18 February 2006	Wild birds	-
Slovenia	9 February 2006	25 March 2006	Wild birds	-
Spain	7 July 2006	7 July 2006	Wild birds	-
Sweden	28 February 2006	26 April 2006 (H5)	Wild birds – domestic poultry - game birds - mink	-
Switzerland	26 February 2006	30 March 2006 (H5)	Wild birds	-
Turkey	1 October 2005	9 March 2008	Domestic poultry – wild birds	12 / 4
Ukraine	2 December 2005	11 February 2008	Wild birds – domestic poultry – zoo birds	-
United Kingdom	30 March 2006	25 February 2008	Wild birds – domestic poultry	-